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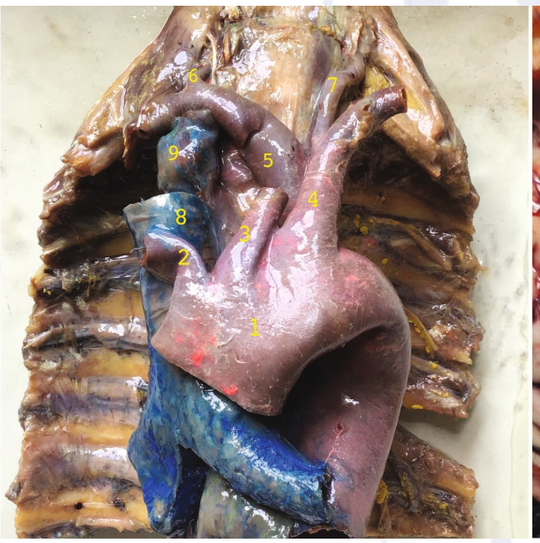

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Journal of The Anatomical Society of India • Volume 75 • Supplementary Issue • April 2026 • Pages S1-S114

Volume 75 • Supplementary Issue • April 2026

Journal of the Anatomical Society of India

Print ISSN: 0003-2778

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309, Block-B, Canopy Calyx Apartment, Coffee Board Layout, Hebbal-Kempapura,
Bengaluru-560 024, India.
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Published by

Wolters Kluwer India Pvt. Ltd. (Medknow),
Smartworks, Marisoft, Wing-C, Wadgaon Sheri,
Kalyani Nagar Annex, Pune - 411 014,
Maharashtra, India.
Website: www.medknow.com

Printed at

Nikeda Art Printers Pvt. Ltd.,
Building No. C/3 - 14,15,16, Shree Balaji Complex, Vehele Road,
Village Bhatale, Taluka Bhiwandi, District Thane - 421302, India.

Journal of the Anatomical Society of India

Print ISSN: 0003-2778

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Journal of the Anatomical Society of India

Volume 75 | Supplementary Issue | April 2026

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Original Article

A Morphometric Analysis of the Distal Radius: Implications for the Distal Radioulnar Joint

Satarupa Paul Ghosh, Animesh Karmakar

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Abstract

Background: The stability of the distal radioulnar joint (DRUJ) relies heavily on the osseous congruity of the ulnar (sigmoid) notch. Morphometric variations, particularly anterior-posterior asymmetry, significantly influence joint mechanics and implant design. This study aimed to evaluate the detailed morphometric parameters of the distal radius, specifically analyzing the dimensional asymmetry between the anterior and posterior aspects of the ulnar notch. **Materials and Methods:** A morphometric study was conducted on 54 dry adult human radii (27 right and 27 left) free of pathology. Using a digital Vernier caliper (0.01-mm precision), measurements were obtained for the anterior and posterior lengths of the ulnar notch, notch width, radial styloid length, and the dimensions of the inferior articular facet. Statistical analysis was performed using paired and independent *t*-tests. **Results:** The analysis revealed significant anteroposterior asymmetry. The posterior (dorsal) length of the ulnar notch was consistently greater than the anterior (volar) length. On the right, the mean posterior length (0.77 ± 0.18 cm) significantly exceeded the anterior length (0.46 ± 0.14 cm; $P < 0.001$). Left-sided specimens showed a similar pattern (0.58 vs. 0.45 cm). Conversely, the inferior articular facet was wider at its anterior margin. The mean radial styloid length was 1.16 cm (right) and 1.12 cm (left). **Conclusion:** The ulnar notch extends significantly further dorsally than volarly, likely to accommodate the dorsal radioulnar ligament and increase articular surface area. In contrast, the radiocarpal facet is wider anteriorly. These morphometric norms are critical for preoperative planning, radiographic interpretation, and designing anatomical plates that restore DRUJ congruity.

Keywords: *Anthropometry, distal radioulnar joint, joint instability, radius, wrist joint*

Introduction

The distal radius articulates with the ulna through the ulnar (sigmoid) notch to form the distal radioulnar joint (DRUJ), a pivot joint essential for forearm pronation and supination.[1,2] Distal radius fractures constitute approximately 8%–15% of adult skeletal injuries, underscoring the clinical importance of precise morphometric understanding for orthopedic planning and implant design.[3,4] Functionally, the DRUJ is an incongruent joint in which nearly 80% of axial wrist load is transmitted through the radius, with only 20% borne by the ulnar column.[5] Full forearm rotation permits 150°–180° of motion, supplemented by approximately 30° at the radiocarpal joint, with stability maintained by the integrated "forearm ring" comprising the DRUJ, proximal radioulnar joint, and interosseous membrane.[2,5,6]

Anatomically, the sigmoid notch is shallow (mean depth: ~1.7 mm) and only partially covered by articular cartilage, contributing minimally to inherent joint stability.[7] Its dorsal aspect is flatter, exhibiting a dorsal tilt of approximately 9°, further reducing bony constraint and emphasizing reliance on soft-tissue stabilizers.[8] The notch spans roughly 130° of the radial articular arc, whereas the ulnar head spans nearly 200°, creating a functional mismatch that shifts contact between volar and dorsal regions during rotation.[9] Variations in notch orientation and ulnar variance significantly influence load transmission across the DRUJ; positive ulnar variance increases stress on the triangular fibrocartilage complex (TFCC) and ulnocarpal complex, predisposing to ulnar impaction and degenerative changes.[10]

Clinically, involvement of the sigmoid notch in intra-articular distal radius fractures disrupts joint congruity and TFCC integrity, leading to DRUJ instability and

How to cite this article: Ghosh SP, Karmakar A. A morphometric analysis of the distal radius: Implications for the distal radioulnar joint. J Anat Soc India 2026;75:S1-5.

Article Info

Received: 22 December 2025
Revised: 31 January 2026
Accepted: 04 February 2026
Available online: 13 April 2026

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Access this article online

Website: https://journals.lww.com/joai
DOI: 10.4103/jasi.jasi_203_25

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poorer functional outcomes.[11-16] Advanced imaging is often required to accurately assess these injuries.[12,17] Chronic instability or altered loading may progress to degenerative arthrosis of the DRUJ, presenting with ulnar-sided wrist pain, crepitus, and reduced grip strength.[10,18,19]

Materials and Methods

Study design and setting

This research was designed as an observational, descriptive, cross-sectional morphometric study. The study was conducted on a collection of 54 adult human dry radii (27 right and 27 left). The specimens were obtained from the osteological collection of the Department of Anatomy at a tertiary care teaching hospital. The duration of the study was 3 months.

Inclusion and exclusion criteria

Both right and left radii were included to allow comparative morphometric analysis. All bones with deformities, pathological changes, or visible erosion of the distal articular surface were excluded from the study.

Measurements

All morphometric parameters of the distal end of the radius were measured using a digital Vernier caliper with an accuracy of 0.01 mm. Each measurement was taken twice by the same observer to minimize intra-observer error, and the mean of the two readings was recorded. The following parameters were studied:

1. Length and width of the ulnar notch: The length was measured between the anterior and posterior limits of the sigmoid notch [Figure 1c], and the width was measured between the superior and inferior margins [Figure 1b]
2. Length of the styloid process: Measured from the tip of the styloid process to the level of the inferior articular surface of the radius [Figure 1a]
3. Dimensions of the inferior articular facet: The linear dimensions of the anterior and posterior margins of the distal articular surface (radiocarpal articulation) were measured [Figure 1d and e].

All measurements were taken in centimetres (cm). Care was taken to ensure proper alignment of the caliper jaws with the bony contours to avoid parallax or angular error.

Data analysis

Descriptive statistics – mean, standard deviation (SD), minimum, and maximum values – were calculated for each morphometric parameter and aspect (anterior/posterior, right/left).

To assess the statistical significance of differences between paired measurements (e.g., anterior vs. posterior aspects of the same radius), a two-tailed paired Student's *t*-test was applied at a significance level of $\alpha = 0.05$. In cases comparing right and left sides, an independent *t*-test was employed.

All statistical analyses were performed using a standard statistical software environment. Missing or damaged data entries, if any, were excluded on a pairwise basis to preserve analytical integrity.

Results

The anterior ulnar notch length averaged 0.463 cm (SD 0.136 cm), while the posterior aspect averaged 0.770 cm (SD 0.181 cm) across the 27 right radius [Table 1]. In other words, the posterior measurements

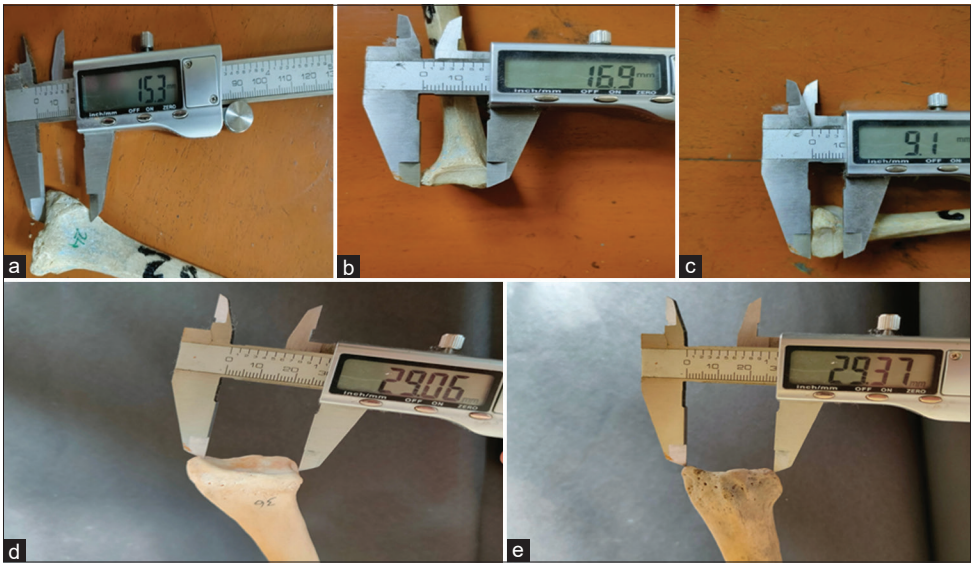

Figure 1: Morphometric measurements of the distal radius using a digital Vernier caliper. (a) Measurement of the length of the radial styloid process. (b) Measurement of the width of the ulnar (sigmoid) notch. (c) Measurement of the length of the ulnar notch from its anterior to posterior limits. (d and e) Measurement of the Anterior and Posterior circumference of inferior articular facet, respectively. All measurements were taken using Skadiio's digital Vernier caliper with 0.01 mm precision, ensuring accurate assessment of distal radius morphometry

were markedly larger on average. Numerically, anterior lengths ranged from 0.20 to 0.70 cm and posterior from 0.30 to 1.00 cm. A paired *t*-test confirmed this difference was highly significant ($P \approx 2.3 \times 10^{-11}$), indicating the posterior notch is consistently longer (dorsal > palmar). Variability was moderate: the SD was about 30% of the mean in each case.

Left distal radius ulnar notch lengths were measured in 27 specimens. The mean length of the ulnar notch in the anterior aspect was 0.45 ± 0.10 cm, whereas in the posterior aspect it was 0.58 ± 0.11 cm [Table 2]. The anterior-aspect values ranged from 0.30 to 0.70 cm and the posterior-aspect values from 0.40 to 0.80 cm. Thus, the posterior ulnar notch was consistently longer than the anterior notch in every specimen. A paired two-tailed *t*-test confirmed that this difference was statistically significant (t[26] = –5.00, $P < 0.001$), indicating that the posterior aspect length was on average about 0.13 cm greater than the anterior aspect.

Table 2 summarizes descriptive statistics for the length of the ulnar notch (in cm) of the left distal radius, comparing the anterior and posterior aspects. Values are given as mean ± SD, with the sample size (N) and range (minimum and maximum) for each aspect. Measurements for both aspects were based on 27 specimens, and all values are presented to two decimal places.

Beyond the anteroposterior length, the superior–inferior width of the ulnar notch was analyzed [Table 3]. The mean width of the notch on the right radius was 1.42 ± 0.25 cm, with a wide range of observed values (0.5–1.7 cm). On the left side, the mean width was comparable at 1.35 ± 0.17 cm, though the range was narrower (1.0 cm–1.7 cm).

The length of the radial styloid process was also measured to assess lateral column morphology [Table 4]. There was minimal asymmetry observed between sides; the right styloid process averaged 1.16 ± 0.34 cm, while the left styloid process averaged 1.12 ± 0.40 cm. Both sides demonstrated significant individual variability, with styloid lengths ranging from a minimum of 0.5 cm to a maximum of 2.0 cm.

To clarify the morphometry of the radiocarpal interface, the dimensions of the inferior articular facet were measured along its margins. The values labeled “Anterior” and “Posterior” in the following tables refer specifically to the linear lengths of the volar (anterior) and dorsal (posterior) margins of the distal articular surface, respectively.

In contrast to the ulnar notch – where the posterior dimension was consistently larger – the inferior articular facet (radiocarpal surface) exhibited greater dimensions anteriorly [Tables 5 and 6]. In the right radius, the anterior margin of the facet measured 2.83 ± 0.21 cm, compared to 2.66 ± 0.22 cm for the posterior margin. A similar pattern was observed in the left radius, where the anterior margin (2.68 ± 0.35 cm) exceeded the posterior margin (2.52 ± 0.22 cm). This indicates that while the ulnar notch deepens dorsally, the radiocarpal articular surface is broader on the volar aspect.

Table 1: Descriptive statistics for ulnar notch length measured on anterior versus posterior aspects of the distal end of the right radius (*n*=number of specimens)

Aspects	*n*	Mean±SD (cm)	Minimum	Maximum
Anterior ulnar notch length	27	0.463±0.136	0.20	0.70
Posterior ulnar notch length	27	0.770±0.181	0.30	1.00

$P \leq 0.001$, Significant difference (Paired *t*-test). SD: Standard deviation

Table 2: Descriptive statistics for ulnar notch length measured on anterior versus posterior aspects of the distal end of the left radius (*n*=number of specimens)

Aspects	*n*	Mean±SD (cm)	Minimum (cm)	Maximum (cm)
Anterior	27	0.45±0.10	0.30	0.70
Posterior	27	0.58±0.11	0.40	0.80

$P \leq 0.001$, Significant difference (Paired *t*-test). SD: Standard deviation

Table 3: Descriptive statistics for the width of ulnar notch measured on the right and left side of the distal end of radius (*n*=number of specimens)

Side	*n*	Mean±SD (cm)	Minimum (cm)	Maximum (cm)
Right	27	1.422±0.247	0.5	1.7
Left	27	1.346±0.169	1	1.7

$P = 0.226$ (NS). NS (Independent *t*-test). SD: Standard deviation, NS: Not significant

Table 4: Descriptive statistics for length of the styloid process measured on right and left side of the distal end of the radius (*n*=number of specimens)

Aspects	*n*	Mean±SD (cm)	Minimum (cm)	Maximum (cm)
Right styloid process	27	1.16±0.34	0.5	2.0
Left styloid process	27	1.12±0.40	0.5	1.8

$P = 0.690$ (NS). NS (Independent *t*-test). SD: Standard deviation, NS: Not significant

Discussion

The analysis demonstrates a consistent and meaningful anatomical pattern: the ulnar notch of the distal radius is significantly longer on the posterior (dorsal) aspect compared to the anterior (palmar) aspect. In the present study, the mean posterior ulnar notch length measured 0.770 cm, whereas the anterior measured 0.463 cm, making the posterior surface approximately 66% longer. This difference is statistically significant and has direct biomechanical relevance. The posterior portion of the sigmoid notch engages the ulnar head during pronation. The dorsal radioulnar ligament (DRUL) is the primary stabilizer in pronation, inserting along this posterior margin.

Table 5: Descriptive statistics for circumference of inferior articular facet measured on the right distal end of radius (*n*=number of specimens)

Aspects	*n*	Mean±SD (cm)	Minimum (cm)	Maximum (cm)
Anterior inferior articular facet	27	2.83±0.21	2.4	3.2
Posterior inferior articular facet	27	2.66±0.22	2.3	3.0

$P \leq 0.05$, Significant difference (Paired *t*-test). SD: Standard deviation

Table 6: Descriptive statistics for circumference of inferior articular facet measured on the left distal end of radius (*n*=number of specimens)

Aspects	*n*	Mean±SD (cm)	Minimum (cm)	Maximum (cm)
Anterior inferior articular facet	27	2.68±0.35	2.0	3.2
Posterior inferior articular facet	27	2.52±0.22	2.1	2.8

$P \leq 0.05$, Significant difference (Paired *t*-test). SD: Standard deviation

A larger posterior articular surface may therefore represent a functional adaptation to accommodate the increased translational forces occurring during pronation. The anterior aspect, which articulates predominantly during supination, is assisted by the volar radioulnar ligament; thus, the smaller anterior dimension aligns with the relatively lower mechanical demand placed upon it during rotation.

Our findings align with and expand upon prior morphometric investigations. Tolat *et al*.[7] described the sigmoid notch as "shallow and dorsally inclined," reporting an average depth of approximately 1.7 mm and a dorsal tilt of around 9°. While they emphasized depth, our data highlights the anteroposterior dimensional asymmetry, reinforcing that the dorsal half of the notch is the dominant articulating surface. Similarly, Af Ekenstam *et al*.[9] noted that the sigmoid notch spans only 130° of the radial articular circumference compared to the 200° span of the ulnar head. Our results complement this by demonstrating that within that limited radial arc, the posterior segment provides the majority of the osseous contact. Furthermore, Bhat *et al*.[8] analyzed the notch using cryosections and emphasized the variability in notch inclination; our linear measurements support their conclusion that osseous morphology alone is insufficient for stability without soft tissue support. In addition, Heo *et al*.[12] utilized computed tomography (CT) to assess the notch, noting that bony architecture varies significantly; our dry bone data provides baseline normative values that can assist in validating such radiographic measurements.

This anatomical data also resonates with the biomechanical models proposed by Palmer and Werner,[5] who described the complex load transmission pathways across the wrist. The significantly larger surface area of the posterior notch observed in our study supports their finding that the radius bears the majority of the axial load, necessitating a robust articular interface, particularly in pronation. In addition, Morrey and An[2] identified the DRUL as the primary stabilizer in pronation; the extended dorsal osseous margin likely acts as a critical structural counterpart to this ligamentous restraint. Conversely, the smaller anterior notch dimensions align with the observations of Kakar *et al*.[15] and Ruch and Papadonikolakis,[11] who highlighted the joint's inherent skeletal instability. Our findings quantify this lack of anterior bony constraint, providing an anatomical explanation for the joint's heavy reliance on the volar soft tissues (the "forearm ring") to prevent instability.

In analyzing the inferior articular facet, our results show that the anterior surface is slightly broader than the posterior on both right and left radii. This subtle but consistent anterior–posterior asymmetry may correlate with how carpal forces are distributed across the radiocarpal joint. During wrist extension – a common functional position – the anterior portion of the radial articular surface bears more carpal load, potentially explaining the slightly wider anterior facet dimension observed.

Overall, these measurements confirm that the dorsal portion of the sigmoid notch is structurally dominant and that the inherent incongruity of the joint requires reliance on the TFCC for stability. Clinically, these morphometric distinctions have practical consequences for orthopedic surgery. In fracture fixation, the asymmetry in posterior notch length must be respected when reducing intra-articular distal radius fractures; failure to restore the dorsal length or contour may predispose patients to chronic DRUJ instability. Regarding implant design, standard volar plating systems often assume approximate symmetry, but our data indicate that posterior surfaces are dimensionally larger, which could guide the design of specific DRUJ prostheses or sigmoid notch augments. Finally, knowing that the posterior notch is significantly elongated reinforces the need to restore appropriate dorsal tension in the DRUL during TFCC reconstructions.

Conclusion

This study demonstrates that the ulnar (sigmoid) notch is inherently asymmetric, with a consistently longer posterior margin that reflects the functional mechanics of the DRUJ. In contrast, the inferior articular facet shows greater anterior width, underscoring the complex three-dimensional morphology of the distal radius. These normative measurements emphasize that surgical reconstruction and implant design must account for dorsal notch dominance to restore proper joint congruity and avoid DRUJ impingement.

Limitations

The present study acknowledges several limitations inherent to its design and methodology. First, as a morphometric analysis of dry human radii, specific demographic data such as age, sex, stature, and hand dominance were unavailable, preventing the assessment of sexual dimorphism or size-based correlations. Second, the measurements recorded represent only the osseous anatomy; since articular cartilage is absent in dry bone specimens, the values reported here likely underestimate the true physiological dimensions of the articular surface *in vivo*. Third, while specimens with visible deformities were excluded, the study utilized a historical skeletal collection where subtle post-traumatic remodeling or minor degenerative changes could not be entirely ruled out. Finally, linear calliper measurements provide a two-dimensional assessment and may not fully capture the complex three-dimensional curvature of the ulnar notch, which might be better visualized using advanced CT-based morphometry.

Ethical clearance

The study utilized historical dry human osteological specimens from the museum collection of the Department of Anatomy, R. G. Kar Medical College and Hospital. As the study involved no living human participants, no private health information, and utilized legally procured osteological specimens for educational/research purposes, it was exempted from a specific IEC protocol number in accordance with institutional guidelines. The study adhered to the ethical standards for the respectful handling of human remains.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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Original Article

Morphology and Morphometry of Supraorbital, Infraorbital, and Mental Foramina in Dry Adult Skulls and their Clinical Correlation

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Abstract

Introduction: The location and morphology of supraorbital (SOF), infraorbital (IOF), and mental foramina (MF) are strategically important in surgical and dental procedures. These foramina are present in the norma frontalis of the skull and transmit important neurovascular structures. **Materials and Methods:** In this study, the different morphometric variations of these foramina were examined in fifty intact dry human adult skulls. Measurements were made to analyze the degree of variation in the location and size of SOF, IOF, and MF. Bilateral measurements were taken as the distance between the supraorbital and midline (SOF-ML), Infraorbital foramen and Anterior Nasal Spine (IOF-ANS), and Mental Foramen and Symphysis Mentae (MF-SM). The dimensions of the foramina on both sides were measured. The shape of the foramina was also recorded. Variations were evaluated according to side. **Results:** In 50% of the skulls, SOF was present as a notch. The mean distance between the SOF-ML was 22.61 mm ± 2.81 mm and 22.10 mm ± 2.27 mm on the left and right sides, respectively. The mean distance between the IOF-ANS was 25.82 mm ± 2.84 mm and 25.12 mm ± 1.96 mm on the left and right sides, respectively. The mean distance between the MF-SM was 26.58 mm ± 2.22 and 26.17 mm ± 2.27 mm on the left and right sides, respectively. The shapes of the SOF and MF were oval or rounded, with 50% of the skulls exhibiting an oval shape for SOF and 58% for MF. The shape of IOF was oval, semilunar, and rounded in 42%, 33%, and 25% of skulls, respectively. **Conclusions:** The study has clinical credibility in ascertaining the accurate location of SOF, IOF, and MF, thus avoiding any unforeseen injury related tosurgical and dental procedures.

Keywords: *Infraorbital foramen, mental foramen, morphology, morphometry, skull, supraorbital foramen*

Introduction

The supraorbital (SOF), infraorbital (IOF), and mental foramina (MF) are critical anatomical landmarks and conduits for neurovascular structures that innervate and vascularize key regions of the face. A comprehensive understanding of their morphological variations and morphometric dimensions is essential for clinical procedures, including regional anesthesia, craniofacial surgery, and dental interventions. The supraorbital foramen, located on the frontal bone above the orbit, transmits the supraorbital nerve, artery, and vein, which supply the forehead and scalp up to the vertex. It is more often in the form of a notch at the junction of the lateral two-thirds and the medial one-third of the supraorbital margin. The infraorbital foramen is present on the anterior surface of the maxilla 1 cm below the infraorbital margin and is a continuation of the infraorbital fissure and groove. The infraorbital foramen transmits the infraorbital nerve and infraorbital vessels. The infraorbital nerve and vessels supply the lower eyelid, side of nose, cheek, upper lip, upper incisors, canine, premolars, and often the first molar. Since the levator labii Superioris lies in relation to the infraorbital foramen, so it needs to be reflected in the event of surgical procedures in the region. The mental foramen lies in the anterolateral surface of the body of the mandible and represents the outer opening of inferior alveolar canal. The mental foramen transmits the mental nerves and vessels, which are the continuations of the inferior alveolar nerve and vessels. The mental nerve and vessels supply the lower labial mucosa, gingiva, lower lip, and chin. The position of the mental foramen varies in position depending upon facial morphology at different age groups. In

How to cite this article: Hussain SA, Khan JA, Bhat GM, Shah BA. Morphology and morphometry of supraorbital, infraorbital, and mental foramina in dry adult skulls and their clinical correlation. J Anat Soc India 2026;75:S6-11.

Article Info

Received: 20 December 2025
Revised: 04 February 2026
Accepted: 09 February 2026
Available online: 13 April 2026

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Access this article online

Website: https://journals.lww.com/joai
DOI: 10.4103/jasi.jasi_200_25

Quick Response Code:

children, the mental foramen is close to the lower border of the mandible; in adults, it is equidistant from the inferior and alveolar borders of the mandible, but in old edentulous individuals, it is nearer to the alveolar border of the mandible. In erect posture, these three foramina on the norma frontalis lie approximately in a vertical plane but sometimes vary depending upon the facial symmetry.[1-3]

Materials and Methods

In the present study, fifty (n = 50) intact dry human adult skulls were examined. The skulls were present in the Postgraduate Department of Anatomy, Government Medical College, Srinagar, Jammu and Kashmir, India. Skulls, with fractures in the piriform aperture, infraorbital foramen or at the infraorbital margin, were excluded. Careful measurements were made to analyze the degree of variation in the location and size of SOF, IOF, and MF. The diameter of the foramina was measured on both sides of the line of symmetry. SOF(L) and SOF(R) represent the diameter of the SOF on the left and right side, respectively. Bilateral measurements were taken as the distance between the supraorbital and midline (SOF-ML), Infraorbital foramen and Anterior Nasal Spine (IOF-ANS), and Mental Foramen and Symphysis Mentae (MF-SM). SOF-ML(L) and SOF-ML(R) represent the distance between the SOF and ML on the left and right side, respectively. Figure 1 shows typical measurements carried out in the present study. The distance between SOF and ML was measured from the center of the SOF to the MF [Figure 1a]. The distance between IOF and ANS was measured from the center of the IOF to the ANS [Figure 1b]. The distance between MF and SM was measured from the center of the MF to the SM [Figure 1c].The dimensions of the foramina on both sides were measured as the internal diameter. The shape of the foramina was also examined and recorded. Variations in measurements and shapes were evaluated and analyzed according to side. Range, mean, mode, median, and standard deviation were computed and statistically analyzed using SPSS (Statistical Package for the Social Sciences) SPSS developed and owned byinternational business machines corporation (IBM) Armonk, NY, USA. Correlations were determined by Pearson's correlation coefficient. Pearson's correlation coefficient was used to quantify the strength and direction (positive or negative) of the linear relationship among the measurements.

Results

Morphometric measurements, including the dimensions of SOF, IOF, and MF and the distances SOF-ML, IOF-ANS, and MF-SM, were analyzed. The multidimensional statistical parameters corresponding to the morphometric measurements are tabulated in Table 1. The statistical analysis revealed one statistically significant ($P < 0.05$) variation in the dimensions of the foramen. The variation in the dimension of the SOF on the two sides of the skulls investigated was found to be significant. Whereas the variation in the dimensions of the two remaining foramina was found to be statistically

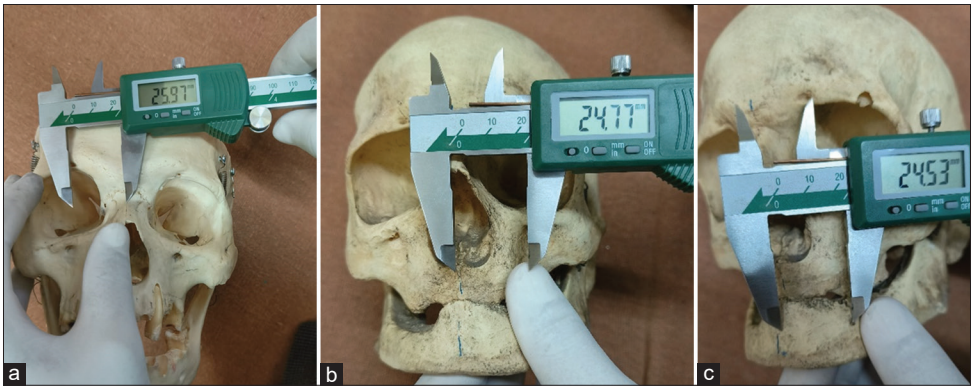

Figure 1: Distance between (a) Supraorbital foramen and midline, (b) Infraorbital foramen and Anterior Nasal Spine (c) Mental Foramen and Symphysis Mentae

Table 1: Statistical analysis of morphometric variations of the foramina

Statistical parameters	Dimensions of foramen (mm)						Measurements (mm)					
	SOF		IOF		MF		SOF-midline		IOF-ANS		MF-SM	
	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right
Average	2.73	2.52	3.13	3.06	2.28	2.27	22.61	22.07	25.82	25.12	26.58	26.17
Median	2.74	2.48	2.88	2.92	2.35	2.23	22.65	21.00	24.67	24.93	27.17	25.83
SD	0.51	0.63	0.81	0.92	0.55	0.40	2.81	2.27	2.84	1.96	2.22	2.27
Variance	0.26	0.40	0.65	0.84	0.30	0.16	7.88	5.13	8.07	3.83	4.94	5.17
Maximum	3.51	3.55	5.33	5.00	3.25	2.86	27.72	26.53	29.71	27.64	29.72	29.45
Minimum	1.94	1.57	2.18	2.03	1.29	1.71	18.43	19.76	21.19	22.06	23.28	22.28

SOF: Supraorbital foramen, IOF-ANS: Infraorbital foramen and anterior nasal spine, MF-SM: Mental foramen and symphysis mentae, SD: Standard deviation

insignificant ($P > 0.05$). The variation in the dimensions of the IOF and MF on the two sides of the skulls investigated was found to be insignificant. The average diameter of SOF on the left side was found to be higher than on the right side. However, the maximum and minimum diameters of SOF on the left side were observed to vary over a narrower range than on the right side [Table 1]. The average and median diameter of IOF was found to be the largest. The variations of lateral distance of the foramina with respect to corresponding lines of symmetry were analyzed with important statistical parameters tabulated in Table 1. The analysis of the measurements revealed that the variations of the lateral distances of all three foramina are statistically significant with $P < 0.05$. The average and median distance of SOF was found to be the smallest, whereas the average distance of MF was found to be the largest from the corresponding lines of symmetry, ML and SM, respectively.

The percentage distribution of the diameters of the three foramina is shown in Figure 2. Diameters of foramina on the left side as well as the right side are shown. It is evident that the range of the diameters of the foramina is the same as tabulated in Table 1. The percentage distribution of the lateral distances of the foramina on either side of the corresponding lines of symmetry is shown in Figure 3. In 50% of the skulls, SOF was present as a notch. The mean

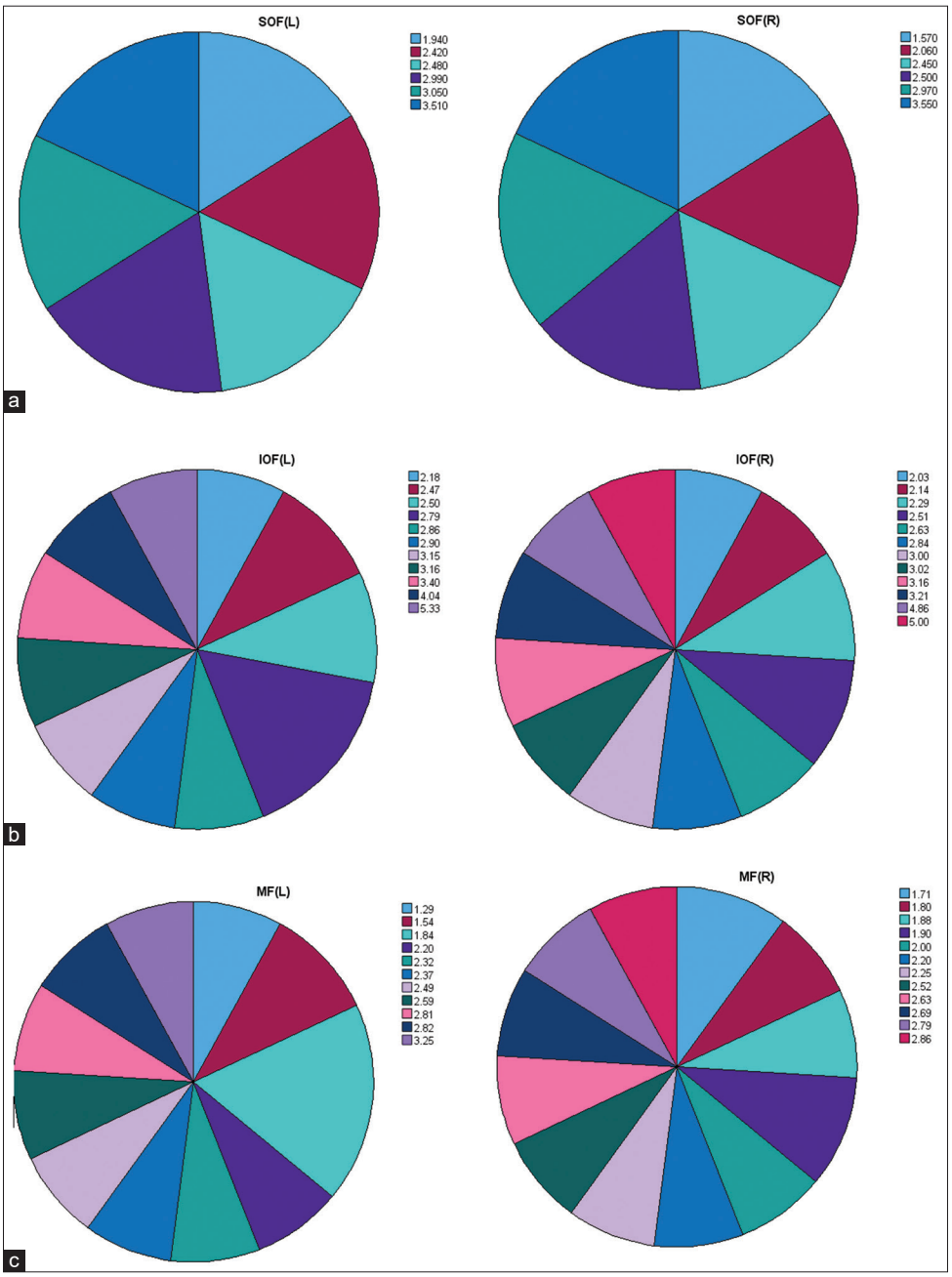

Figure 2: Percentage distribution of diameters of the three foramina. (a) Supraorbital foramen, (b) Infraorbital foramen and (c) Mental foramen

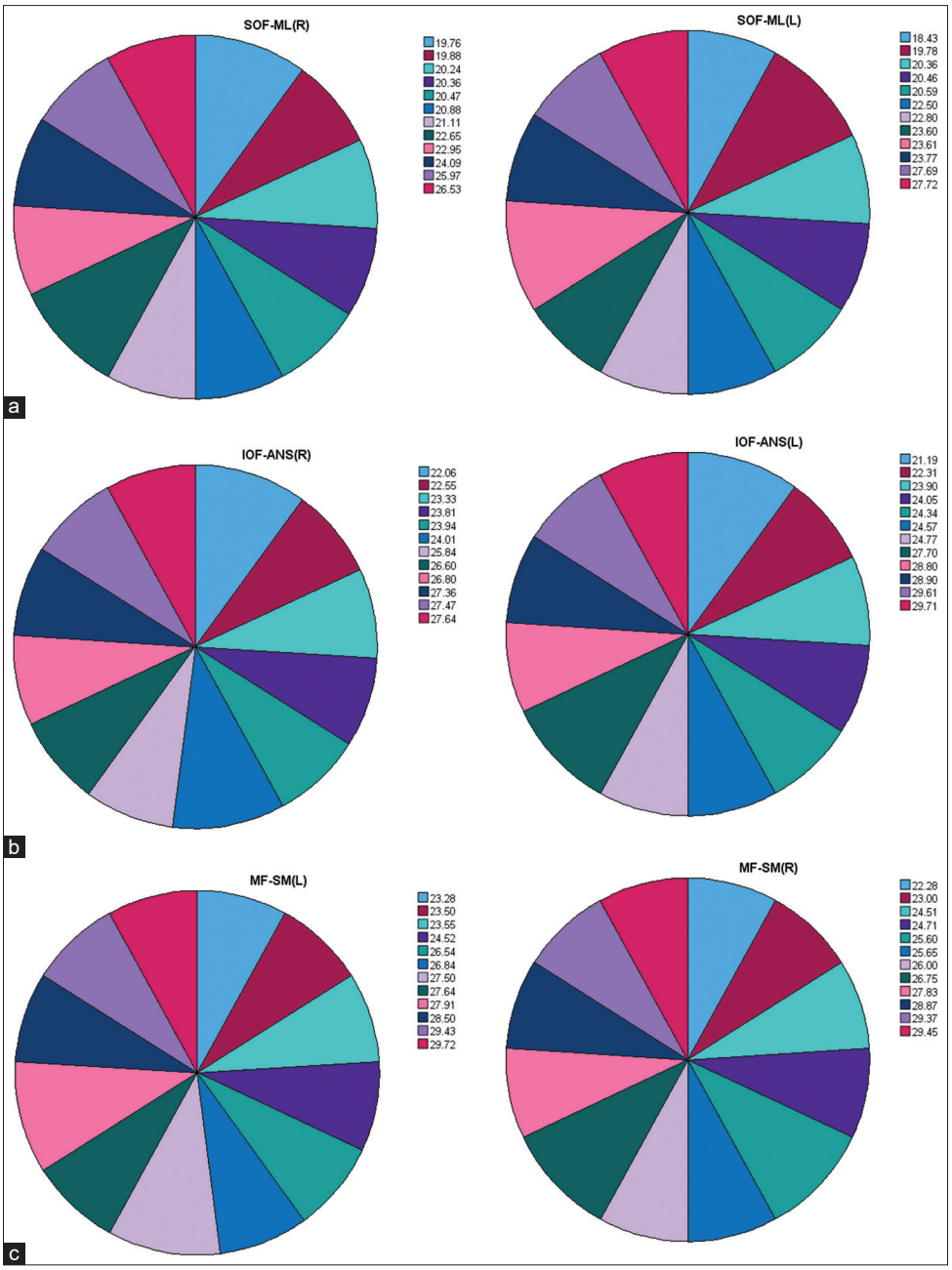

Figure 3: Percentage distribution of distances of the three foramina from the line of symmetry. (a) Supraorbital foramen and midline, (b) Mental foramen and symphysis mentae, and (c) Infraorbital foramen and anterior nasal spine

distance between the SOF-ML was 22.61 mm ± 2.81 mm and 22.10 mm ± 2.27 mm on the left and right sides, respectively. The mean distance between the IOF-ANS was 25.82 mm ± 2.84 mm and 25.12 mm ± 1.96 mm on the left and right sides, respectively. The mean distance between the MF-SM was 26.58 mm ± 2.22 and 26.17 mm ± 2.27 mm on the left and right sides, respectively. The shapes of the SOF and MF were oval or rounded, with 50% of the skulls exhibiting an oval shape for SOF and 58% for MF. The shape of IOF was oval, semilunar, and rounded in 42%, 33%, and 25% of skulls, respectively.

The correlations among various measurements were determined by performing statistical analysis and determining the Pearson Correlation. The correlation among the dimensions of the three foramina is tabulated in Table 2. A strong positive correlation exists between the dimensions of the SOF and MF on either side [SOF(L)↔SOF(R); MF(L)↔MF(R)]. A strong positive correlation exists between the distances of the SOF-ML and MF-SM on either side [SOF-ML(L)↔SOF-ML(R); MF-SM(L)↔MF-SM(R)]. A positive correlation exists between the distances of the IOF-ANS on either side. [IOF-ANS (L)↔IOF-ANS (R)] [Table 3].

Discussion

The SOF/notch, infraorbital foramen, and the mental foramen are important bony land marks in the front of the skull and transmit important neurovascular structures. Knowledge of location of these foramina is important for giving regional nerve blocks to anesthetize the required area supplied by these nerves. This is important for carrying out dental and maxillofacial procedures such as tooth extraction, fracture fixation, implants placements, and certain cosmetic procedures. Lack of knowledge of accurate positions of these foramina may lead to failure of anesthetizing the required area and may lead to iatrogenic nerve injury. Our study included the morphology and morphometry of all the three foramina and their relative distances from each other. The combined morphometric study of all the three foramina in skulls within the same department is rarely done in the Country A study on South Indian dry skulls (n = 83) found that the notch was more common than a complete foramen. Key measurements included 22.2 mm from midline to SOF, 29 mm from the frontozygomatic suture, SOF height 3.0–3.5 mm, and multiple (accessory) foramina in 66% of cases.[4,5] In the Bosnian population (n = 60 skulls), notches were present in 73.8% and foramina in 26.2%. Accessory foramen appeared in about 16.7%, with noted sex-based differences in spatial relations.[6] Among 55 Indian skulls, IOF was on average 6.1 mm below the infraorbital margin and 15.3–15.8 mm from the piriform aperture; dimensions averaged 3.4 mm vertically and 3.3–3.5 mm horizontally.[7] In Thais (n = 106 skulls), key measurements include SOF width 4.3 mm; SOF height 2.8 mm; IOF 3.4 mm; and MF 2.8 mm. SOF islocated 25.1 mm lateral to the nasal midline, IOF 28.4 mm lateral to the maxillary midline, 9.2 mm below the infraorbital rim, and 2.15 mm medial to the zygomaticomaxillary suture. Vertical distances from IOF to SOF measured 44.9 mm and to the occlusal plane 42.5 mm.[8] An Indian study (n = 90 hemi-skulls) reported IOF mean dimensions of 3.8 mm (vertical) and 2.5–2.6 mm (transverse). The IOF was located 29 mm from the alveolar margin, 34 mm from the anterior nasal spine, 42 mm from the nasion, and 6 mm below the infraorbital margin. Orientation angles varied with an average entry angle of 48° in the horizontal plane.[9] In Northeastern Brazil, IOF presented sexual dimorphism: male skulls had significantly larger IOF dimensions and greater distances from the anterior nasal spine (statistically significant, $P < 50$).[10] Shapes were also documented in another study (n = 60): Most IOFs were oval, directed inferomedially; mean transverse diameters 2.95–2.98 mm, and vertical 3.52–3.93 mm.[11] North Indian skull study (n = 72) measured the vertical gap between the inferior wall of SOF and the superior wall of IOF as 40.9 mm (right) and 40.8 mm (left).[12]

Table 2: Correlation among the diameters of the three foramina on the left and right

	SOF (left)	SOF (right)	IOF (left)	IOF (right)	MF (left)	MF (right)
SOF (left)	1	0.935	−0.431	−0.616	−0.299	−0.334
SOF (right)	0.935	1	−0.305	−0.501	−0.149	−0.236
IOF (left)	−0.431	−0.305	1	−0.898	0.46	0.567
IOF (right)	−0.616	−0.501	−0.898	1	0.443	0.564
MF (left)	−0.299	−0.149	0.46	0.443	1	0.909
MF (right)	−0.334	−0.236	0.567	0.564	0.909	1

SOF: Supraorbital foramen, IOF: Infraorbital foramen, MF: Mental foramen

The morphological variability, presence of notches versus foramina, accessory openings, and population-based differences underline the importance of precise localization for regional nerve blocks, facial reconstruction, blepharoplasty, facial aesthetic surgeries, and maxillofacial procedures.[4,12] Variations in shape, size, depth, and orientation necessitate careful consideration during anesthesia delivery, orbital and midface surgery, and drug delivery techniques (de Oliveira *et al*., 2016).[10] Understanding vertical relationships supports safer surgical approaches and minimizes nerve injury risk.[12] Variations in mental foramen location, especially in edentulous persons due to alveolar bone resorption, are critical for lower lip and chin anesthesia and implantology.

In this study, the morphological and morphometric variations of SOF, IOF, and MF are investigated and analyzed for clinical interventions. In our present study, the SOF was in the form of a notch in 50% of the cases

Table 3: Correlation among the distances from the axis of symmetry on either side

	SOF-ML (left)	SOF-ML (right)	IOF-ANS (left)	IOF-ANS (right)	MF-SM (left)	MF-SM (right)
SOF-ML (left)	1	0.928	0.279	0.031	0.090	0.040
SOF-ML (right)	0.929	1	0.333	0.200	0.172	0.170
IOF-ANS (left)	0.279	0.333	1	0.767	0.2564	0.519
IOF-ANS (right)	0.031	0.200	0.767	1	0.196	0.539
MF-SM (left)	0.088	0.172	0.256	0.196	1	0.860
MF-SM (right)	0.040	0.170	0.519	0.539	0.860	1

SOF: Supraorbital foramen, IOF-ANS: Infraorbital foramen and anterior nasal spine, ML: Midline, MF-SM: Mental foramen and symphysis mentae

studied. The other morphological and morphometric parameters in our present study were consistent with the findings of the earlier workers.

Limitations

Our study used the specimens in the osteology section of the anatomy department, and the gender and age of the specimens were not determined with certainity, so it is recommended to include gender and age-identified skulls in the study to see sexual dimorphism and age-related morphological changes. Furthermore, radiological study, particularly cone–beam computerized tomography involving the same parameters in a particular population group, will increase the clinical applicability.

Conclusions

The study has clinical credibility in ascertaining the accurate location of SOF, IOF, and MF, thus avoiding any unforeseen injury related to surgical and dental procedures. The correlation between the dimensions of the foramina and their lateral distances from the line of symmetry could be used to precisely locate the position of the foramina for safe and precise surgical procedures. Morphometric and morphological parameters of these foramina act as guidelines to enhance surgical precision and anesthesia efficacy, thus emphasizing the importance of individualized anatomical knowledge for minimizing iatrogenic nerve damage in facial procedures.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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Original Article

Aberrant Origin and Variant Patterns of Branching of the Right Subclavian Artery: A Cadaveric Study

Abstract

Background: The origin and branching pattern of the right subclavian artery usually depict so many variations from the standard textbook descriptions. The subject, the anatomical study of the right subclavian artery is taken up in view of its clinical importance. They are subclavian steal syndrome, various aneurysms, and dysphagia lusoria. **Materials and Methods:** The present study has been done on 50 fetal and 50 adult cadavers to establish the frequency of the abnormal origin of right subclavian artery, prevalence of the deviations of branching from the usual description, and to analyze the data with the previous studies. The dissection has been done in both fetal and adult cadavers as the number of adult cadavers is limited for the study and not for comparative purposes. **Results:** The origin of the right subclavian artery from the arch of aorta is 1% in the present study which is in accordance with the previous studies. The normal branching pattern of thyrocervical trunk is found only in 72%. **Conclusion:** The origin of aberrant right subclavian artery is one of the congenital abnormalities of the arch of aorta and it should be properly evaluated in surgical procedures. The internal thoracic artery is used for revascularization in coronary artery diseases, and it is important to be aware of the variation concerning the internal thoracic artery.

Keywords: *Dorsal scapular artery, internal thoracic artery, right subclavian artery, thyrocervical trunk, vertebral artery*

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Introduction

On the right side, the subclavian artery arises from the brachiocephalic artery behind the right sternoclavicular articulation; on the left side, it takes origin from the arch of the aorta. For descriptive purposes, each subclavian artery is divided into three parts. The first portion extends from the origin of the artery to the medial border of the scalenus anterior; the second lies behind this muscle; and the third extends from the lateral margin of the muscle to the outer border of the first rib, where it becomes the axillary artery. The subclavian arteries vary in their origin, their course, and the height to which they rise in the neck. The artery may ascend as high as 4 cm above the clavicle, or any intermediate point between this and the upper border of the bone, the right subclavian usually ascending higher than the left.[1]

The right subclavian artery may arise as a separate trunk from the arch of the aorta, and in such cases, it may be either the first, second, third, or even the last branch derived from that vessel; in the majority, however, it is the first or last, rarely the second or third. When it is the first branch, it occupies the ordinary position of the brachiocephalic artery; when the second or third, it gains its usual position by passing behind the right carotid; and when the last branch, it arises from the left extremity of the arch, and passes obliquely toward the right side, usually behind the trachea, esophagus, and right carotid, sometimes between the esophagus and trachea, to the upper border of the first rib, hence it follows its ordinary course. In very rare instances, this vessel arises from the thoracic aorta, as low down as the fourth thoracic vertebra.[1]

Branches

The branches of the right subclavian artery are as follows:

1. Vertebral
2. Thyrocervical
3. Internal mammary
4. Costo cervical
5. Dorsal scapular.

How to cite this article: Ramasamy C, Ramasamy SK. Aberrant origin and variant patterns of branching of the right subclavian artery: A cadaveric study. J Anat Soc India 2026;75:S12-9.

Article Info

Received: 29 December 2025
Revised: 04 February 2026
Accepted: 09 February 2026
Available online: 13 April 2026

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Access this article online

Website: https://journals.lww.com/joai

DOI: 10.4103/jasi.jasi_207_25

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The first three branches arise close together at the medial border of the scalenus anterior from the first part; in most cases, a free interval of from 1.25 to 2.5 cm exists between the commencement of the artery and the origin of the nearest branch. The thyrocervical trunk is a short thick trunk, which arises from the front of the first portion of the subclavian artery, close to the medial border of the scalenus anterior, and divides almost immediately into three branches, the inferior thyroid, suprascapular, and superficial cervical. The costo cervical branch arises from the second part and the dorsal scapular arises from the third part of right subclavian artery. The superficial cervical and dorsal scapular sometimes arises by a common trunk called transverse cervical artery.

The vertebral artery, the first branch of the subclavian artery arises from the upper and posterior aspect of the first part, just distal to the sternoclavicular joint. Later it ascends upward to reach the foramen transversarium of the sixth cervical vertebra. This part constitutes the first part of the vertebral artery. The internal thoracic artery arises from the inferior surface of the first part of the subclavian artery, about 2 cm above sternal end of the clavicle.[1]

Thyrocervical trunk in the form of a short, wide vessel arises from the front of the first of the subclavian artery, close to the medial border of the scalenus anterior muscle and divides almost into three branches-inferior thyroid artery, suprascapular artery and superficial cervical artery. If the dorsal scapular artery does not exist in the cases, the superficial cervical artery is replaced by transverse cervical artery. The inferior thyroid artery, which is the main branch of the thyrocervical trunk, appears as the direct continuation of the trunk. Ascending cervical is the continuation of inferior thyroid artery. Suprascapular artery, the first branch of the thyrocervical trunk passes downward and laterally across the scalenus anterior muscle to reach the upper border of the clavicle. The superficial cervical artery arises from the thyrocervical trunk next to suprascapular artery. After its origin, it is roughly parallel to the suprascapular artery but lies at somewhat at a higher level clavicle. It arises opposite the origin of the thyrocervical trunk. The costo cervical trunk arises from the posterior aspect of the second part of the right subclavian artery. After its origin, the trunk arches backward over the cervical pleura and divides into superior intercostal and deep cervical artery. The dorsal scapular artery arises from the third part of the right subclavian artery. The artery usually passes laterally in between the upper and middle or middle and lower trunks of the brachial plexus.[1]

Materials and Methods

Fifty embalmed fetal cadavers of both sexes (30 males and 20 females) obtained from Government General Hospital, Guntur, during 2002–2003 constituted the fetal component of the study conducted for thesis submission in 2005. Subsequently, the study was extended to include fifty embalmed adult cadavers of both sexes (37 males and 13 females) from our department of anatomy during the educational dissection between 2006 and 2016, which formed the adult cadaveric material for the analysis. The study was conducted following approval from the Institutional Ethics Committee. Exposure of the origin of the right subclavian artery and its branches was done following the classical incisions and dissection procedures as provided by the Cunningham's Manual of Practical Anatomy.[2]

The right subclavian artery was observed under the following protocol.

1. The origin of right subclavian artery
2. Branches of right subclavian artery-vertebral artery, internal thoracic artery, thyrocervical trunk from 1st part, costo cervical trunk from 2nd part, dorsal scapular artery from 3rd part
3. Branches of thyrocervical trunk-suprascapular, superficial cervical and inferior thyroid artery
4. Presence of the transverse cervical artery.

All the observations were noted on the special proformas and then studied carefully.

Results

The origin of right subclavian artery

The right subclavian artery was arising as the 4th branch of the arch of aorta from the right, after the origin of left subclavian artery in one female fetal cadaver [Figures 1 and 2] and in one adult male cadaver [Figure 3]. Then, it coursed behind the esophagus from left to right, to reach behind the right sternoclavicular joint and it branched normally. The results of the present study, including both fetal and adult cadaveric dissections, are summarized, in Table 1.

Branches of right subclavian artery

Vertebral artery

In the present study, the right vertebral artery arose from the first part of right subclavian artery in all 50 fetal specimens and in all 50 adult cadavers.

Internal thoracic artery

In this study, the internal thoracic artery arose from the first part of the right subclavian artery in 45 fetal and 48 adult cadavers.

Thyrocervical trunk

In this study, the thyrocervical trunk was arising from the first part of the right subclavian artery in all dissections. Bifurcation into superficial cervical and ascending cervical was present in one adult cadaver. Suprascapular artery was absent in one fetal and 2 adult cadavers. Additional branch, internal thoracic artery was present in one fetal and two adult cadavers. Ascending cervical was arising from superficial cervical instead of inferior thyroid in two adult

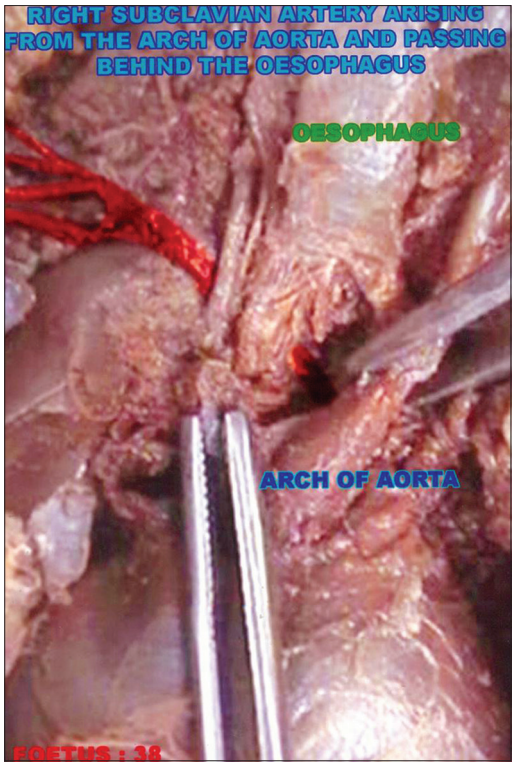

Figure 1: Aberrant origin of right subclavian artery from the arch of aorta and passing behind the esophagus in a fetal cadaver

cadavers. Inferior thyroid was directly arising from first part of right subclavian artery instead of from thyrocervical trunk in one adult cadaver [Figure 8].

Costo cervical trunk

In one out of fifty adult cadavers, the costo cervical trunk was from the first part of the right subclavian artery [Figure 9]. In one fetus, the costo cervical arose by a common stem with the transverse cervical artery from the second part of right subclavian artery [Figure 10]. In one adult cadaver, the costo cervical trunk was absent and the branches directly arise from subclavian artery.

Dorsal scapular artery

The dorsal scapular arose from the transverse cervical in 12 fetal and in 9 adult cadavers in this study.

Transverse cervical artery

Transverse cervical artery arose from thyrocervical trunk in 5 fetal and 5 adult cadavers in this study.

Discussion

The origin of right subclavian artery

The aberrant right subclavian artery (ARSA) from the arch of aorta was first described by Hunauld in 1735 in

Table 1: Results of the present study (*n*=50)

Observation	Fetal study	Adult study
The origin of right subclavian artery	From brachiocephalic trunk: In 49 specimens	From brachiocephalic trunk in 49 cadavers
	From the arch of aorta in 1 fetal cadaver [Figures 1 and 2]	From the arch of aorta in 1 adult cadaver [Figure 3]
Origin of vertebral artery	From the first part of right subclavian artery in all 50 fetal cadavers	From the first part of right subclavian artery in all 50 adult cadavers
Origin of internal thoracic artery	From the first part of the right subclavian artery in 45 and from second part in 4 fetal cadavers	From the first part of the right subclavian artery in 48 adult cadavers
	From thyrocervical trunk in 1 fetal cadaver [Figure 4]	From thyrocervical trunk in 1 adult cadaver
		Two origins of internal thoracic artery in 1 adult cadaver- one from the thyrocervical trunk and another from the first part of right subclavian artery [Figure 5]
Origin and branching of thyrocervical trunk	From the first part of right subclavian artery in all fetal cadavers	From the first part of right subclavian artery in all fetal cadavers
	Typical trifurcation into suprascapular, superficial cervical and inferior thyroid was seen in 40 fetal cadavers	Typical trifurcation into suprascapular, superficial cervical and inferior thyroid was seen in 32 adult cadavers
	Bifurcation into cervico-scapular trunk and inferior thyroid was seen in 2 fetal cadavers [Figure 6]	Bifurcation into cervico-scapular trunk and inferior thyroid was seen in 2 adult cadavers
	Bifurcation into suprascapular and common stem of inferior thyroid and superficial cervical was in one fetal cadaver [Figure 7]	Bifurcation into suprascapular and common stem of inferior thyroid and superficial cervical was in one adult cadaver
Costo cervical trunk	The costo cervical trunk arose from the second part of the right subclavian in 49 fetal cadavers	The costo cervical trunk arose from the second part of the right subclavian in 48 adult cadavers
Dorsal scapular artery	Dorsal scapular artery arose from the third part of right subclavian artery in 33 fetal cadavers	Dorsal scapular artery arose from the third part of right subclavian artery in 36 fetal cadavers
	From the second part in 5 fetal cadavers	From the second part in 5 adult cadavers
Transverse cervical artery	Origin of transverse cervical artery from thyrocervical trunk in 5 fetal cadavers	Origin of transverse cervical artery from thyrocervical trunk in 5 cadavers

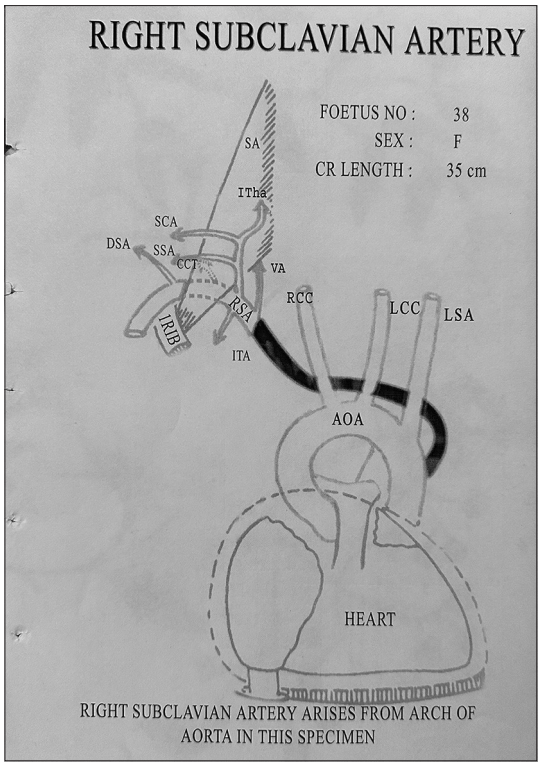

Figure 2: Diagrammatic representation of aberrant origin of the right subclavian artery from the arch of aorta and passing behind the esophagus in a fetal cadave

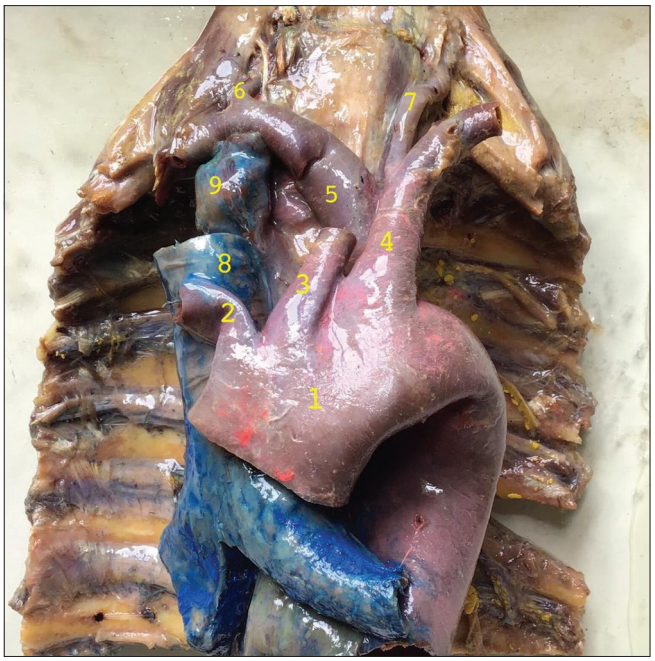

Figure 3: Aberrant origin of the right subclavian artery from the arch of aorta and passing behind the esophagus in an adult cadaver. (1) Arch of the aorta. (2) Right common carotid artery. (3) Left common carotid artery. (4) Left subclavian artery. (5) Right subclavian artery. (6) Left vertebral artery. (7) Right vertebral artery. (8) Pulmonary trunk. (9) Right brachiocephalic vein

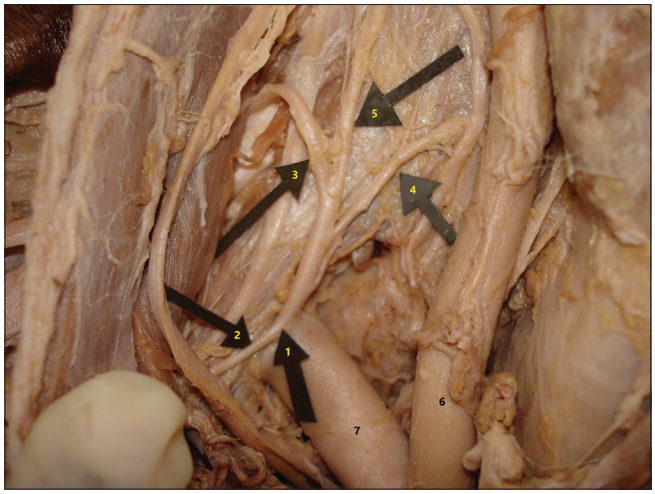

Figure 4: Origin of right internal thoracic artery from right thyrocervical trunk in an adult cadaver. (1) Right thyrocervical trunk. (2) Right internal thoracic artery. (3) Right suprascapular artery. (4) Right superficial cervical artery. (5) Right inferior thyroid artery. (6) Right common carotid artery. (7) Right subclavian artery

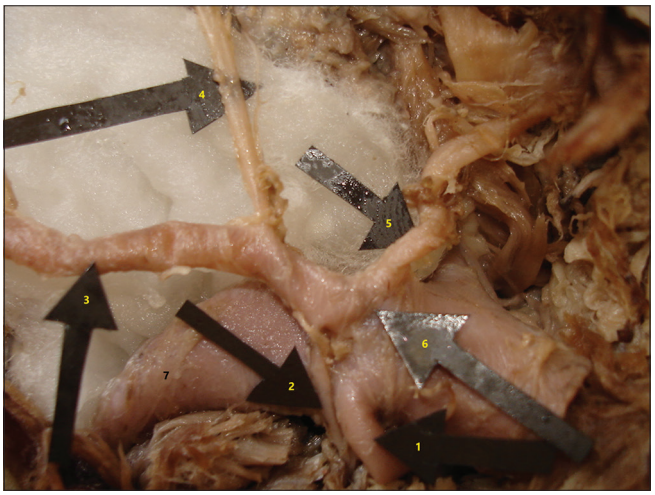

Figure 5: Two origins of right internal thoracic artery in an adult cadaver. (1) Right internal thoracic artery No 1 from the first part of right subclavian artery. (2) Right internal thoracic artery No 2 from thyrocervical trunk. (3) Right supra scapular artery. (4) Right superficial cervical artery. (5) Right inferior thyroid artery. (6) Right thyrocervical trunk

cadaver, but not reported until 1794, Bayford described the first patient and subsequent autopsy of this patient with this unusual right subclavian artery.[3,4] In his words, the condition may be called Lusoria from the Latin word lususnature, which means freak in nature. Stedman described the right subclavian artery arising abnormally from the arch of aorta when he discovered the right recurrent laryngeal nerve.[5] According to him, when there is abnormal origin of the right subclavian artery, there is variation of the course of the right recurrent laryngeal nerve.

The aberrant origin of the right subclavian artery from the arch of the aorta is attributed to abnormal regression and persistence of other components of the embryonic aortic arch system. Normally, the right subclavian artery develops from the right fourth aortic arch, the right dorsal aorta (between the fourth arch and the seventh intersegmental artery), and the right seventh intersegmental artery. In cases of ARSA,

Figure 6: Bifurcation of right thyrocervical trunk into a common stem of inferior thyroid and superficial cervical and suprascapular artery in a fetal cadaver

Figure 7: Bifurcation of right thyrocervical trunk into inferior thyroid artery and scapulo-cervical trunk in a fetal cadaver

Figure 8: Origin of right inferior thyroid artery directly from first part of right subclavian artery in an adult cadaver. (1) Right vertebral artery. (2) Right inferior thyroid artery. (3) Right ascending cervical artery. (4) Right superficial cervical artery. (5) Right supra scapular artery. (6) Scalenus anterior muscle. (7) Right subclavian artery

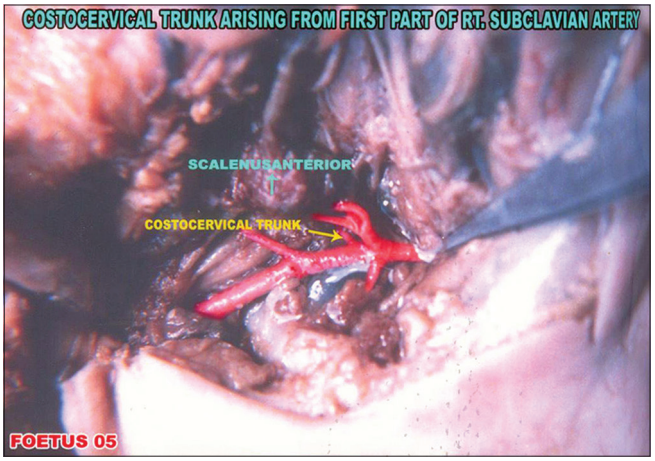

Figure 9: Origin of right costo cervical trunk from first part of right subclavian artery in a fetal cadaver

the right fourth aortic arch and the proximal segment of the right dorsal aorta regress, while the distal portion of the right dorsal aorta persists. Consequently, the right subclavian artery arises from the distal part of the aortic arch or proximal descending aorta and courses posterior to the esophagus to reach the right upper limb.

Cainey summarized the results of eight investigators and had reported 19 instances (0.8%) of this variation in 2291 autopsy subjects.[6] In a study based on 400 dissections by Dasler and Anson, an ARSA arising from the arch of aorta distal to the left subclavian artery is 0.25%.[7] It is interesting to note that in all these studies, the course of the ARSA was retroesophageal (between the vertebra and the esophagus) most commonly (107/238 cases), retro tracheal (between the trachea and esophagus) seldom (25/238 cases) and in front of the trachea most rarely (6/238 cases).

Holzapfel who studied the course of 133 cases of the right subclavian arising as the last branch of the aortic arch found that in 107 cases (80%) the right subclavian

passed behind the esophagus to reach the right side, between the trachea and esophagus in 20 cases (15%), and in front of the trachea in 6 cases (5%).[8] Others have reported an incidence from 0.4% to 1.7% in various anatomic, radiological and surgical studies which is given in Table 2.

Branches of right subclavian artery

Vertebral artery

It may arise directly from the arch of aorta (3%), from the right common carotid when the right subclavian arises from the aorta beyond the left subclavian artery or from the brachiocephalic trunk. The vertebral arteries may arise from the inferior thyroid or give rise to inferior thyroid artery, or it may give origin to superior intercostal, deep cervical or occipital artery. In three percent cases, the artery may arise from the thyrocervical trunk or from the costo cervical trunk.[17]

Figure 10: Origin of right costo cervical trunk and right transverse cervical artery from second part of right subclavian artery in a fetal cadaver

Table 2: Origin of aberrant right subclavian artery from the arch of aorta

ARSA from arch of aorta					
Author	**Number cases**	**ARSA**	**Method of study**		
			Cadavers	**Radiology**	**Surgery**
Goldbloom[9]	225	4	*		
Cairney[6]	2494	231	*		
Abbott[10]	1000	7	*		
Reid[11]	58	3	*		
Bahnson and Blalock[12]	841	18		*	*
Gross and Neuhauser[13]	40	10		*	*
Turner[14]	192	5	*		
von Segesser and Faidutti[15]	8500	13		*	
Pattinson[16]	5407	7		*	
Present study	100	2	*		

*reperesent the method of study. ARSA: Aberrant right subclavian artery

Internal thoracic artery

The internal thoracic artery occasionally arises from the second part and rarely from the third part of the subclavian artery.[18] In 70% of cases the left internal thoracic artery originates alone, whereas in 30%, it arises from a common trunk with other arteries: thyrocervical trunk, suprascapular artery, and inferior thyroid artery.[18] In an angiographic study by Calafiore *et al*., they found that the left internal thoracic artery originates together with other arteries in more than 1/3 of cases. In an echo graphic study by them, the right internal thoracic artery arises alone from the subclavian artery in 95% of cases, whereas in the remaining 5%, it originates from a common trunk with other arteries. The internal thoracic artery arising from thyrocervical trunk is 9%.[19]

Thyrocervical trunk

The branching pattern of thyrocervical trunk in other studies of comparison with the present study is given in Table 3. The branching pattern of bifurcation of thyrocervical trunk in other studies of comparison with the present study is given in Tables 4 and 5. When it is absent, its branches may arise independently mostly from the second part of the right subclavian artery. It may arise in common with the dorsal scapular artery.[20]

Costo cervical trunk

The costo cervical trunk is constantly absent from 30% to 40% of the individuals. It may arise from the other parts of the right subclavian artery. When it is absent its branches may arise independently mostly from the second part of the right subclavian artery. It may arise in common with the dorsal scapular artery.[18]

Dorsal scapular artery

The origin of dorsal scapular artery from the various parts of the right subclavian artery and from the transverse cervical artery in the present study in comparison with the other studies is given in Table 6.

Transverse cervical artery

When the dorsal scapular artery does not arise from the subclavian artery, it usually arises by the transverse cervical artery and divides into two branches the superficial being the superficial cervical artery and the deep being the dorsal scapular artery. It usually arises from the thyrocervical trunk. It may arise from the subclavian artery directly.[21] The origin of transverse cervical artery from the various parts of the right subclavian artery and from thyrocervical trunk in comparison with the other studies is given in Table 7.

Conclusion

The origin of the right subclavian artery from arch of aorta is 1% in the present study which is in accordance with the previous studies. The normal branching pattern

Table 3: Branching pattern of thyrocervical trunk

Name of the author	Normal trifurcation (%)	Trifurcation with transverse cervical (%)	Bifurcation (%)	Other variations (%)
Long[20]	30	45		-
Reed and Trotter[21]	45	45	10	-
Bergman *et al*[18]	46.5	-	15	9
Present study	72	11	6	9

Table 4: Bifurcation pattern of thyrocervical trunk into cervicoscapular trunk and inferior thyroid artery

Branching of thyrocervical trunk into cervicoscapular trunk and inferior thyroid artery	
Name of the author	**Incidence (%)**
Bergman *et al*[18]	10
Present study	4

Table 5: Bifurcation pattern of thyrocervical trunk into suprascapular and cervico thyroid trunk

Branching of thyrocervical trunk into suprascapular and cervicothyroid trunk	
Name of the author	**Incidence (%)**
Bergman *et al*[18]	10
Present study	2

Table 6: Origin of dorsal scapular artery from the various parts of the right subclavian artery and from transverse cervical artery

	Origin of dorsal scapular artery		
Name of the author	**From the third part of right subclavian (%)**	**From the second part of right subclavian (%)**	**From transverse cervical (%)**
Bergman *et al*[18]	30	30	40
Anton Reiner[21]	35	30	25
Present study	69	10	21

Table 7: Origin of transverse cervical artery from the various parts of the right subclavian artery and from thyrocervical trunk

	Transverse cervical artery		
Name of the author	**From thyrocervical trunk (%)**	**From second part of right subclavian (%)**	**From third part of right subclavian (%)**
Bergman *et al*[18]	43	7	6
Present study	11	2	8

of thyrocervical trunk is found only in 72%. This study also confirms the fact that the internal thoracic artery and the dorsal scapular artery are the occasional branches of thyrocervical trunk. This study also confirms the major blood supply of the scapular region is the dorsal scapular artery rather than the transverse cervical artery.

Previous studies on the aberrant right subclavian artery (ARSA) have emphasized its potential for serious, clinically significant complications and the need for operative planning. Gardner and Pathare reported aneurysmal change in ARSA in two patients, underscoring that this variant can progress beyond an incidental anatomical finding to a high-risk vascular pathology.[22] Naqvi described the case of a 50-year-old patient with progressive dysphagia in whom evaluation revealed a tracheo-esophageal fistula attributable to ARSA, highlighting the artery's capacity to produce life-threatening complications.[23] Finally, Heye provided an overview of evolving operative strategies and technical approaches for ARSA management, reflecting an expanding surgical armamentarium tailored to anatomy, symptom burden, and complication profile.[24] Collectively, these reports frame ARSA as a clinically important vascular variant that can manifest with compressive symptoms, catastrophic fistulization, or aneurysmal degeneration, supporting the need for detailed anatomical assessment and individualized treatment pathways.

Acknowledgments

The authors respectfully acknowledge the fetal and adult cadaveric specimens that contributed to this study. We also thank Mr. Ragava Vignesh for preparing the diagrammatic illustration depicting the ARSA arising from the aortic arch as the fourth branch and coursing posterior to the esophagus.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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Review Article

Analysis of Anatomical Variations Reported from India: A Review of Case Reports and Cadaveric Studies

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Abstract

Anatomical variations are commonly encountered during clinical practice, imaging, and surgical procedures and may significantly influence diagnostic accuracy and treatment outcomes. This review aimed to compile and analyze clinically relevant anatomical variations reported from India over a ten-year period. A structured literature search was conducted for studies published between 2012 and 2022 using electronic databases including PubMed/MEDLINE. Rayyan software was used for screening and selection. Only case reports and cadaveric studies conducted in India were included. Anatomical variations were categorized into head, neck and face (HNF), trunk, upper limb, and lower limb. A total of 172 articles were identified, of which 72 studies met the inclusion criteria. Sixty-nine distinct anatomical variations were documented. Of these, 27 were reported in the HNF region, 24 in the trunk, 16 in the upper limb, and 2 in the lower limb. Variations involving maxillofacial dentition and gastrointestinal organs were most frequently reported. Cadaveric dissection and radiological imaging were the predominant methods of identification. Anatomical variations reported from India span multiple body regions and have important clinical and surgical implications. Systematic documentation of region-specific variations can enhance diagnostic accuracy, surgical safety, and medical education, highlighting the need for an India-specific anatomical variation database.

Keywords: *Anatomic variations, cadaveric study, case report, Head, limbs, maxillofacial anomaly, neck and face, trunk*

Introduction

Anatomical variation is an alteration in the morphological features of body structure that may or may not impact the regular function.[1] The anatomical variations are usually identified during routine dissection and clinical practice, including preoperative imaging and surgical procedures.[1] The identification of such variation has become more feasible with the progress of scientific research based on observational studies using cadaveric dissection, autopsy, medical images, and evidence-based anatomy.[1] The anatomical variations may include deviation in blood vessel branching, nerve patterns and locations, ligament attachments and morphology, muscle structure, attachments, and innervations, as well as bone morphology and accessory bones.[2-7] Such variations are quite common and often have no noticeable impact on patient health but may contribute to significant medical conditions. Consequently, it is critical to differentiate between structural variations and other pathologic aberrations because the former do not cause a discernible reduction in normal functioning.[8] Patient care may be affected, as demonstrated by the present spike in litigation caused by these errors.[9]

Detailed knowledge of anatomical variances is important for many reasons that are listed below: (1) Accurate diagnosis:[1] Anatomical variations can mimic pathological conditions. For example, a variation in blood vessel placement or size might resemble a vascular disease on imaging. Recognizing these differences prevents misdiagnosis; (2) Successful surgical intervention:[10] Surgeons rely on a detailed understanding of anatomy for safe and effective procedures. Anatomical variations, such as an aberrant nerve or artery, can complicate surgeries. Awareness of these variations reduces the risk of accidental injury and improves outcomes; (3) Tailored Medical Treatment: Variations can influence how patients respond to treatments. For instance, differences in the hepatic artery's anatomy may affect liver transplant procedures or targeted therapies; (4) Medical Imaging Interpretation: Radiologists

How to cite this article: Aggarwal S, Chakotiya AS, Kumari M, Tabassum H. Analysis of anatomical variations reported from India: A review of case reports and cadaveric studies. J Anat Soc India 2026;75:S20-30.

Article Info

Received: 17 March 2025
Revised: 01 January 2026
Accepted: 10 March 2026
Available online: 13 April 2026

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Access this article online

Website: https://journals.lww.com/joai

DOI: 10.4103/jasi.jasi_52_25

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must distinguish between normal anatomical variants and abnormalities. Misinterpretation of variations as pathological findings could lead to unnecessary tests or interventions; (5) Preventing Complications: Knowledge of variations helps in avoiding complications during invasive procedures such as catheterization, biopsies, or endoscopies. For instance, variant renal artery anatomy must be considered during kidney-related procedures; (6) Educational and Research Significance: Understanding variations contributes to medical education and improves the anatomical knowledge base, aiding future research and clinical practice; (7) Genetic and Evolutionary Insights: Anatomical variations can provide insights into genetic diversity and evolutionary adaptations, which may have implications for personalized medicine and understanding human biology; and (8) Understanding Normal Development: Variations in anatomy often originate during embryological development. By studying these variations, embryologists can better understand the mechanisms of organogenesis, tissue differentiation, and morphogenesis.[11]

The literature on anatomical variation and medical education currently has a gap in it[12] in terms of a compiled document that covers such variations present worldwide or within a geographical region. Geographic location, race, genetic, environmental adaption, and chemical or radiation exposure can all have a significant impact on anatomical differences.[13] Therefore, this review article attempts to highlight some major anatomical variations clinically significant reported in India only, in a decade that may provide evidence-based information for surgical procedure. The studies included are related to cadaveric and case studies presented in different parts of the body, focusing on their significance in clinical practice and approaches to identifying them.

Methods

Study selection criteria

A structured literature search was conducted to identify studies reporting anatomical variations from India published between 2012 and 2022. Electronic databases including PubMed/MEDLINE were searched using predefined keywords such as "anatomical variation," "rare," "abnormal," and "India." Rayyan software was used for systematic screening of titles and abstracts, followed by full-text assessment for eligibility. Only case reports and cadaveric studies conducted in India were included in the review, as these study designs provide direct anatomical confirmation of variations. For uniform analysis, the included studies were categorized based on the anatomical region involved into head, neck and face (HNF), trunk, upper limb, and lower limb. This classification facilitated region-wise synthesis of reported variations and their clinical relevance [Figure 1].

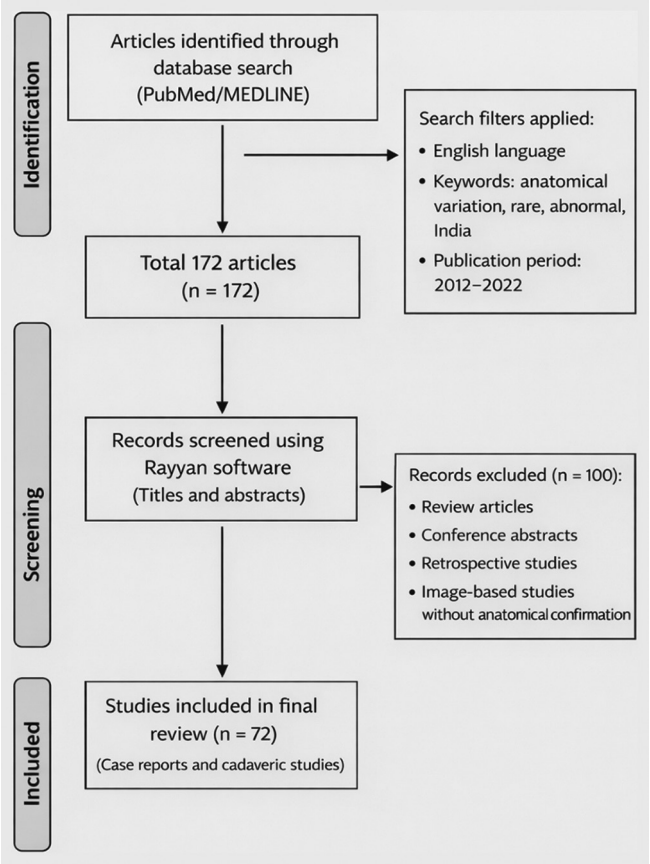

Figure 1: PRISMA flowchart for the studies included in the review

Inclusion criteria

(i) Articles originally published in the English language, (ii) articles published between the years 2012 and 2022 were reviewed, (iii) only Indian studies were considered for this study, (iv) only case reports and cadaveric studies were included, and (v) studies represent rare anatomical variations.

Exclusion criteria

(i) Image-based examination studies were not considered and (ii) review articles, literature review, retrospective studies, letters, or abstract-only conference abstracts were also not included.

Results and Discussion

In the present study, the result of the advanced search criterion followed by literature review provides n = 172 articles. At the next logical interface, 72 studies were considered for the further review. The results obtained were based on imaging, cadaveric, and autopsy studies. After scrutiny, a total of 69 anatomical variations were found, of which 27 variations were in the HNF, 24 variations in the trunk, 16 variations in the upper limb, and 2 variations in the lower limb [Figure 2].

Anatomical variations in head, neck, and face

The HNF part showed 27 variations in dentition, nerve, muscle, structure, brain, veins, and artery.

Anomaly of the maxillofacial region

In clinical terms, the anomaly of the maxillofacial region often presents the variances in the jaw and face. Hence, it includes the jaw, dentition, face, neck, nerves, and other structures that connect to the mouth. The maxillary first molar has been diagnosed with the highest count of anatomical variations as recorded with diagnostic techniques, including radiological as well as dental operating microscope, especially in the count of canals present in each root, as depicted in Table 1.[14-17] Maxillary first molars are generally found to be with three roots that include two buccal roots: mesiobuccal and distobuccal (direction toward the inside of the cheek) and one lingual or palatal root and in total four canals (3R4C).[18] Among these roots, the mesiobuccal root has two root canals. In the event of anomalies, the number of canals in the maxillary first molar might reach eight.[19] Two canals are typically found in the mesial root and one canal in the distal root of the mandibular first molar.[20] Two roots with three or four root canals make up the most typical mandibular first molar root canal morphology.[21,22] The mesial roots of the mandibular first molar have been documented in numerous examples in the literature to have three or four canals; however, there is little information available for more than two root canals.[21] Anatomical variation radix entomolaris is exclusive to mandibular molars as reported by Karunakar *et al.* with the help of the SLOB technique with preoperative radiograph [Table 1]. Radix entomolaris varies from 5–v x in Asian and Eurasian people to <5% in Mongolian populations.[19,23,24] As per the literature, the frequency of three-rooted lower first molars is approximately 3% in African populations[25] and does not exceed 4% in Caucasians. The prevalence of this anomaly in the Indian population[26] is lower (2.16%) than in any other Asian

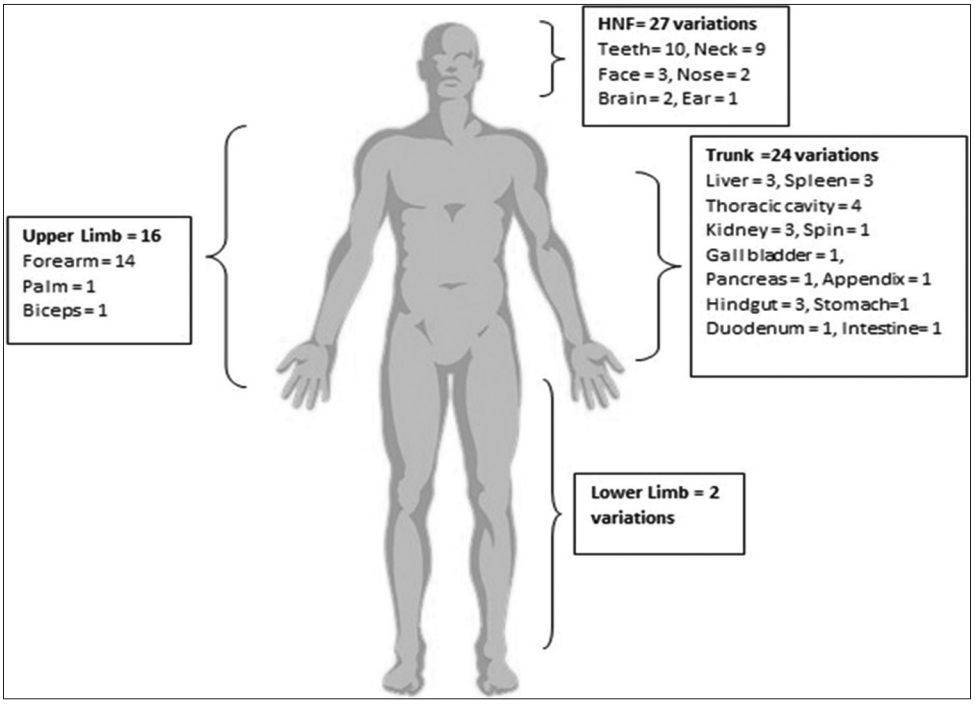

Figure 2: Body parts with anatomical variations

Table 1: Characteristics of anatomical variations observed by different techniques

Teeth	Anomalies	Analyzed by the technique
Maxillary first molar	Three MB canals[14,17]	CBCT and DOM
	Two palatal canals[66]	DOM
	One distobuccal canal[66]	DOM
	Seven canals	CBCT
	Type I canal configuration in a single-rooted maxillary first molar[15]	CBCT
Primary maxillary second molar	Four rooted retained[25]	Radiographic examination
Maxillary second premolar	Three roots and four canals[25]	CBCT
Mandibular premolars	Bilateral and three rooted[26]	CBCT
Mandibular molar	Mandibular first molar with four distal canals and two mesial canals[20]	CBCT
	Mandibular second molar with vertucci type I, type V, and type III canal configuration[21]	CBCT
	Radix entomolaris (additional distolingual root) in mandibular first[24] and second molar[22]	SLOB technique with preoperative radiograph
	Six rooted mandibular first molar[23]	CBCT
Permanent maxillary canine	Three-rooted[28]	Post exodontia examination
Incisor	Dual-rooted maxillary central incisors	Radiograph

CBCT: Cone-beam computed tomography, DOM: Dental operating microscope, MB: Mesiobuccal, SLOB: Same lingual opposite buccal

Figure 3: (a) Three-rooted mandibular first premolar;[26] (b) Three-rooted mandibular second premolar;[25] (c) Four-rooted mandibular first and second molar;[20] (d) Maxillary second premolar with three roots[26]

population, and it is more common in women and on the right side of the jaw.

One of the studies has identified that premolars only exhibit one variant, the maxillary second premolar [Figure 3], which has four canals and three roots.[26] The majority of maxillary second premolars have one root and either one or two root canals. According to Vertucci, there are 75% of single canals with a single apex and 24% of double canals at the apex. It was observed that just 1% of apex had three canals.[27] A large variety of canal configurations in maxillary second premolars were observed with the help of CBCT, in a number of case studies that were published in the endodontic literature.[20,25,28] The maxillary second premolar's canal morphology revealed a variegated morphological pattern that is uncommon in the literature. Canine showed one variation which is three-rooted permanent maxillary canine.[29] Typically, maxillary canines are single-rooted, single-canalled teeth as reported by Suresh Chandra and Gopikrishna. Maxillary canines are thought of as single-rooted, single-canal teeth, and it is uncommon for a permanent canine to have two bifid roots and three root canals.[29] Under these circumstances, the pulp canal may become quite complicated, branching and dividing all the way down the root, or perhaps joining at the tip. Studies by Bolla and Kavuri and Mohammed *et al*. revealed the maxillary anterior teeth's multiple roots or two root canals.[30,31] Two roots with two root canals are a very rare condition.[21]

A rare case of a two-rooted maxillary central incisor, with the help of three-dimensional imaging in treatment planning,[32] has been also reported.

Anomalies in the arteries of the maxillofacial region

Aberrant subarcuate artery is one of the variations present in the ear, as depicted in Table 2, sometimes referred to as a dilated subarcuate artery;[32] it is an uncommon anatomical abnormality that might rupture during surgery or any other clinical procedure if the condition is unaware.

Anomalies in the nerves of the maxillofacial region

Other variation observed in a cadaveric dissection study [Table 2] includes the superior root of the ansa cervicalis, which had a contribution from the vagus and hypoglossal nerves.[33] In general, the ansa cervicalis (or ansa hypoglossi) is formed by the union of the C1, C2, and C3 nerves from the cervical plexus, which provides innervation to the infrahyoid muscles[33] [Figure 4]. In rare cases, the superior root can also arise from the vagus nerve.[33]

Trigeminal neuralgia (TN) with petrous endostosis is shown in another form [Table 2]. A rare cause of TN is called petrous endostosis, consequent of trigeminal nerve compression by the petrous bone. With a 5% frequency, conspicuous suprameatal tubercle, also known as petronus endostosis, is a rare condition.[34]

It is uncommon to see the lesser occipital nerve (LON) in the "Carefree part" of the posterior triangle [Table 2 and Figure 5a and b]. There have rarely been any published reports in the literature on the unusual location of the LON in the "carefree part" of the posterior triangle.[35] We are describing a unique instance in which the LON is situated in the posterior triangle's "carefree part." This case revealed a distinctive variation in the lesser occipital nerve (LON), which looped around the abnormally divided trapezius muscle fasciculus at an uncommon site and distance. Dash *et al*.'s work showed that the peculiar placement of LON might be important to consider when employing anesthetic blockades to treat migraine pain.[35] It is uncommon to have an accessory mental nerve [Table 2];[36] various ethnic groups have various rates of accessory mental foramen: 5.7% among American blacks, 3.6% among Egyptians, 3.3% among Greeks, 9.7% among Melanesians, 3% among Hungarians, 2.6% among French, 1.5% among Russians, and 4% among American whites.[37]

Anomalies in the muscles of the maxillofacial region

Many variations was shown by the sternocleidohyoid muscle (cleidohyoid muscle) it includes double or absent,

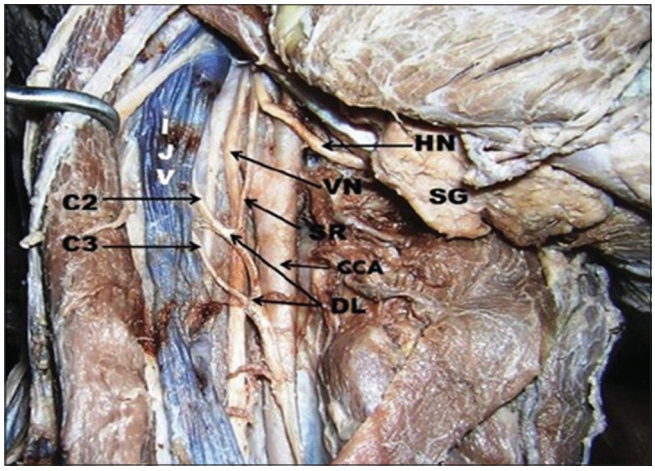

Figure 4: Anatomical variation in Ansa cervicalis.[33] IJV: Internal jugular vein, HN: Hypoglossal nerve, SR: Superior root, VN: Vagus nerve, CCA: Common carotid artery, C2, C3: Second and third cervical nerves, respectively, SG: Submandibular gland

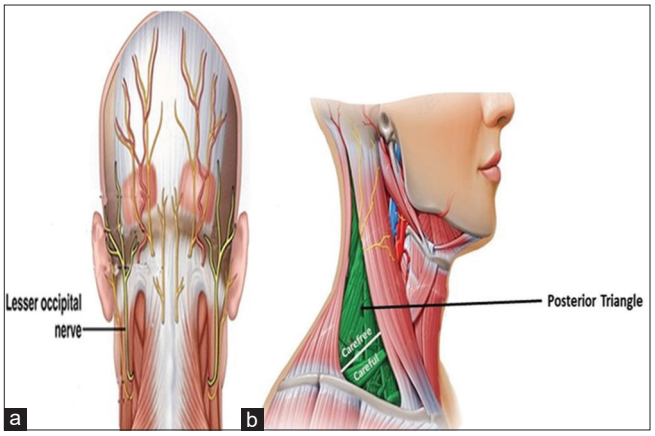

Figure 5: (a) Lesser occipital nerve; (b) "Carefree part" of the posterior triangle[35]

Table 2: Anatomical variations in the head, neck, and face canal, muscle, and nerves

HNF nerves and artery	Anomalies	Analyzed
Ear	Dilated subarcuate canal[31]	Cadaveric dissection study
Nerve	Superior root of the ansa cervicalis[16]	
	TN with petrous endostosis[34]	
	LON[35]	
	AMN[36]	Case report
Sternocleidohyoid muscle	Clavicular slip, or interrupted by a tendinous intersection[38]	Cadaveric dissection study
Levator glandulae thyroideae	Fibromusculor glandular in nature with the absence of pyramidal lobe[40]	Cadaveric dissection study
Posterior triangle muscle of the neck	Absent[33]	Cadaveric dissection study

HNF: Head, neck, and face, TN: Trigeminal neuralgia, LON: Lesser occipital nerve, AMN: Accessory mental nerve

augmented by a clavicular slip, or interrupted by a tendinous intersection.[38] The capsule of the sternoclavicular joint, the posterior side of the medial portion of the clavicle, and the posterior surface of the manubrium sterni are the origins of the sternocleidohyoid muscle.[38] Between the sternohyoid and superior belly of the omohyoid muscles' attachments, it penetrates into the hyoid bone.[38] It is more usual for there to be no sternal attachment than no clavicular attachment.[39] There are some people who may not have a sternohyoid muscle at all, and others who have two muscles instead of one. There could be an extra fibrous slip connecting the sternohyoid muscle to the clavicle. The term "cleidohyoid" refers to this distinct section.[38]

Another variant is the lack of a pyramidal lobe on the left side of the levator glandulae thyroideae, which was fibromusculoglandular in nature.[40] A case of levator glandulae thyroideae without a pyramidal lobe on the right side was reported.[41] The lesion extended from the upper border of the thyroid gland's isthmus to the lower border of the thyroid cartilage's lamina, measuring 0.6 cm in width and 1 cm in length. The absence of the neck's posterior triangle muscle was the final change [Figure 5b]. According to a study, there is an aberrant muscle on both sides, with a partially defective cervical portion and a distinct descending portion.[33]

Anomalies in different head, neck, and face structure

Variances in HNF include aplastic right frontal sinus, absent right ethmoid air cells, extensive septal spur in the left side, lack of right middle, inferior, and superior turbinates, and left concha bullosa with bilateral maxillary sinusitis.[42] It is believed that middle turbinates are an especially useful marker for endoscopic sinus surgery.

In an endoscopic sinus surgery, Ferrari *et al*. reported a case that was identical and involved bilateral middle turbinate absence.[43] Aydil and Ozçelik reported a case of unilateral middle turbinate agenesis on the same side as a septal spur, suggesting that the septal spur might substitute the space usually occupied by the middle turbinate.[44]

An additional form is bilateral linguofacial trunk. Previous research has reported on the abnormal architecture that is emerging in the lower arterial branches of the external carotid artery.[42,43] Instances of ascending pharyngeal artery were reported to have originated from carotid termination in a radiological investigation.[45] Ozgur *et al*. during surgical practice found that the linguofacial trunk was present in 7.5% of cases.[45] In 4.9% of patients, they also reported the incidence of bilateral linguofacial trunk.

The final one is the double-looped ansa cervicalis, which is connected to its deep location in the neck's carotid triangle. Ahmed's morphological study revealed four different ansa cervicalis looping patterns.[46] 84% of the prevalence was accounted for by type 1 with a U-shaped loop. Type 2, characterized by a Y-shaped loop, was observed in 8% of cases. Double and fused Y-shaped loops accounted for 4% of cases, while double and separated Y-shaped loops were classified as Type 4, with an incidence of 4%.[46]

Head, neck, and face veins and artery

Veins and artery combinedly showed 3 variations, out of which 2 are of jugular veins and 1 is of the common carotid artery. According to Mumtaz and Singh, the left side accounts for more than two-thirds of IJV variants.[47] In the parotid region, an unusual development of the external jugular vein is linked to the absence of the retromandibular vein. In 1 out of every 104 instances, an undivided retromandibular vein is discovered, as stated by Pai *et al*. during a cadaveric study.[48] In a recent radiographic research, the intervertebral disc of the C3-C4 vertebra was found to have varying levels of carotid termination at a frequency of 29.6%, with 79.6% occurring between the vertebral bodies of C3 and C4.[49]

Anomalies in the brain

An extra cerebellar lobe was observed in a cadaver, which is extremely unusual.[50] Jackson *et al*., using head computed tomography scan and a head magnetic resonance imaging, reported a unilateral cerebellar hemisphere coupled with a complicated ipsilateral ear abnormality.[51]

Anomalies in the upper limb

Upper limb muscular anomalies

Out of the total 16 variations, 7 were muscular variations. One of these muscle varieties is the long head of the biceps tendon. According to Ogawa and Naniwa's theory, rotator cuff tears may be caused by the biceps tendon that passes through the supraspinatus tendon.[52] Gramstad *et al*., during a cadaveric study, discovered that humeral rotations in both the coronal and sagittal planes considerably increased the tension in LHBT.[53]

A musculofascial tunnel anomaly in the arm can cause proximal entrapment of both the median nerve and the brachial artery. As noted in a condition where the median nerve was situated between the brachial artery and the biceps tendon, there may be differences in the arrangement of material within the fossa.[54]

In this instance, the case report specifically mentioned the lack of flexor carpi radialis (FCR).[55] The anomaly in the case of ligament reconstruction and tendon interposition arthroplasty for thumb carpometacarpal joint arthritis, as well as the absence of the FCR in a young boy undergoing tendon transfer for the reconstruction of posterior interosseous nerve palsy, was observed.[56] Different ethnic groups have differing prevalences of palmaris longus absences.[57] Asians (2.9%) and African-Americans (4.5%) were less common than the Caucasian population (Hispanic: 14.9% and non-Hispanic: 13.1%).[57] Compared to the Caucasian population, the

overall prevalence of missing PL (unilateral: 3.3% and bilateral: 1.2%), in the Chinese population is 4.6%, which is quite low on the basis of clinical assessment.[57] Palmaris longus, which normally continues as palmar aponeurosis, has duplicated tendons and multiple insertions to the fasciae of the thenar and hypothenar muscles as well as the flexor retinaculum.

Always located anterior to the interosseous nerve and posterior to the median nerve is the Gantzer muscle.[58] Oh *et al*. also noted that the Gantzer muscle gave rise to two tendons in one forearm,[59] whereas in another study,[60] this muscle gave rise to three tendons; two of these tendons were placed into the flexor pollicis longus and the other into the flexor digitorum profundus. There is also variance in the muscle mass in the forearm flexor compartment that mimics the pronator teres (PT).[61] In 70.6% of instances, the PT muscle was joined at the medial intermuscular septum and the medial humeral epicondyle.[62]

Anomalies in the upper limb's nerves

Maximum variations have been shown by the nerves, with a count of four. When performing carpal tunnel release and flexor tendon surgery, it is essential to recognize the rare occurrence of Berrettini anastomosis with the superficial palmar arch to avoid complications.[63] A significant variable that is becoming more clinically significant during axillary lymph node dissections and mammary gland surgeries is aberrant cutaneous nerve loops in the axilla.[64]

An uncommon anatomical variation was observed in the right arm, where the median nerve gave rise to an aberrant cutaneous branch that was accompanied by a superficial vein in the forearm. This information is useful for peripheral neuropathy diagnosis by neurophysiological assessment and nerve transplantation.[65] The lateral chord of the brachial plexus is an uncommon development that is a significant oddity.[65]

Anomalies in the arteries in the upper limb

Understanding the anatomy of the axillary artery and its branches is crucial since the scapular area muscles are used in transposition and reparative surgery.[66] Brachial artery and median nerve proximal entrapment in the arm due to an aberrantly developed musculofascial tunnel was observed during a cadaveric study.[67] An uncommon sub-brachialis path of the median nerve in the arm, with the whole course of the nerve situated deep within the brachialis muscle, in a case. However, it resumed its usual path close to the cubital fossa and became visible as the cubital fossa's most medial content.[67] Shetty *et al*. described a very unusual case with an absent median nerve in the cubital fossa.[68]

Neurovascular anomalies in the upper limb

The upper limb's neurovascular structure also showed variances. The brachium–antebrachium had two variants, one of which was neurovascular.[69] Up to 18.53% of upper limb cases have irregular arterial channel configurations.[70] There are between 5% and 63.5% of cases when the median nerve and the musculocutaneous nerve communicate.[71] Although the musculocutaneous nerve is formed from the median nerve in the embryo, it is anatomically derived from the lateral cord.[72]

Anomalies in the bones of the upper limb

In this review, we have found variations related to bone, which are pockets, osseous inadequacies, and thickening of the redundant lateral border in the scapula in a case report.[73] Although they are rare, osseous defects in the scapula's body might result in radiolucent regions that could be misunderstood. Clinicians have already faced this diagnostic conundrum, and concerns have been expressed.[74]

Anomalies in trunk

Anomalies of organs in the trunk

A number of variations has been remarked in structural organs that include auxiliary lobe, variations in the position of organs, and vascular network.

In adults, asymptomatic intestinal malrotation is an extremely uncommon occurrence.[75] According to a retrospective assessment, 3 out of 1220 cases (0.2%) of intestinal malrotation occurred in adults having hepatobiliary surgery.[76] A congenital pelvic kidney with varied vascular anatomy and altered hilar anatomy, together with bilateral malrotation.[77]

Anatomical differences associated with situs abnormalities are typically more prevalent in the pediatric population.[78] Post-mortem findings were reported in one patient with antiphospholipid antibody syndrome,[79] while another case involved an adult with a congenital diaphragmatic hernia.[80]

Duplication of the gallbladder is a relatively uncommon congenital biliary tract defect, estimated to occur in approximately 1 in 4000 births. Boyden classified these anatomical variations into two main types: (1) vesica fellea duplex, in which a double gallbladder has two separate cystic ducts,[81] and (2) vesica fellea divisa, a bilobed or bifid gallbladder with a shared neck.[82] Additional morphological patterns include the Y-shaped type, where the two cystic ducts unite to form the common bile duct, and the H-shaped type, where the cystic ducts enter the biliary tree independently, forming the ductular type.

One of the rarer variations in the structure of the liver is the presence of auxiliary liver lobes.[83] A large accessory liver lobe that is attached to the main liver by a stalk;[84] a small accessory liver lobe (10–30 g in weight) that is attached to the main liver;[85] a microscopic ectopic liver that is found in the gallbladder wall;[86] and a liver that is not connected to the main liver and is typically attached to the gallbladder

or the intra-abdominal ligaments.[87] We specifically include low-lying cord and spinal filar arteriovenous (AV) in this review.[88] An unusual kind of spinal AV shunt in which the draining vein and the artery of the filum terminale interact directly is called a spinal filar AV fistula. An example of a low-lying spinal cord is the conus medullaris, which terminates below the L2 vertebrae.

Anomalies of the arteries in the trunk

The arterial network of the trunk has shown seven different variants. Hansdak *et al*. have reported the inferior mesenteric artery in an adult male cadaver of Indian origin as one of these modifications.[86] Amonoo-Kuofi *et al*. have reported a case similar to this one during dissection in 27 embalmed cadavers, in which the superior mesenteric artery (SMA), which supplied the splenic flexure and the proximal part of the descending colon, gave rise to an accessory left colic artery.[87] Variations in the arterial supply of the left colic flexure are extremely rare.[88]

Coronary artery anomalies are abnormalities of the coronary arteries that typically affect approximately 1% of the population. Estimates vary depending on the study, ranging from 0.3%–5.6% in various angiographic investigations to over 1% in standard autopsy. Thank you for your observation. The sentence can be revised to "The anomalous origin of the right coronary artery from the left coronary sinus, first described by Yans *et al.*, has been reported with an incidence between 0.026% and 0.255% in both autopsy and angiographic studies.[89]

The anatomical variant known as splenomesenteric trunk, or aberrant splenic artery emerging from SMA, is observed in <1% of the population and is more common in females.[90] Its potential embryological basis is the interruption of the ventral longitudinal anastomosis. The mesenteric artery has the greatest variance among them.

Anomalies of the veins in the trunk

Nayak and Soumya have reported a rare variation in the azygous veins of the thoracic wall in an adult male cadaver aged 65 years.[91]

The left ascending lumbar and subcostal veins united to produce the azygos vein. It ran along the left side of the descending thoracic aorta, passing over the left vagus and left subclavian arteries until coming to an end in the left brachiocephalic vein.[92] Dual inferior vena cava (IVC), in which the left-sided IVC empties into the hemiazygos vein, is another form. 0.6% of cases of IVC interruption with azygos or hemiazygos continuation have been reported.[92] There has also been a case of hemiazygos left IVC continuation and retroaortic right renal vein in a left-sided IVC patient reported.[92] The pancreas is situated ahead of the splenic vein. It is situated anteriorly to the splenic vein in 54% of instances and posteriorly to the vein in 2% of cases.[92]

Anomalies in muscles of the trunk

Muscles of the trunk part show only 2 variations and both are of the superior rectus muscle had two equal-sized bellies. Rectus sternalis muscle with double slips observed in a male cadaver.[93] It has been reported that both sexes and practically all races possess the rectus sternalis.[94] Asians, Black people, and Caucasians are said to be ethnic. Asians had the highest incidence (11.5%), with northern Chinese accounting for 18.2% of the total and Taiwanese for the lowest (1%). 4.4% of cases are from Europe, with 9.3% coming from Turkey alone.

Lower limb anomalies

There have been only two variants in the lower limb muscles that were observed, one involving the flexor compartment of the right lower limb near the rear of the thigh.[95] A review of the literature showed that there have been descriptions of an abnormal muscle originating from the long head of the biceps femoris that is inserted into the tendo calcaneus or sural fascia.[95]

Conclusions

This review has compiled significant information on major variations in human anatomy. Permanent dentition emerged as one of the most variable structures, with notable anomalies observed in the root canal morphology of the maxillary first molar and mandibular molar within the maxillofacial region. Variations in root canal anatomy (e.g., additional canals, curved roots, or accessory foramina) can make root canal treatment more complex and increase the risk of failure if not accurately identified. Variations in the anatomy of permanent teeth can affect the clinical outcome of dental procedures and can also impact oral hygiene. Subsequently, the muscular structures and nerves in the HNF region have shown variations as reported in the cadaveric studies. Anatomical variation in the organs in the trunk part and muscles of the upper limb and lower limb was also recorded. These variations may impact the surgical procedures and radiological investigations for the medical experts. Identifying anatomical variations is essential for improving clinical practices, with methods including cadaveric dissection, imaging, and surgical observation. Despite its importance, there is limited research on teaching and assessing these variations in medical education. The study suggests creating an India-based health informatics database and conducting further research to enhance awareness and outcomes.

Financial support and sponsorship

This work was supported by the Indian Council of Medical Research-Headquarters, New Delhi, India.

Conflicts of interest

There are no conflicts of interest.

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Case Series

Unusual Ossification of Pterygospinous Ligament of Sphenoid Bone with Formation of Pterygospinous (Civinini's) Foramina and Its Clinical Implications: A Case Series

Abstract

Various intracranial and extracranial ligaments are related to the sphenoid bone. Among these, the pterygospinous ligament (PTSL) extends from the posterior free border of the lateral pterygoid plate to the spine of the sphenoid bone (SS). Sometimes PTSL shows changes of ossification which can lead compression of structures in upper part of infratemporal fossa as well as formation of additional foramina. In this case series, we described five unique cases that showed partial or complete ossification of PTSL, resulting in the pterygospinous bar formation. All five skulls were observed morphologically and photographs were taken on both sides. Ossification of this ligament leads to the formation of a bony bar in this area. This bony bar if it is fully formed, leads to the formation of additional foramina called as pterygospinous foramina. The structures passing through the foramina ovale may passes through these foramina. In addition, such a bony bar can compress the surrounding nerves and vessels. Anatomical variations documented in the present study are useful to anesthetists, radiologists, neurosurgeons, and anthropologists.

Keywords: *Lateral pterygoid plate, pterygospinous ligament, spine of sphenoid bone*

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Introduction

The sphenoid bone lies in the skull base, "wedged" between the frontal, temporal, and occipital bones. It has a central body, paired greater and lesser wings spreading laterally from it, and two pterygoid processes. Each of these processes, descending perpendicularly from the junctions of the greater wings and body of the sphenoid, consists of a medial and a lateral plate. The lateral pterygoid plate (LPP) is broad, thin, and everted; a variable pterygospinous process on its irregular posterior border is connected by a ligament to the sphenoid spine.[1]

Various intracranial and extracranial ligaments are present near to the sphenoid bone. Some of these ligaments are named as pterygospinous, pterygoalar, interclinoid, and caroticoclinoid. Pterygospinous and pterygoalar ligaments are in the superior part of the infratemporal fossa, nearby to foramen ovale. Any anatomical variation in these ligaments, such as ossification, may affect the important structures passing through the foramen ovale.

Pterygospinous ligament (PTSL) was first described by an Italian Anatomist, Filippo Civinini in 1829, as a thickening of the pterygoid fascia starting from the posterior free margin of the LPP of the sphenoid bone to finish at spine of the sphenoid bone (SS).[2,3]

Ossification of this ligament can lead to additional bony tissue formation in area close to foramen ovale. Sometimes, additional foramen can be formed in this bony bar. Possibly such kind of openings may provide openings for medial pterygoid vessels and nerves.[4]

The process of PTSL ossification can be complete by a bony bar formation which is extending from LPP to SS with a complete bony foramen. The ossification if it remains incomplete, i.e. when ossification fails to reach SS from LPP then it can leads to the formation of a partial bony notch.

Such ossified bony bar can be important reason for entrapment of blood vessels and nerves. Peukar *et al*.[5] were the first to demonstrate that pterygospinous bar (PTSB) may cause compression of the lingual nerve between the bony bridge and medial pterygoid muscle, which may

How to cite this article: Nirmale VK, Vedpathak SB, Bhele AV. Unusual ossification of pterygospinous ligament of sphenoid bone with formation of pterygospinous (Civinini's) foramina and its clinical implications: A case series. J Anat Soc India 2026;75:S31-6.

Article Info

Received: 10 July 2025
Revised: 13 February 2026
Accepted: 14 February 2026
Available online: 13 April 2026

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Access this article online

Website: https://journals.lww.com/joai

DOI: 10.4103/jasi.jasi_114_25

Quick Response Code:

result in lingual numbness and pain associated with speech impairment.

Piagkou *et al*.[6] found that the Chorda tympani branch of the facial nerve running with the lingual nerve can also be compressed by PTSB, resulting in the impairment of taste and salivary function.

The presence of wider LPP can also embrace neurovascular structures, which may present difficulty for the administration of mandibular anesthesia.[7]

Incidence of PTSL ossification and formation of foramina is significantly variable and usually ranging from 1% to 31.2%.[8,9]

Occurrence of PTSB also shows racial variations and found more frequently among European population than South and North African population. Among the countries of Asia, its prevalence is more in Japan than in India.[10]

In the present study, we observed the ossification of PTSL, resulting in the complete or incomplete PTSB formation in the upper part of infratemporal fossa.

Materials and Methods

For the present study, a total of 36 skulls were observed; however, we could see partial/complete PTSL ligament ossification in only five of them. These five skulls were studied thoroughly. The skulls were washed with water and their bases were closely observed macroscopically for the pterygoid plates and spine of sphenoid and for the presence of ossified pterygospinous bars and foramina. Photographs were taken from different angles and were labelled. The age and sex of the macerated skulls were not documented, so these records are not available.

Case Series

Case 1

We found that one of the skulls available in the bone bank of the Department of Anatomy showed a posteriorly elongated LPP, which fused on the right side with SS and on the left side was just short of reaching the SS. This elongation of LPP is because of the ossification of the PTSL, which bridges between the LPP and the SS. This bony PTSB forms the medial margin of the foramen ovale bilaterally and overlaps the foramen spinosum at its posterior margin [Figures 1 and 2].

Hence, we can see two additional foramina in the LPP near its root, with approximate sizes of foramen ovale and foramen spinosum.

Case 2

One of the skulls in the bone bank of the Department of Anatomy showed an incomplete bony bar extending from the SS to the posterior free margin of the LPP, close to the skull base on the left side. The SS cannot be seen independently on this side [Figure 3].

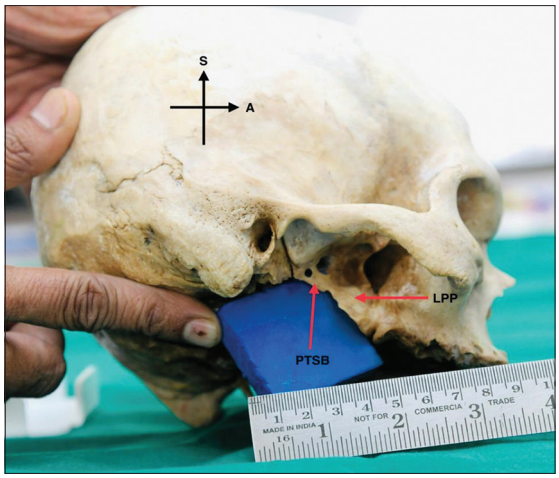

Figure 1: (Case 1) Right lateral view of dry human skull. LPP: Lateral pterygoid plate, PTSB: Pterygospinous bar

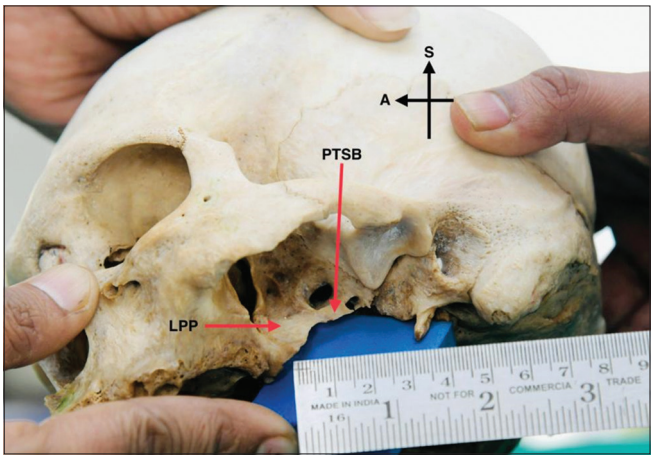

Figure 2: (Case 1) Left lateral view of dry human skull. LPP: Lateral pterygoid plate, PTSB: Pterygospinous bar

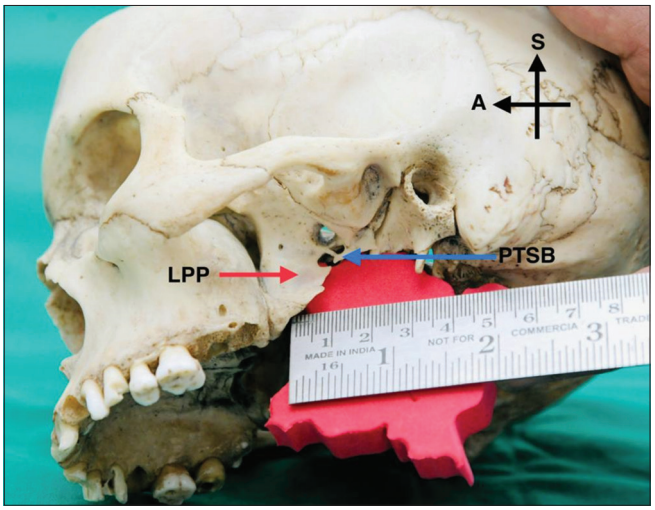

Figure 3: (Case 2) Left lateral view of dry Human Skull: Red arrow indicates the LPP: Lateral pterygoid plate and blue arrow indicates PTSB: Pterygospinous bar

This bony bar was formed due to the ossification of the PTSL. This bar, also called Civinini's bar, has pushed the

foramina ovale more laterally and away from the apex of the petrous temporal bone compared to the right side. This had also formed the incomplete foramina of size more or less similar to the foramen ovale of the left side. Posterolateral to this foramen, the Civinini's bar shows one complete foramen between the bar itself and the infratemporal surface of the greater wing of sphenoid bone. As the foramina ovale was pushed laterally, the mandibular nerve on the left side will be more stretched compared to the right side.

Case 3

We found another skull where the LPP of the right side showed a bony spine near the skull base projecting close to the right SS, overlapping the middle of the foramen ovale. Similarly, we can find a thin bony bar arising from the spine of the sphenoid and approaching the bony spine described above. This bony bar was splitting the foramen spinosum into two different foramina. Such bony spines may compress structures passing through the foramen ovale and foramen spinosum of the right side.

On the left side, the foramen ovale was not seen to be overlapped by the lateral pterygoid process, but the thin bony bar was seen at the left spine of sphenoid, which divides the foramen spinosum into two different foramina and may be a source of compression to the middle meningeal vessels on the left side also.

Case 4

We found another skull where on the right side a thin bony bar extending from the upper end of the LPP and reaches midway between the root of LPP and the SS and fuses with the undersurface of greater wing of sphenoid creating an additional foramen which pushes the foramen ovale more medially. This additional foramen was believed to transmit the nerve and vessels to the medial pterygoid muscle. We also found that a small bony spine projects forward from the sphenoid spine, which overlaps Formina spinosum from below.

On the left side, the forward extension of the SS was in the form of a broader and thinner bony plate, which pushed the foramina spinosum more laterally on the left side. This might be the reason for the kinking of the middle meningeal vessels and the nervous spinosus. The bony bar creating an additional foramen was not seen on the left side. A small bony spine was seen arising from the root of LPP.

Case 5

We found another skull where, on the left side, we can see that the anterior aspect of the SS was partially ossified in the form of a thin bony plate medial to the foramina spinosum. Similarly, the upper end of the posterior border of LPP showed a spine-like bony projection directed toward the spine of the sphenoid overhanging the foramina ovale. This suggested partial ossification of the PTSL in life.

On the right side, similar bony projection from the upper part of the posterior border of LPP was seen. However, unlike on the left side, there was a thin bony extension from the SS which has fused with the undersurface of the greater wing of sphenoid in between the foramina spinosum and ovale in such a way that one additional foramen was created just below the foramina spinosum. Since this thin bony bar (ptergospinous bar) was placed just below the foramina spinosum, it was most likely to cause compression of the nerves and vessels on the right side.

Discussion

The PTSL is derived from the lateral pterygoid muscle, whereas some authors believe that it is derived from the thickening of the pterygoid fascia. The PTSL extends from the posterior free border of LPP to SS, which lies below and medial to the foramen ovale in a vertical axis.[2,3]

In 1862, Hyrtl, a German Anatomist, found the ossified Pterygoalar ligament (Hyrtl's ligament), also called Pterygoalar bar, which forms the pterygoalar foramina. This ligament travels from the root of LPP to the inferior surface of the greater wing of the sphenoid bone. Branches of mandibular nerve supplying muscles may pass through it.[11,12]

The PTSL is extending LPP to SS medial to the foramen spinosum and ovale. It is more distant from the base of the skull. It attaches more posteriorly, and courses more medially than the pterygoalar ligament.[13]

In Lemurs (wet-nosed primates), the lower extension of LPP passes medial to FO and an opening in the bony plate transmits a part of the mandibular nerve toward the medial side.[14]

In the typical Pithecoids, PTSB is complete and passes lateral to FO, the perforation of the bar transmitting the nerve to the lateral side.[14]

Wood-Jones[14] also described the range of variation in his human racial studies and proposed the classification described below.

(a) The attached margin of the lateral lamina may fade away as a ridge upon the sphenoid anterior to the foramen ovale
(b) It may pass back as a ridge to the anterior margin of the foramen, and then this ridge may be distinctly seen on either side of the foramen, or it may be in the mid-point of the periphery of the anterior margin of the foramen
(c) The ridge may pass back and affect some sort of continuity with the SS and then the PTSB may pass laterally to the foramen ovale (pithecoid), medially (primitive) or even across the lumen of the foramen. These features are of some racial significance.

In herbivores, rodents, carnivores, and mature monkeys, a wide PTSB exists. A small bar is seen in rodents which is not visible in New World monkeys. Hence, the presence of PTSB is the phylogenetic remnant.[15]

In Platyrrhines, the middle portion of LPP from its free posterior border gives a small spinous projection. In the Aotus genus of monkeys, complete or incomplete ossification of PTSL bridges the gap between the spina Civinini and sphenoid bone.

In Tarsius and Lemurides, LPP is long and expanded so that it forms an intimate relationship with the auditory bulla. In great apes, the spine of Civinini and the spine of the sphenoid are well developed.

In humans, LPP and SS are separated from each other by significant gap which can be easily seen in norma lateralis.[16]

In humans and anthropoids, the PTSB is usually incomplete. When it is present in varying degrees of completion, it gives rise to anomalies in which pterygospinous foramina is formed.[14]

Some studies mentioned about genetic control behind PTSB formation and its variable occurrence in different geographic locations signified its racial variations.[17]

Sphenoid bone ossification

During the development of the sphenoid bone, basisphenoid is constituted by the presphenoid and post-sphenoid, which fuse at about 8 months. The greater wing and pterygoid plate are referred to as "alisphenoid" postnatally.

Earlier to that, medial pterygoid plates and the lateral part of greater wings commence ossification in the membrane during 8–9 weeks of intrauterine life. During the earlier period of the 3rd month, LPP commences ossification in the membrane and the Endochondral center for the hamulus appears. By the end of the 8th month, the pterygoid plates are fused to the greater wings. At the time of birth, the body of sphenoid is fully formed, with lesser wings and two separate greater wings attached to the pterygoid plates. During the 1st year of life, greater wings fuse to the body and the foramen ovale is completed, and the Sinus commences the pneumatization process. During the 2nd year of life, foramen spinosum is fully formed.[18]

In the adult skull, the medial surface of the LPP gives origin to the medial pterygoid muscle; however, the nerve to the medial pterygoid arises from the mandibular nerve, which exits from the foramen ovale lateral to the pterygoid plate. Similarly, medial pterygoid vessels arising from the maxillary artery are also lateral to the LPPs. However, as per the observations in our study, the medial

Table 1: Comprehensive literature review of the relevant studies on the pterygospinous bar in different parts of India

Name of the researcher	Sample	Study material	Region	Incidence of pterygospinous bar in percentage		Details
				Complete (%)	Incomplete (%)	
Nayak *et al*. (2007)[19]	416	Dry skull	Indian	5.76	3.8	Studied the incidence and phylogenetic significance of PTSB formation in Indian Skulls
Das and Paul (2007)[8]	50	Dry skull	Indian	00	2.0	Described anatomical and radiological aspects of an incomplete ossified pterygospinous ligament
Sharma Namita and Garud Rajendra (2011)[20]	50	Dry skull	Indian	2.0	00	Studied the aberrations of the foramina in the intermediate region of the human cranial base in the Indian population
Shinde *et al*. (2011)[21]	65	Dry skull	Indian	00	3.1	Studied an Ossified Pterygospinous Ligament in adult human skull in the population of Karnataka
Devi Jansirani *et al*. (2012)[22]	204	Dry skull	Indian	1.0	10.8	Studied pterygospinous and pterygoalar bar and foramina with ossified ligaments at the base of the adult human Dry skull in the North Indian population
Chakravarthi *et al*. (2012)[23]	71	Dry skull	Indian	3.0	1.0	Studied abnormal bone formation around the foramen ovale leading to nerve compression (study population state of Karnataka)
Saran *et al*. (2013)[17]	80	Dry skull	Indian	2.5	11.3	Suggested Pterygospinous foramina as a important landmark for maxillofacial surgeons. (study population: State of Tamil Nadu)
Verma *et al*. (2013)[24]	116	Dry skull	Indian	12.9	1.7	Studied Civinini bar and its incidence in North Indians; its clinical relevance
Kavitha Kamath and Vasantha (2014)[25]	100	Dry skull	Indian	1.0	16.0	Studied the PTSL and Pterygoalar ligament ossification in human skulls with their phylogeny
Yadav *et al*. (2014)[26]	50	Dry skull	Indian	4	10	Studied the occurrence and clinical significance of PTSB in human skulls of North India
Goyal and Jain (2016)[27]	75	Dry skull	Indian	2.7	14.7	Studied the pterygospinous bar and foramen of Civinini in the Punjabi Population
Present study (2025)	36	Dry skull	Indian	1 (2.7)	4 (11.11)	Study of complete and incomplete ossification of Pterygospinous ligament

PTSL: Pterygospinous ligament, PTSB: Pterygospinous bony bridge

pterygoid vessels and nerves are believed to create an additional foramen near the root of the lateral pterygoid process to reach their destination. Normally, these vessels wind around LPP. Similarly, middle meningeal vessels and the meningeal branch of the mandibular nerve are believed to create one smaller foramen in the bony bar overlapping the foramen spinosum before passing through the actual foramen spinosum. These observations correlate with classification 'C' as described by Woods [Case 1 – Figures 1 and 2].

Our second case correlates with Classification 'C' by Woods on the left side, but classification 'B' on the right side. Different variations of complete and incomplete ossification of PTSL have been observed in our study in third, fourth, and fifth observations [Case 2 – Figure 3].

Our observations show that ossification of PTSL may occur on both right as well as left sides in varying degrees of completion. Hence, PTSB may be seen on both right and left sides in more or less same frequency.

Scientists from the different parts of India documented the incidence and variable pattern of ossification of PTSL and additional foramen formation in the bony ossified bar. Their findings are summarized in Table 1.

Rosa *et al*.[9] studied 93 dry skulls showing partial or complete ossification of PTSL and pterygoalar ligaments radiographically by using the Hirtz axial technique. They reported that correct radiographic identification of ossified bony bars of PTSL and pterygoalar ligaments play a very crucial role in surgical procedures done for the management of trigeminal neuralgia cases.

Matys *et al*.[28] studied 200 helical sinonasal CT scan. He found an ossified PTSL in 35 patients, including 2 individuals with bilateral complete (1.0%), 8 with unilateral complete (4%), 8 with bilateral incomplete (4.0%), 12 with bilateral incomplete (6.0%) ossification, and 5 (2.5%) with mixed ossification (complete on one side and incomplete on the contralateral side). He found that PTSBs presence was equally distributed between both right and left sides, with complete bars (9 of 17, 53%) and partial bars (18 of 33, 55%) being only slightly more frequent on the right side.

They predicted that presence of such bony PTSBs possess potential obstacle for percutaneous cannulation of the foramina ovale in trigeminal neuralgia cases.

Conclusion

Our study shows that there may be partial or complete ossification of PTSL in 13.88% of skulls in the population of Western Maharashtra. The resultant PTSB so formed may be complete or incomplete and may compress or alter the course of structures passing through foramen ovale and foramen spinosum with its clinical implications. Therefore, these study findings are useful to maxillofacial and dental surgeons, anesthesiologists, radiologists, neurosurgeons, and anthropologists.

Limitations of the study

This case series has documented the variable pattern of PTSL ossification with the additional foramina formation on a dry skull and tried to describe the possible altered course of blood vessels and nerves after passing through the foramen ovale, which needs to be confirmed by cadaveric dissection.

Ethics informed consent

All bones used in this study were retrieved from cadavers donated to the anatomy department with written and informed consent for the study of the bone for educational and research purposes.[29]

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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Case Report

Atypical Aponeurotic Fused Origin of Pectoralis Minor

Abstract

Variations of the pectoralis major and minor muscles are common. It is seen that variation in the insertion of pectoralis minor (PMi) is more common. At the origin, documented variation of PMi is not uncommon. Studies have shown that the origin of PMi from the 2nd to 5th rib is normal or quite common. The present article is documented on fused atypical and hypertrophied aponeurotic origin of PMi on both sides found during routine dissection of a 65-year-old male cadaver. The variation of PMi is clinically important for surgeons while they perform surgical intervention in avoiding complications, in treating PMi syndrome or thoracic outlet syndrome, as an important neurovascular bundle is covered by PMi. Moreover, PMi acts as an accessory respiratory muscle during forced inspiration.

Keywords: *Aponeurotic origin, case report, pectoralis minor, pectoralis minor syndrome, thoracic outlet syndrome*

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Introduction

Pectoralis minor (PMi) muscle originates from 3, 4, 5 ribs, near the costochondral junction, and the intervening fascia covering external intercostal muscles. It gets inserted into the Medial border and upper surface of the coracoid process.[1] The approved "typical" origin of the PMi muscle is the third to the fifth ribs.[2-4]

Nevertheless, the origin of PMi at the second to the fourth ribs is comparatively common, even as evidence regarding gender differences in relation to the locations where the PMi develops the inferior attachments exists.[5,6] PMi stabilizes the scapula and assists in breathing by acting as an accessory muscle during respiration. When the scapula is fixed, the PMi can be considered an accessory muscle of respiration when inspiration is deep and forced, as it will help raise ribs 3–5 during inspiration and aid in expanding the thoracic cavity.[7] Most research studies on the PMi describe variations in the ribs from which the muscle arises, and these are very common. PMi has a constant costal attachment to the 3rd and 4th ribs. Origin of PMi from the 5th rib is reported with a pooled prevalence of 73.3%, and from the 2nd rib is reported to 61.5%.[8] Aponeurotic origin, where the muscle fibers arise from the fascia rather than directly from the ribs or costal cartilage, is rarely mentioned and is not reported as a separate percentage in any research study.

The variation of PMi is clinically important for surgeons doing surgeries in cases of PMi syndrome (PMS) or thoracic outlet syndrome (TOS), as well as physicians, to rule out any short inspiration or dyspnea due to tightness of PMi. This paper reports a case of Aponeurotic origin of PMi with fused fibres in a 65-year-old male cadaver.

Case Report

An abnormal PMi muscle was encountered during the dissection of the pectoral region of a 65-year-old male cadaver.

Dissection is done using standard protocol. A vertical incision is made with 22 no. surgical blade from the center of the suprasternal notch to the xiphoid process in the midsagittal plane. The incision is extended upwards and laterally till the areolar margin, the areola is encircled, and the incision is carried upwards and laterally to the anterior axillary fold. Horizontal incision is made from the xiphoid process across the chest wall till the posterior axillary fold. Finally, a horizontal incision is made from the center of the suprasternal notch to the acromial end of the clavicle. With the help of tooth forceps and 22 no. surgical blade, the skin, superficial fascia, and deep fascia are removed to expose the Pectoralis major muscle. The Pectoralis major muscle is dissected from its origin and reflected to

How to cite this article: Kaur A. Atypical aponeurotic fused origin of pectoralis minor. J Anat Soc India 2026;75:S37-9.

Article Info

Received: 28 October 2025
Revised: 05 March 2026
Accepted: 10 March 2026
Available online: 13 April 2026

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Access this article online

Website: https://journals.lww.com/joai
DOI: 10.4103/jasi.jasi_169_25
Quick Response Code:

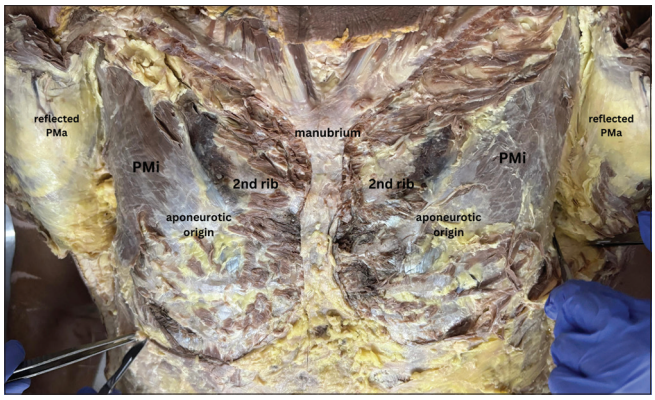

Figure 1: Aponeurotic origin of pectoralis minor on both the sides (pectoralis major). PMi: Pectoralis minor, PMa: Pectoralis major

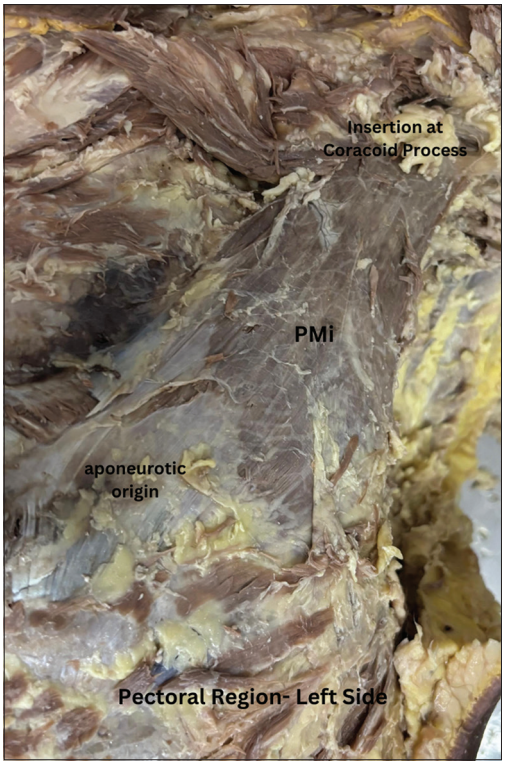

Figure 3: Aponeurotic origin of pectoralis minor on left side. PMi: Pectoralis minor

expose the PMi muscle. PMi has its normal site of origin and insertion. It is observed that the fibres appear aponeurotic and fused at the 3, 4, 5 ribs, near the costochondral junction, and from the intervening fascia covering external intercostal muscles. The PMi muscle belly appears tight, and its origin appears completely fused [Figures 1-3]. It gets inserted at the Medial border and upper surface of the coracoid process.

At the origin, the fibres are found aponeurotic and fused on both the sides.

Discussion

Normally, anatomical variations do not have any impact on the functioning of organs or the body. However, in clinical

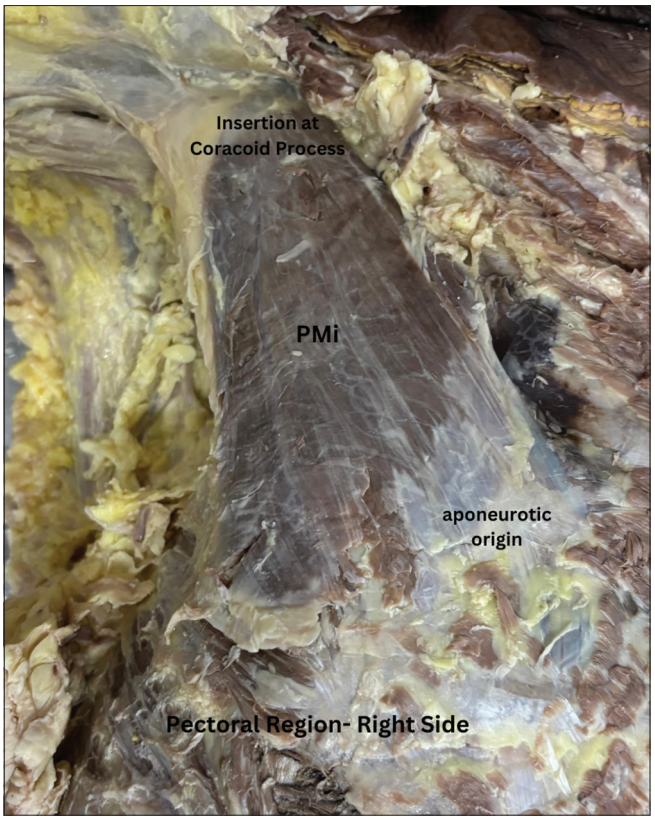

Figure 2: Aponeurotic origin of pectoralis minor on right side. PMi: Pectoralis minor

practice, anatomical variations are known to play vital roles with regard to the diagnosis and treatment or therapeutic procedures, as they might require additional attention and specific arrangements.[4,9]

During embryological development, somites derived from skeletal muscle cells differentiate, proliferates, and get migrated to the limb bud. The associated connective tissue determines the muscle morphology and various attachments.[10] The pectoral muscles arise from muscle cells that migrate from the lower cervical and first thoracic myotomes into the limb buds during the fifth week of development. Their final structure is formed through migration, fusion, and selective apoptosis of these muscle cell precursors.[11] The PMi muscle forms a "bridge" over the neurovascular structures passing from the thorax into the upper extremity. Occupational and daily living activities, sports such as rowing, swimming, baseball, volleyball, and weightlifting with repetitive movements of the upper extremities can result in stretching of the PMi muscles. Repetitive trauma leads to the formation of strain and myofascial trigger points in the PMi muscle, further shortening the muscle. These pathologies are the potential mechanisms of underlying pain in the PMi muscle and neurovascular compression.[12,13]

Variation in PMi can result in TOS, the entrapment of the upper extremity neurovascular structures from the cervical region to the axilla, causing pain, paresthesia,

weakness, numbness, swelling, coldness, tingling, and discoloration.[14]

Knowledge of the variation of PMi will be helpful in early diagnosis as well as management (conservative and surgical) of PMS or TOS.

Acknowledgment

I would like to acknowledge the Department of Anatomy.

Financial support and sponsorship

Department of Rachana Sharira (Anatomy).

Conflicts of interest

There are no conflicts of interest.

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Case Report

Falcine Ossification: An Incidental Finding During Autopsy

Abstract

Falx cerebri (FC) is made up of fibroblasts and large amounts of extracellular collagen, which are capable of undergoing osteogenic differentiation. Reports of ossification of the intracranial dural meninges are infrequent in medical literature. Ossification is a rarely detected incidental finding during imaging studies and mostly has no clinical implications. During the dissection of the cranium of a medico-legal autopsy case, a well-defined ossified segment measuring approximately 4.0 cm × 1.0 cm was observed in the anterior third of the FC. Isolated ossification of the cranial dura mater may occur with or without associated brain pathology.

Keywords: *Dura mater, falx cerebri, ossification*

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Introduction

The falx cerebri (FC) is a sickle-shaped fold of the dura mater situated in the midline between the two cerebral hemispheres.[1,2] Its narrow anterior edge is attached to the internal frontal crest and the crista galli, and its wider posterior part merges in the midline with the upper surface of the tentorium cerebelli. The superior sagittal sinus runs along the attached upper margin of the FC, the inferior sagittal sinus courses along its free inferior margin above the corpus callosum, and the straight sinus is located at the junction where the FC attaches to the tentorium cerebelli.[1,3]

Ossification of some dural partitions is commonly found in many nonhuman animals. This is rare in humans. Reports of ossification of the intracranial dural meninges are infrequent in medical literature.[4,5] Ossification is a rarely detected incidental finding during imaging studies and mostly has no clinical implications.[6] Some earlier accounts of this phenomenon were obscured by the use of the term *calcification*, a misnomer that has been perpetuated in many radiology textbooks.[7] Data regarding the incidence of falcine ossification (FO) in the Indian population are lacking, as only a limited number of case reports have been published within the Indian literature. However, certain epidemiological aspects of FO have been described in the international context.

Case Report

During the dissection of the cranium in a medico-legal autopsy case from India, localized ossification of the FC was observed. A 56-year-old woman with no history of any illnesses collapsed at home and was brought dead to the hospital. Coronary artery occlusion was identified as the cause of death. Upon dissection, ossification was observed in the anterior third of the FC, extending between its superior and inferior margins and measuring approximately 4.0 cm × 1.0 cm [Figure 1]. It was cut from the rest of the FC, and on its gross examination, the specimen appeared elongated with a mildly porous texture. It exhibited hard, white nodules on the surface. It did not break even on application of a moderate amount of pressure [Figure 2]. There was no evidence of compression of the associated dural venous sinuses. The brain was congested, and the cerebral vessels showed minimal atheromatous thickening. On further examination, no evidence of abnormal ossification was observed in other intracranial dural structures. On gross examination, no abdominal or thoracic organs showed ossification. As this was a medicolegal autopsy case and the finding was incidental and unrelated to the cause of death, histological evaluation was not performed. Based on the gross morphological features, the lesion was

How to cite this article: Asok A, Ajay B, Menon PA. Falcine ossification: An incidental finding during autopsy. J Anat Soc India 2026;75:S40-2.

Article Info

Received: 16 December 2025
Revised: 17 February 2026
Accepted: 18 February 2026
Available online: 13 April 2026

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Access this article online

Website: https://journals.lww.com/joai
DOI: 10.4103/jasi.jasi_197_25
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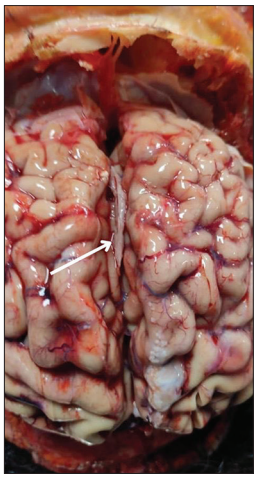

Figure 1: Ossified part of the falx cerebri at its anterior-third

Figure 2: Gross appearance of the ossified falx cerebri

consistent with ossification. However, the absence of histological confirmation is acknowledged as a limitation.

Discussion and Conclusion

FC is formed by multipotent mesenchymal cells, which are capable of undergoing osteogenic differentiation, which may be triggered by trauma, hemorrhage, irritation, or degeneration.[3,6] When the FC ossifies, it may give the impression of a "supernumerary" bone.[8]

In FC ossification, there is the formation of fatty central marrow cavity surrounded by dense cortical bone.[3,7] A 1974 paper observed that mineralization of the dura differs from that of the leptomeninges frequently found in the spinal cord. The former typically involves ossification, whereas the latter is usually a dystrophic type of calcification.[7] In contrast, a 2020 review article by Gonçalves *et al*. describes intracranial calcifications as simple calcium deposits that may occur physiologically or in association with pathological conditions, affecting the brain parenchyma, meninges, choroid plexus, and vessel walls.[9]

FO is rare in human beings, and when present, it is usually found to occur in small islands and commonly on its anterior portion.[6] This is consistent with the findings of our case. In a study of 3000 magnetic resonance (MR) images of the brain, Sands *et al*. could observe only small islands of FO in 12 (0.4%) cases.[10] Lee *et al*. have reported MR visualization of FO in only 0.7% patients.[11] In contrast to this rare incidence, in a 2006 study by Tsitouridis *et al*., 36 out of 40 cases who were examined for various reasons showed FO. Commonly, FO is confined to a single area, but in this study, four patients had FO in more than one location. The most common regions of ossification were the anterior part of the FC (27 cases), followed by the middle area (7 cases), whereas the least common ossifications were situated in the posterior part (2 cases).[3] Conversely, Tubbs *et al.* documented a case that deviated from the typical pattern, showing complete ossification of the FC in an adult male cadaver.[4]

There are literature reports of the association of FO with certain clinical conditions, such as hypertelorism, basal cell nevus syndrome, and myotonic dystrophy, and certain metabolic conditions such as hyperparathyroidism and Vitamin D intoxication.[4,12,13] Furthermore, few neoplastic conditions, such as leukemic infiltration, giant cell tumor, dural metastases, and falcine osteosarcoma, may simulate FO.[4,12,13] However, the deceased in our case had no documented medical history or postmortem findings indicative of the aforementioned disorders.

Although there is limited evidence of direct clinical impact, an ossified FC may hinder brain tissue displacement during unilateral increases in intracranial pressure, such as those seen in various types of herniation.[5] Furthermore, since FC forms walls for major dural venous sinuses and facilitates neurovascular connections, its ossification can obstruct the superior sagittal sinus, impeding cerebrospinal fluid flow and elevating intracranial pressure, potentially leading to fatal outcomes.[3,5]

In the present case, FO was identified incidentally during a medico-legal autopsy, whereas most previously reported cases have been observed during radiological investigations or gross anatomical dissection courses. In this instance, FC was the only dural structure exhibiting ossification. Isolated ossification of the cranial dura mater may occur with or without associated brain pathology.[14] This case contributes to the limited literature on FO, and it remains uncertain whether such findings represent a benign anatomical variant or are the outcome of an underlying pathological process.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that his name and initials will not be published and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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72nd Annual Conference of the Anatomical Society of India *"The Cadaveric Path to Medical Expertise"* Department of Anatomy, Darbhanga Medical College, Darbhanga, Bihar 13th–16th November, 2025

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DOI: 10.4103/jasi.jasi_80_26
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001. A Study on Ulnar Neuropathy in Eastern India

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Introduction: Ulnar neuropathy is a disorder mainly caused by localized compression or degeneration of the ulnar nerve, leading to weakness of hand muscles and altered sensation along the ulnar nerve territory. There is limited data regarding this relatively uncommon disease's detailed clinical features. This study aimed to document and analyze the detailed motor and sensory loss and apparent causes of ulnar neuropathy in Eastern India.

Methodology: The cross-sectional, observational study was conducted at AIIMS, Kalyani, from 2023 to 2024. All the patients presented with features suggestive of ulnar neuropathy at various departments (Orthopaedic, Medicine, PMR, and Neurophysiology lab) were approached, and the presenting features and clinical examination findings were recorded.

Statistical Analysis: The statistical analysis was done using Microsoft Excel and Omni Calculator software.

Results: The motor weakness involving the intrinsic hand muscles was predominant. The sensory loss was mostly seen in the fifth digit. A few cases of ulnar clawing were found.

Conclusion: This study might be helpful for primary care clinicians to diagnose and plan the management of this relatively unusual condition.

002. A Comparative Study on the Variation of Q Angle with Different Parameters in Young Population

Vishakha Shivaprasad Panickar, Anupam Baske, Snehasree Choudhury

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Introduction: The quadriceps angle (Q angle) is formed when the line connecting anterior superior iliac spine (ASIS) and midpoint of patella intersects with the line connecting tibial tubercle to midpoint of patella. Q angle is an important parameter to assess patellofemoral mechanics and is thus of great interest to clinicians.

Methodology: It is an observational comparative cross-sectional study. A total of 100 adult volunteers around 18-25 years age (25 asymptomatic male students, 25 asymptomatic female students, 25 symptomatic male students and 25 symptomatic female students) will be enrolled in this cross-sectional study. Each volunteer had its Height, Weight and Q angles will be measured. Q angle will be measured in all subjects bilaterally in both supine and standing position with the same goniometer. Comparison of Q angles and various parameters and groups will be studied and tabulated. Correlation between Age, Weight, Height and Q angles will be determined by Karl Pearson's correlation coefficient.

Results: Q angle is an important parameter to assess the quadriceps muscle's function and its effect on knee.

Statistical Analysis: Data will be analysed by available standard statistical software-jamovi 2.3.28-one way ANOVA.

Conclusion: The present study documents variations in the Q angle in young healthy adults. From the foregoing, we conclude that Q angles are higher in females than males and right and left Q angles are not equal in the same individual.

003. CBCT-based Cephalometric Assessment of Forward Head Posture in Patients with Temporomandibular Disorders

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Background of the Study: Forward Head Posture (FHP) is linked to temporomandibular disorders (TMD), affecting TMJ function and cervical spine alignment. Altered cranio-cervical angles may contribute to TMD by increasing joint stress. This study examines the relationship between FHP and TMD using cephalometric markers, CVT-OPT angle, CVT-RL, OPT-RL, and NSL-Od plane to assess postural changes and their impact on TMJ dysfunction.

Methodology: A cephalometric study was conducted on 60 participants (30 TMD patients, 30 controls) using cone beam computed tomography (CBCT). Key cranio-cervical parameters CVT-OPT angle, CVT-RL, OPT-RL, and NSL-Od plane were analysed, and independent t-tests were used for statistical comparison.

Results: Significant reductions were found in CVT-RL, OPT-RL, and NSL-Od plane in the TMD group ($P < 0.001$), indicating altered head and neck alignment. The CVT-OPT angle showed no significant difference ($P > 0.05$).

Discussion: Forward head posture (FHP) contributes to TMD by increasing cervical strain and altering TMJ loading. Reduced CVT-RL and OPT-RL suggest compensatory cervical changes, while altered NSL-Od plane reflects mandibular adaptations that may exacerbate joint stress.

Conclusion: FHP plays a key role in TMD pathophysiology. Identifying cranio-cervical misalignments through cephalometric analysis can aid in diagnosis and posture-based treatment strategies. Further research should explore postural interventions to improve TMD management.

004. Congenital Absence of the Trapezium, 1st Metacarpal, Thumb and Hypoplasia of Scaphoid: A Rare Case Report

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Background: Congenital anomalies of the hand are rare and often involve the thumb, which plays a critical role in prehension and function. The complete absence of the trapezium, first metacarpal, and thumb, accompanied by hypoplasia of the scaphoid, is exceptionally uncommon and sparsely documented.

Case Presentation: We report the case of a 25-year-old female who presented with a congenital deformity of the right hand. On clinical examination, she exhibited absence of the thumb, with only four fully formed digits. X-ray imaging confirmed the congenital absence of the trapezium and first metacarpal, with hypoplasia of the scaphoid. No associated syndromic or systemic anomalies were identified. The patient had adapted well functionally over the years.

Discussion: Congenital absence of thumb and carpal bones may result from disruptions in embryonic limb development during the fifth to eighth weeks of gestation. This condition may be isolated or part of a syndrome. This case underscores the significance of anatomical assessment in such patients to plan for rehabilitation or surgical intervention.

Conclusion: Early diagnosis and multidisciplinary evaluation are key for management of rare congenital hand deformities. This case contributes to the limited literature on isolated congenital absence of multiple hand bones and emphasizes the adaptive potential of the human body.

005. Active Learning in Anatomy: A Flipped Classroom Approach

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Introduction: Anatomy is one of the fundamental subject of medical science; so more energy needs to be laid for better understanding of the subject. A flipped classroom is a teaching learning method where students are given the opportunity to learn about the subject matter at home before working through it in class. It is a learner centric teaching model fostering significant learning experience.

Aims and Objectives: To compare the active learning & to assess the perception of students regarding flipped classroom.

Methodology: A Comparative study which had been done on 1st year 100 MBBS students of SBMC, Hazaribag. They are randomely divided into two groups (A & B) of 50 students each. Four competencies of equal weightage of Anatomy had been selected by faculty of Anatomy department. First two competencies had taught by traditional lectures to Gr. A and rest two by flipped classroom to Gr. B. Evaluation of active learning has done by MCQs test after both teaching learning methodology. Assessment of perception of flipped classroom has done by feedback questionnaire.

Results: The mean value of the academic scores of the tests conducted was higher after flipped classroom session compared to traditional lectures with a significant $P < 0.001$. Analysis of perception via feedback questionnaire revealed that the flipped class had advantage in terms of better student involvement, understanding & learning.

Statistical Analysis: Comparison of academic scores between two groups was done by calculating mean, SD and *P* value. Perception of students regarding flipped classroom was assessed through a qualitative method via a pre validated questionnaire on a Likart scale. SPSS software version 29.0 was used to analyse data.

Conclusion: Flipped classroom can be an effective learner centered teaching strategy and can be implemented for Medical colleges.

006. Study of Lip Print in Population of West Champaran

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Background: Cheiloscopy, the study of lip prints, is a growing field in forensic science used for personal identification and gender determination. Lip prints are unique and remain

unchanged throughout life, making them an effective biometric tool, especially in scenarios where fingerprints are unavailable.

Aim: To analyse and classify lip print patterns in the population of West Champaran and evaluate the presence of sexual dimorphism.

Materials and Methods: A cross-sectional observational study was conducted on 100 individuals (50 males and 50 females) aged between 18-40 years. Lip prints were obtained using lipstick and cellophane tape, transferred onto white bond paper, and analysed using Tsuchihashi' s classification. The central 10 mm of the lip was studied. Statistical analysis was done using the chi-square test, with $P < 0.05$ considered significant.

Results: Type I lip pattern was predominantly seen in females, whereas Type III was more frequent in males. The gender-based distribution of lip print patterns showed statistically significant differences, confirming the presence of sexual dimorphism.

Conclusion: Lip prints are a reliable, non-invasive tool for personal and gender identification in forensic investigations. This study provides foundational data for the West Champaran population and supports the broader application of cheiloscopy.

007. Double Trouble: Persistent Left Superior Vena Cava with Arch of Hemiazygos Vein – A Rare Case Report

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Introduction: Persistent left superior vena cava (PLSVC) results in double superior vena cava which is congenital central venous anomaly seen in ~0.3-0.5% of the general population. It drains into right atrium in 90% of the cases through its opening in coronary sinus. It may also open into left atrium directly or through pulmonary vein resulting in right to left shunt and thus lead to significant hemodynamic consequences.

Methodology: During routine undergraduate MBBS dissection, we noticed left sided superior vena cava arising from union of left internal jugular and left subclavian vein terminating through its opening in coronary sinus. It also received hemiazygos arch formed by union of superior hemiazygos vein and left superior intercostal vein.

Results: Right side superior vena cava having length of 89.3 mm was normal in its formation, course and termination. The caliber of PLSVC was lesser than right superior vena cava but it measured 109.5 mm, it was descending lateral to arch of aorta to open in left end of coronary sinus. Coronary sinus was dilated at its opening with PLSVC having external diameter of 13.5 mm. PLSVC also showed opening of arched venous channel passing over aorta from left side.

Conclusion: Although PLSVC may be asymptomatic, in some patients PLSVC presents as atrial fibrillation, arrythmias or with nonspecific cardiac symptoms. Prior knowledge about such variations is essential in all the interventional procedures on right atrium through the left subclavian approach and before the placement of central venous access devices.

008. MRI Study of the Relationship between Intervertebral Disc and Nerve Root in the Intervertebral Foramen of the Lumbar Spine

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Introduction: The intervertebral foramen is the exit pathway for lumbar spinal nerve roots and lies in close relation to the intervertebral disc. Variations in their spatial relationship across lumbar levels can influence clinical presentation, diagnosis, and surgical planning. Magnetic resonance imaging (MRI) offers high-resolution, non-invasive visualization of these anatomical details.

Methods: An observational study was conducted on 50 lumbar spine MRI scans (500 intervertebral foramina) in the sagittal plane, without pathology affecting foraminal anatomy. Images were retrieved from the PACS. The position and shape of the nerve root, along with the central and posterior disc heights, were recorded and analyzed by sex and age groups.

Results: The nerve root was most frequently located posterior and proximal to the intervertebral disc. Posterior disc height (Right): males: 7.7 ± 1.9 mm; females: 7.4 ± 1.9 mm, Posterior disc height (Left): males: 7.5 ± 1.7 mm; females: 7.4 ± 1.6. Mean central disc height was 10.5 ± 2.9 mm (range: 3.8-21.7 mm), highest at L4–L5 (12.0 ± 2.7 mm) and lowest at L1–L2 (8.4 ± 2.0 mm) ($P = 0.001$).No significant gender differences were found, though central disc height varied significantly with age.

Statistical Analysis: Data were analyzed using Stata 14 and expressed as mean ± SD, median (min–max), or frequency (%). Paired t-test/Wilcoxon signed-rank test, one-way ANOVA, Spearman's rank and chi-square/Fisher's exact test were applied.

Conclusion: This study provides normative morphometric data on lumbar disc and nerve root relationships, useful for surgical planning and understanding degenerative or compressive pathologies.

009. Anatomical Variations of the Suprascapular Notch in Adult Human Scapulae: A Morphometric and Morphological Study

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Background: The suprascapular notch (SSN), located on the superior border of the scapula near the base of the coracoid process, serves as a passage for the suprascapular nerve. Morphological variations of the SSN influence the risk of suprascapular nerve entrapment. Understanding SSN anatomy is crucial for anatomists, orthopedic surgeons, and anthropologists.

Materials and Methods: Fifty adult dry human scapulae (25 right, 25 left) of unknown sex were examined. The presence or absence of the SSN, its morphological classification according to the Rengachary system (Types I–VI), and linear dimensions (maximum width and depth) were recorded using digital Vernier calipers. Side differences and type distribution were analyzed. All results presented are hypothetical placeholders.

Results: Hypothetical data: The SSN was present in 96% of scapulae. Type III was most common (22%), followed by Type II (18%), Type IV (4%), Type I (14%), Type V (2%), and Type VI (2%). Mean width was 8.2 ± 1.5 mm; mean depth 5.6 ± 1.1 mm. No statistically significant side differences were observed.

Conclusion: The SSN shows marked morphological variation in adults. Knowledge of its types and morphometry can aid in clinical diagnosis, surgical approaches to the shoulder, and prevention of iatrogenic injury to the suprascapular nerve.

010. High Division of the Axillary Nerve before Entering the Quadrangular Space: A Cadaveric Observation

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Introduction: The axillary nerve (C5-C6) is a branch of the posterior cord of the brachial plexus, typically dividing into anterior and posterior branches after passing through the quadrangular space and gives muscular, articular and cutaneous branches. The nerve is affected mostly during the various surgical procedures of the shoulder joint and contribute about 6% of brachial plexus injury. All these iatrogenic injuries occur because of lack knowledge of anatomical variations of the nerve, therefor it is essential to know the possible variations.

Materials and Methods: This study was carried out on 30 cadaveric specimens including both right and left sides were dissected as per standard dissection methods to find the origin, course, branches, distribution & exact location of the nerve beneath the deltoid muscle from important landmarks like from department of Anatomy, Dr. N. D. Desai Medical College & research centre, Nadiad.

Results: The axillary nerve originates from posterior cord of brachial plexus from all the cadaveric specimens and enter the quadrangular space descending infer-laterally on the anterior surface of subscapularis muscle. In this specimen the nerve divides into anterior and posterior branches before entering the Quadrangular space. It is important for clinicians, anaesthetists and orthopaedic surgeons to know this kind of variations during surgical exploration of neck, axilla and upper arm, fracture of surgical neck of humerus.

011. Morphological Variation of Measurement of Proximal End of Femur

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Objective: In this study, we evaluate the normal range of length of anterior and posterior aspect of neck, diameter of head and neck of femur, cross-section area and angle neck shaft in north Bihar population.

Methodology:

- We used dry adult femur in this department study sample
- Vernier calliper and goniometer used for as the parameter
- Result were analysed by using statical software.

Results: In the present study, measurement of different parameter at the proximal end of femur after statical analysis are:-

Neck shaft angle - 125 degree
Neck length - 29.6 mm anteriorly
31.8 mm posteriorly
Diameter of neck - 23.5 mm
Cross-sectional area - 435.25 mm.

Discussion: The proximal end of femur is the subject of much attention for orthopedic surgeons and the main aim of this operation is to remove pathology and restore anatomy as far as possible.

Conclusion: The output of the study might be helpful for dimension and design of implant at proximal end of femur (Hip replacement therapy) of north bihar population.

012. Anatomical Variation Seen in Median Nerve: A Case Report

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Background: Median nerve is one of the terminal branch of brachial plexus which is formed by union of two roots; lateral root and median root coming from lateral and medial cord, respectively.

Objective: To provide additional information about formation of median nerve to surgeons to avoid injury during surgical procedures of the region.

Methodology: Adult male cadaver given to U. G. students for routine dissection class. We had dissected around both axillary region to observe the brachial plexus and nerve roots of median nerve, in the department of Anatomy, Darbhanga Medical College, Bihar.

Results: We observed that the median nerve in the right axillary region of adult male cadaver was formed by the three roots, of these three roots two were from the lateral cord and one was from the medial cord of the brachial plexus. No any variation was found in the median nerve in the left axillary region.

Discussion: The median nerve normally formed the union of two roots of brachial plexus but we found that the additional root taking part in formation of median nerve The anomalous origin of median nerve may lead to confusion in surgical procedure and nerve block anaesthesia.

Conclusion: The knowledge of anatomical variation in median nerve is important for medical practitioner in dealing with surgery around axilla and arm region in col to prevent post-operative complications.

013. Vitamin D Deficiency in CNMP and Its Morphological Degenerative Changes in Bone

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Introduction: Vitamin D plays a pivotal role in musculoskeletal health, influencing bone metabolism, neuromuscular function, and inflammatory regulation. Vitamin D insufficiency associated with CNMP (Chronic Non-Specific Musculoskeletal Pain) has a high prevalence of about 30-90% in the general population. The active form of vitamin D is 25(OH)D, low levels can result from various underlying conditions. It is important to evaluate vitD in serum & achieving optimal 25(OH)D levels for the management of CNMP.

Aim: To determine Vit D deficiency in CNMP patients and to evaluate the morphological degenerative changes in Bone.

Materials and Methods: Present study is conducted in SIMS, Hyd. TS, India. 30 patients 17F and 13M with CNMP, were included in study after taking informed consent & examined by collecting blood samples and X-ray's for scoring osteopenia, osteoporosis in bone. OMPQ Questionnaire & VAS score has been used to evaluated the pain intensity. The other parameters taken are Demographic variables, Biochemical & CBP. Inclusion criteria: >18 yrs of Age, CNMP patients, both gender. Exclusion Criteria: <18 yrs Age, pregnant woman, Recent surgery, Patients with Gout, Rheumatoid arthritis.

Results: The mean & standard deviation has been calculated using Microsoft Excel and Jamovi 2.3.28 software, obtained results of 25(OH)D in ng/ml are 12.2 + 5.5 Deficient, 24.7 + 1.1 Insufficient, 67.3 + 23.7 Sufficient and none were toxic among CNMP patients.

Conclusion: A multidisciplinary approach, incorporating biochemical, clinical, and imaging data, is essential for optimal management.

014. Bilateral Bifurcation of Right Third and Left Fourth Ribs and Their Costal Cartilages

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Introduction: Thorax is supported by a skeletal framework. There are 12 pairs of ribs which articulates with their costal cartilages to sternum anteriorly and articulates with thoracic vertebra posteriorly. The intercostal spaces contain intercostal muscles, nerves and vessels.

Case Presentation: During routine dissection class of UG medical students in Anatomy Department at Darbhanga Medical College, Darbhanga in October 2023 we found bilateral variation in attachment of right third and left fourth ribs and their costal cartilages at sternal end. The bifurcation was at their costochondral junction enclosing a small oval circular intercostal space covered with fascia and muscle.

Results: In the present case the distance of bifurcation from lateral margin of sternum was 2.4 cm towards right side and 2.1 towards left side.

Conclusion: Knowledge of this anatomical variation is of utmost important to surgeons performing thoracic surgeries. Studies shows that the bifurcation is usually associated with genetic syndromes as GORLIN GONZ SYNDROME. It is usually asymptomatic.

015. Ossification of Stylohyoid Complex: A Case Report

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Introduction: The stylohyoid complex is composed of styloid process of temporal bone, the stylohyoid ligament and lesser horn of hyoid bone. Stylohyoid ligament is a fibrous remnant of the Reichert's cartilage. Ossification of the Stylohyoid ligament can lead to various symptoms due to its proximity to vital structures like carotid artery and cranial nerves. Therefore, it is worth to have a precise knowledge of normal anatomy and its variations for analyzing the possible effects of an ossified Stylohyoid complex.

Case Report: During routine osteology classes for undergraduate students in the Department of Anatomy, the styloid process of one of the skulls, was observed to be elongated bilaterally due to ossification of Stylohyoid ligament.

Conclusion: Elongation and ossification of the Stylohyoid ligament is often a benign accidental finding, but it can lead to wide array of symptoms that can significantly impact a patient's quality of life. A thorough understanding of the clinical implications, diagnostic modalities and management options is crucial for healthcare professionals to effectively diagnose and manage this condition.

016. Imaging Study of Anatomical Variations of the Gallbladder and Bile Ducts: A Retrospective Cross Sectional Analysis

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Background: Anatomical variations of the gallbladder and bile ducts are important because of their implications in diagnostic imaging and hepatobiliary surgery. Preoperative recognition of these variants using magnetic resonance cholangiopancreatography (MRCP) is essential for preventing iatrogenic injuries and for improving surgical safety.

Methods: A retrospective cross-sectional analysis of 120 MRCP studies performed between January 2023 and December 2024 was conducted. Gallbladder morphology, cystic duct insertions, intrahepatic bile duct branching patterns and common bile duct (CBD) diameters were reviewed. Frequencies of anatomical variations were analysed. For statistical Purposes *P* value less than 0.05 was taken as statistically significant.

Results: In this retrospective analysis of 120 MRCP studies, the most common gallbladder morphology was pear-shaped (50.0%), followed by cylindrical (27.5%), hourglass-shaped (12.5%), and other forms (10.0%). External variants included Phrygian cap (10.8%) and Hartmann's pouch (6.7%), while the majority (82.5%) showed no external variation. Cystic duct anatomy was typical in 54.2% of patients, with high insertion (18.3%), low insertion (15.8%), medial insertion (4.2%), and other variants (7.5%) also identified. Intrahepatic bile duct branching demonstrated Type A1 in 45.0%, Type A2 in 26.7%, Type A3 in 15.0%, Type A4 in 5.0%, and Type A5 in 8.3%, accounting for all cases. The mean common bile duct (CBD) diameter was 4.6 ± 1.3 mm (range, 1.8-7.9 mm), and 95.8% had a normal caliber (<7 mm). A significant positive correlation was observed between age and CBD diameter (R = 0.34, p < 0.001).

Conclusion: Anatomical variations of the gallbladder and bile ducts were common in this population, although slightly less prevalent than previously reported. These findings underscore the importance of careful preoperative MRCP assessment to enhance diagnostic accuracy, surgical planning, and prevention of biliary injury.

017. Origin of the Buccal Branch of Facial Nerve and Anastomosis of the Facial Nerve Branches

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Introduction: In parotid surgery, the extratemporal course of the Facial Nerve (FN) is very variable. Familiarity with these variations in the branching patterns is extremely crucial in successful dissection and preservation of the nerve. The present study aimed to describe the origin of the buccal branch of facial nerve and anastomosis of the facial nerve branches.

Methodology: A total of 20 facial nerves were dissected from 10 cadavers (bilateral) in ANATOMY department at DARBHANGA MEDICAL COLLEGE. Out of these 10 cases, 8 were males and 2 were females. Ten (50%) were left and 10 (50%) were right facial nerves. Photographs of intra-parotid distribution of each facial nerve were taken during dissection.

Results: In 80% of the cases (16/20), the buccal branch originated mainly from the lower division. Anastomotic connections were present between the buccal nerve and lower division in 35% of the cases (7/20), between the upper and lower divisions in 35% of the subjects (7/20), between the main trunk & lower division in 10% of the cases (2/20), and no anastomotic connections were found between the buccal branch & the upper division.

Conclusion: Majority of the buccal branches originated from the cervicofacial division and most of the anastomotic interconnections were identified between the lower and upper division. Anatomical variations in the origin and anastomosis can shed more light on the different consequences of facial paralysis that may encounter after parotid field surgery.

018. An Anatomical Study on Morphometry, Anatomical Variations and Applied Importance of Sacral Hiatus in the State of West Bengal

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Introduction: Sacral hiatus is the opening present at the posterior aspect of lower end of sacral canal. It is formed due to non-fusion of laminae of fifth sacral vertebrae. Caudal epidural anaesthesia is accessed through sacral hiatus but anatomical variations of sacral hiatus can result

in problems. Present study was undertaken to find out the anatomical variations of sacral hiatus which could help anaesthesiologists in the clinical field.

Methodology: A cross sectional, observational, osteological study was performed on 100 (final sample size 87) dry, adult, human sacra of West Bengal state. Various parameters were studied-shape of sacral hiatus, level of apex of sacral hiatus, level of base of sacral hiatus, length of sacral hiatus, anteroposterior depth of sacral hiatus, transverse width of sacral hiatus etc. All measurements were taken using Vernier calipers of 0.2 mm accuracy.

Results and Statistical Analysis: Sacral hiatus was most commonly inverted U shape (51.7%). Most frequently level of apex of sacral hiatus was located opposite S4 body (46%) and base of sacral hiatus was typically located opposite S5 body (92%). Length of sacral hiatus had a mean of 2.36 cm and standard deviation of 0.93 cm. Mean of anteroposterior diameter of sacral hiatus was 0.65 cm and standard deviation was 0.22 cm. Transverse width of sacral hiatus had a mean of 1.49 cm and standard deviation of 0.30 cm.

Conclusion: Inverted U shape of sacral hiatus which is most common in our study, makes caudal epidural anaesthesia easier. Knowledge of anatomical variations of sacral hiatus improves success rate of caudal epidural anaesthesia and helps in avoiding complications.

019. A Case Report Comparison of Presrence of Nutrient Foramen in Dried Tibia of Right Left Leg and Clinical Importance

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Background: The nutrient foramen is vital anatomical feature in long bone, including the tibia, serving as the primary conduct for the vascular supply to the bone. Variations in location and characteristics of nutrient foramina may have significant implication in clinical settings, particularly in orthopaedic procedures.

Materials and Methods: During routine demonstration and examination of dried tibia right and left in anatomy department of Anatomy Darbhanga medical college Laheriasarai Darbhanga Two human dried tibia bone were examined for the presence, location and size of nutrient foramina. Measurement were taken from both bone, and compression was performed to identify any asymmetrical feature. Official permission was obtained from department of anatomy Anatomy DMCH Laheriasari Darbhanga.

Case Report: A human dried tibia of undetermined age sex was subjected to detailed. During the examination, we found in nutrient foramen in tibia. Absent nutrient foramen in right tibia.

Conclusion: The finding of this study highlight the significance of understanding the anatomy of nutrient foramina in both tibia. Further research with large sample size is recommended to elucidate variation across different populations facilitating enhanced surgical planning and patient beneficial.

020. Proposed Anatomical Redefinition of the Gluteal Intramuscular Injection Safe Zone: A Morphometric and Geometric Model to Avoid Sciatic Nerve Injury

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Introduction: The sciatic nerve (SN), formed by tibial (TN) and common peroneal nerve (CPN), shows frequent variations in bifurcation level and its relation to the piriformis muscle (PM). These variants increase the risk of iatrogenic injury during hip procedures, nerve block failures, and complications such as piriformis syndrome. Despite widespread reliance on the dorsogluteal upper outer quadrant (UOQ) for intramuscular (IM) injections, evidence suggests it does not reliably avoid the SN.

Materials and Methods: Fifty-eight lower limbs from 29 formalin-fixed cadavers were dissected. SN–PM relationships were classified according to Beaton and Anson, and bifurcation levels of SN were recorded. Morphometric and geometric mapping relative to fixed bony landmarks—posterior superior iliac spine (PSIS), greater trochanter (GT), and ischial tuberosity (IT) was performed to propose a reproducible safe zone for gluteal IM injections.

Results: The typical SN–PM relationship (type I) was seen in 74.2% of limbs. Variations were more frequent in males, with bifurcation occurring at the mid-thigh in 44.8%, proximally in 29.3%, and distally in 25.9% of specimens. These anatomical variants positioned the SN medial and inferior to the GT. Geometric triangulation identified a novel safe zone: a superolateral region bounded by vectors from the PSIS to the GT and extending superior-laterally beyond the traditional UOQ.

Conclusion: The proposed morphometric, geometry-based redefinition of the gluteal IM injection site provides reproducible and anatomically validated safer zone alternative to the traditional UOQ. Adoption of this model may reduce iatrogenic SN injury across all observed variation patterns and enhance safety in clinical practice.

021. Morphological Diversity of Renal Arteries: Insights from Cadaveric Dissection

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Introduction: Renal arteries are lateral branches of the

abdominal aorta at the level of L1 and L2 level. The renal artery branching pattern and morphology variates in terms of number of branches and its origin. Knowledge of the renal artery variation and its identification in the pre-surgical stage eliminate many vascular related complications.

Objectives: This cross-sectional observational study was conducted to identify the morphological variation in the renal artery morphology; and determine the incidence of double renal artery, triple renal artery, superior and inferior polar artery.

Materials and Methods: This study was conducted after approval from institutional ethical committee. 50 (35 males and 15 female) formalin fixed cadavers were dissected in the Anatomy department of two medical colleges of Rajkot from 2015 to 2022 during routine undergraduate and postgraduate abdominal dissection schedule. Renal arteries were dissected and explored meticulously to study the morphological variation. Arteries originating from the abdominal aorta and supplying the kidney were defined as renal artery. Artery originating from the renal artery before hilum and supplying the kidney were defined as prehilar artery. Numerical variation in renal artery was identified, noted and analyzed by statistical formulas. In this study the classification of Sampion and Passos was followed: Hilar renal artery entering the hilum, superior polar renal artery entering the upper pole of the kidney and inferior renal artery entering the inferior pole of the kidney.

Results: 49% (49 out of 100 kidneys) were with single renal artery and 51% (51 out of 100 kidneys) were with more than one renal arteries and variations.

Conclusion: Renal artery morphological variations are common and may play a critical role in clinical conditions.

022. Bilateral Triple-Headed Gastrocnemius with Fabella: A Rare Anatomical Variation with Clinical Implications

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Introduction: Anatomical variations of the gastrocnemius muscle, though rare, can have significant clinical implications, particularly when associated with sesamoid bones such as the fabella. These variations may contribute to neurovascular entrapment syndromes in the popliteal fossa. During routine undergraduate MBBS teaching dissections, we encountered a unique case of bilateral triple-headed gastrocnemius muscles with fabellae embedded in the lateral heads, raising concerns regarding potential nerve entrapment.

Methodology: A formalin-fixed male cadaver, approximately 68 years old, was dissected during lower limb anatomy teaching. The posterior compartments of both legs were meticulously examined. The origin, insertion, and morphology of the muscles were recorded. The dimensions of the fabellae were measured, and their relationships with surrounding neurovascular structures were documented.

Results: Both lower limbs had an additional third head of the gastrocnemius, distinct from the medial and lateral heads, merging distally with the Achilles tendon. Fabellae were present bilaterally within the lateral most heads. The common peroneal nerve was found in close proximity to the fabella and adjacent muscle fibers, suggesting a potential site for compression. No gross signs of nerve thickening or degeneration were observed.

Conclusion: This rare bilateral variation of the gastrocnemius muscle with fabella highlights the importance of recognizing anatomical anomalies, particularly in clinical contexts involving posterior knee pain or suspected nerve entrapment. Such awareness is essential for anatomists, radiologists, orthopedic surgeons, and neurologists to ensure accurate diagnosis and management.

023. Osteogenic Potential of Bone Callus: A Cross-sectional Study on Microscopic Structure and Healing stages

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Background: Bone callus, regulated by bone cells, immune cells, cytokines and osteo-inductive factors is vital for fracture healing. Evidence on its role in elderly across bone parts and age groups is limited. This study aim to analyse the microscopic structure of bone callus, with emphasis on bone cells, intercellular matrix, and immune cells at different periods of reporting to OPD.

Methods: This cross-sectional observational study conducted in the Departments of Anatomy and Orthopaedics at AIIMS Rajkot (Ethical approval: D/NF/57/2024) included 50 study participants selected by random sampling method. Patients > 18 years undergoing open reduction and internal fixation, and revision surgeries were included, excluded were patient with infection, tumours, systemic diseases, or steroids, vitamin D/calcium therapy. Bone callus samples were collected intraoperatively, processed by routine histological methods and analysis using ImageJ software.

Results: Preliminary evaluation of ten samples comprised of 06 which were obtained within 3 months, 02 between 3-9 months and remaining 02 after 9 months of fracture. Early stage callus demonstrated significantly higher osteoblast counts (350+/-15/mm) and well organised trabecular bone and marrow spaces, while middle and late-stage callus showed fewer osteoblasts with irregular trabecular morphology.

Statistical Analysis: Data were expressed as mean +/- standard deviation and analysed in SPSS v16.0 9IBM, Chicago, USA). Radiographic and histologic parameters

were compared using one way ANOVA with LSD *post hoc* test ($P < 0.05$ significant).

Conclusion: Early-stages callus exhibited greater osteogenic potential than the later stages, suggesting its promising role as an alternative bone graft source.

024. A Study on Bifurcation of Sciatic Nerve into Tibial Nerve and Common Peroneal Nerve and Its Clinical Importance

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Introduction: The sciatic nerve (SN) is the thickest and longest nerve in the human body, originating from the lumbosacral plexus (L4-S3). The SN typically divides into the tibial nerve (TN) and common peroneal (fibular) nerve (CPN) at the apex of the popliteal fossa, although variations in the level of bifurcation are common. Understanding the variations in the division of the SN is crucial to prevent iatrogenic injuries during surgeries, nerve blocks, and diagnosis of neuropathies.

Materials and Methods: Total 50 adult lower limbs were divided into total six groups (A to F) according to the level of bifurcation of Sciatic Nerve in the Department of Anatomy, RIMS, Ranchi.

Results: No cases observed for bifurcation in the pelvic region (Gr. A), 6% cases found in gluteal region (Gr. B), 16% cases in upper part of the posterior compartment of thigh (Gr. C), 10% cases in the middle part of the posterior compartment of thigh (Gr. D), 48% cases in lower part of the posterior compartment of thigh (Gr. E), 20% cases of bifurcation observed in popliteal fossa (Gr. F).

Statistical Analysis: Chi Square values show significant difference among the level of bifurcation between Male and Female Specimen.

Conclusion: These variations of sciatic nerve have clinical implications regarding intramuscular injections, popliteal block, sciatic nerve block, hip surgery and neurology.

025. Anatomical Variation of Coeliac Trunk: A Computed Tomographic Study in Patients Attending North Bengal Medical College and Hospital

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Background: The coeliac trunk is the major arterial supply to upper abdominal organs. In humans, it arises from the aorta at Thoracic vertebra 12 (T12). Anatomical variations of the branches are important to know for planning any surgical procedures. As the classical branching is not universally present in all, failure to identify the variations may result in inadvertent vascular injury, ischemia, or suboptimal surgical outcomes.

Aims and Objective: To find out the variations in the origin of coeliac trunk in relation to vertebrae at their level of origin among patients attending North Bengal Medical College, West Bengal.

Materials and Methods: A descriptive cross-sectional study was done on Computed Tomography abdomen of 112 patients within a period of 10 months. To determine the level of origin of coeliac trunk, the vertebra was divided into four types (Type I to IV) depending on the level of origin in relation to intervertebral disc, upper 1/3rd, middle 1/3rd and lower 1/3rd of body of corresponding vertebra.

Results: The most common origin of Coeliac Trunk was found at the level of T12 vertebra-Type IV (s55%) and the least common origin from L2 Type II (2%).Variation in the level of origin have significant correlation to vertebra.

Conclusion: The Coeliac trunk had shown variations in its level of origin and has significant correlation to vertebra (T12-L2). This knowledge can be helpful to the clinicians and surgeons while planning treatment of abdominal organs, thus enhance patient's safety and operative complications may reduce.

026. Objective Structured Viva versus Traditional Viva in Anatomy: A Comparative Study of Assessment Efficiency in Eastern India

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Introduction: Traditional viva examinations (TVE) are widely used in Medical Education but often criticized for subjectivity and variability. Objective Structured Viva Examinations (OSVE), by contrast, offer a standardized format aimed at improving reliability, objectivity, and fairness. This study compared OSVE and TVE as assessment tools for first-phase MBBS students in Anatomy in Eastern India. Objectives included evaluating academic performance and analysing perceptions of students and faculty.

Methodology: A crossover educational interventional study was conducted on 108 first-year MBBS students of a medical college in West Bengal. Students were divided into two groups (A and B), each group (n = 54) undergoing both TVE and OSVE for two anatomical systems (Gastrointestinal and Genitourinary) in a crossover design. Academic scores were analysed using paired t-tests and ANOVA. Perceptions of students (n = 108) and faculty (n = 7) were collected by using a validated modified questionnaire on 5-point Likert scale and analysed descriptively and inferentially.

Results and Statistical Analysis: OSVE yielded significantly higher scores than TVE in both groups (Group A: t = 5.20, p<0.05; Group B: t = 2.87, p<0.05). ANOVA showed significant differences in assessment methods (F = 16.94, p<0.001). Tukey's *post-hoc* test confirmed superiority of OSVE. Student feedback showed high acceptance (mean scores >3.5), citing clarity, fairness, and depth. 71.6% of faculty strongly agreed on OSVE's systematic and unbiased nature.

Conclusion: Structured Viva Examination demonstrated superior academic outcomes, better student satisfaction, and strong faculty endorsement compared to traditional viva examination. The findings support structured viva as an efficient assessment method in Anatomy, with potential for broader institutional and university-level adoption.

027. Radiological Study for Determining a Better Parameter between Critical Shoulder Angle and Acromio-Glenoid Angle for Predicting Development of Glenohumeral Joint Osteoarthritis

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Introduction: Glenohumeral joint osteoarthritis (GHOA) is characterized by degenerative changes in articulating surfaces and accounts for an estimated 5-17% patients with shoulder complaints. Among many etiology, the quantitative individual anatomy of the scapula has been found to be associated with occurrence of degenerative shoulder diseases. In their landmark study, Moor *et al*. introduced the critical shoulder angle (CSA), a radiologic parameter which combines glenoid inclination and lateral extension of the acromion. CSA also quantifies the extent of acromial cover without being influenced by flattening of the humeral head which is typically found in GH OA. Miswan *et al*. described acromio-glenoid angle (AGA) to measure glenoid inclination in coronal plane from midpoint of glenoid fossa because the glenohumeral joint force is centered at the midglenoid point. Therefore, morphometric measurements of these angles are excellent predictive parameters to diagnose and predict progression of degenerative shoulder diseases. This study aimed to compare CSA and AGA in patients with and without primary GHOA.

Methodology: A total of 263 patients with a complaint of non-traumatic shoulder pain requiring radiological examination were enrolled in the study. The sample size was estimated at 263 participants based on a prevalence of 78%, 5% absolute precision, 95% confidence level, and finite population correction. The standardized true AP view of shoulder joint was utilized where the affected shoulder is rotated 30 degrees with arm in neutral position, elbow straight, the thumb pointing forward and placing the patient's scapula against a radiographic cassette. The radiographic images were obtained in DICOM format, and all measurements were performed in Radiant DICOM viewer software in 2D images. All the measurements were taken by 2 independent observers. Based on radiographic examination patients were divided into two groups – 1) with primary GHOA, 2) without any arthritic changes. Statistical analysis was performed using Pearson correlation to assess the relationship between CSA and AGA, while intra- and interobserver reliability was evaluated with intraclass correlation coefficients (ICC). A *P* value <0.05 was considered statistically significant.

Results and Statistical Analysis: In OA group, the mean CSA was 29.1 (±4.6) and AGA was 46.2 (±4.1). Pearson correlation analysis had shown significant correlation between AGA and CSA (r = 0.852, p<0.001). Intraobserver and interobserver reliability was high (Intraclass correlation coefficient ≥ 0.80) but decreased with increasing viewing angle.

Conclusion: There is a significant correlation between smaller CSA and AGA in patients with degenerative shoulder joint changes. The CSA and AGA both are equally effective predictive parameter for diagnosing GHOA.

028. Morphometric Evaluation of the Foramen Magnum and Variation in Its Shape and Size: A Study on Human Dried Skull

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The foramen magnum (FM), a crucial anatomical landmark at the cranial base, plays an essential role in neurosurgery, forensic science, and radiology due to its proximity to vital structures such as the medulla oblongata, vertebral arteries, and spinal accessory nerves. Variations in its dimensions and morphology are of both clinical and anthropological significance. The present study aimed to evaluate the morphometric characteristics and morphological variations of the foramen magnum using dried human skulls.

A total of 50 dried skulls of unknown age and sex were obtained from medical colleges in Bhopal and Tundla. Macroscopic examination was conducted to determine the shape of the foramen magnum, while anteroposterior (AP) and transverse diameters were measured using a digital vernier caliper. The foramen magnum area was calculated using Radinsky's formula, and the foramen magnum index (FMI) was derived.

The results showed that the mean AP and transverse diameters were 38.75 mm and 33.44 mm, respectively. The average foramen magnum area was 970.57 mm2, while the mean FMI was 87.68. Morphological assessment revealed considerable variability: round-shaped foramina were most common (22%), followed by irregular (18%), oval (16%), egg-shaped (16%), tetragonal (12%), pentagonal (8%), and

hexagonal (8%). In 4% of cases, occipital condyles were found to encroach into the foramen magnum, a variation with potential clinical implications.

The findings emphasize the importance of morphometric evaluation of the foramen magnum in neurosurgical approaches, particularly transcondylar procedures, as well as in forensic identification and anthropological studies. Despite limitations related to the absence of sex and age determination, the study contributes valuable baseline data for anatomical, clinical, and forensic applications.

029. Musculolocutaneous Nerve and It's Nerve Supply with Coracobrachialis Muscle: A Cross-sectional Study

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Introduction: The musculocutaneous nerve, a branch of the lateral cord of brachial plexus, usually pierces the coracobrachialis and descends between brachialis and biceps brachii muscles and after supplying them it continues as the lateral cutaneous nerve of the forearm.

Aim: To access the relationship of musculocutaneous nerve (or its branch) with coracobrachialis muscles.

Materials and Methods: Descriptive cross-sectional study of 40 dissected upper limbs was conducted in the department of Anatomy, RIMS, Imphal. The relationship of musculocutaneous nerve or its branch with coracobrachialis muscle was noted.

Results: The relationships between the musculocutaneous nerve and the coracobrachialis muscle were categorized into two types: Type I: Musculocutaneous nerve pierced the coracobrachialis muscle in 90% and Type II: Musculocutaneous nerve didn't pierce the muscle in 10%. There were 4 types of coracobrachialis innervation: Type I– Innervates after piercing the coracobrachialis in 70%; Type II– Innervating coracobrachialis before piercing in 20%; Type III– Musculocutaneous nerve did not pierce the muscle and innervated the muscle by a twig from the lateral cord in 7.5%, and Type IV– Absent musculocutaneous nerve, coracobrachialis innervated by a twig from the lateral cord in 2.5%.

Conclusion: Variations in course of the musculocutaneous nerve may impair its function or raise the risk of injury. Surgeons, clinicians and anatomists may find immense value from understanding the relation between the musculocutaneous nerve and the coracobrachialis muscles.

030. Dermatoglyphics in Primary Hypertensive Patents

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Dermatoglyphics is influenced by heredity and abnormality in it are associated with chromosomal anomalies. Primary hypertensionis polygenic and thescientific dermatoglyphic pattern analysis are rare, which could be used as a diagnostic and screening aid. The present study was done to study the frequency distribution of scientific ridge pattern in primary hypertensives. The study was carried out in 200 primary hypertensives with 200 normal controls. The hand imprinting was done using a slight modification of conventional ink flab method. Data were analysed using t test. The primary hyperrensive male and female had significantly high frequency of whorls and TFRC and decreased ulnar loops and "atd" angle in both hands. Dermatoglyphics can be considered as a simple, inexpensive aid for screening and diagnosing primary hypertension.

031. Congenital Absence of Spinous Process, Laminae, and Inferior Articular Processes in a Vertebra

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Introduction: The main function of the vertebral column is to transmit the weight and make the spine erect. Lower lumbar region is more prone for spinal injuries and disc degeneration. Any structural abnormality of vertebra lead to impairment in weight transmission and spinal deformities.

Materials and Methods: During the routine demonstration classes of first MBBS UG students we found one vertebra with incomplete formation of vertebral arch of unknown age and sex at department of Anatomy, NDDFMSR.

Conclusion: The vertebra has anomalies like spina bifida, hemi-vertebra and absence of the vertebral arch. In the present study the lumbar vertebra was absence of spine, laminae and inferior articular processes. The deficient area in the bone leads to lesser area for muscle attachment and cause weakness and backache.

032. Vasoactive Intestinal Peptide and GFAP Expression Patterns in the Myenteric Plexus: Insights into Ulcerative Colitis Pathophysiology

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Objective: Ulcerative colitis (UC), affecting 5 million globally in 2023, reduces life expectancy and raises colorectal cancer risk. Genetic, environmental factors, and immune dysregulation contribute, with diet and lifestyle changes driving its rise. Research into UC pathophysiology increasingly focuses on enteric neurons and glial cells. The study aims to analyze the morphology of vasoactive intestinal peptidergic neurons and enteric glia in UC.

Methods: Thirty human samples: 15 normal colonic tissues (Group 1) from Forensic Medicine, 15 UC tissues (Group 2) from Gastrointestinal Surgery, were stained with H&;E and immunohistochemistry (VIP, GFAP). Qualitative and quantitative assessment was done.

Results: In ulcerative colitis tissues, distinguishing gut layers was difficult compared to normal colonic tissue in H&;E stains. Goblet cell numbers were lower in UC. Histological analysis revealed inflammatory cell infiltration, cryptitis, and crypt abscesses. Surface epithelium showed infiltration with or without ulceration, along with hyperemia in the lamina propria and submucosa. Submucosal fibrosis and increased inflammatory cells were noted. Grade 3 UC tissues exhibited neuronal hyperplasia and myenteric ganglia vacuolization. The myenteric fraction was higher in UC. Immunostaining showed significantly increased VIP and GFAP expression in UC myenteric ganglia.

Conclusions: There is alteration of VIP and GFAP expression in myenteric neurons and glia, influencing pathogenesis in ulcerative colitis. This study suggests new therapeutic insights and diagnostic avenues for UC patients.

033. Bone Ends with Surgical Beginnings: Morphometric Study of the Distal Radius and Ulna with TFC complex

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Introduction: The distal radio-ulnar joint is the most unstable but crucial uniaxial pivot joint at wrist. Its instability arises from its unique morphology, but the triangular fibro-cartilage complex (TFCC), primary stabilizer, provides stability during wrist movements and guides forearm rotation. While carrying a load, the weight is first transmitted proximally through this joint, making it prone to injury. Previous study have reported the presence of an soft intra-articular meniscus within the joint cavity. The aim of this study to evaluate the surgically important structures, the distal radio-ulnar joint and TFCC, in a morphometric perspective to provide a clear intricate anatomical view to the reconstructive surgeons and Radiologist.

Materials and Methods: This study was carried out on 10 embalmed cadavers at R. G. Kar Medical College, Kolkata, examining both the right and left hands following Cunningham's Manual. Dissections followed the steps given in Cunningham's Manual and tabulated. 64 dry bone specimens (32 from the right and 32 from the left) were also studied. The findings were recorded.

Results: The wrist anatomy is largely symmetrical on both sides, the right side shows slightly longer measurements in some parameters (e.g., styloid process, TFCC Base), likely due to dominance related functional adaptions.

Conclusions: The data parameters of the study help to determine prosthetic selection in the demographic. The present study propose that the components of TFCC contributes to the subdivision of the radio-ulnar joint space but no prominent anatomical meniscus homologue.

034. Morphometric Analysis of the Human Foramen Magnum and Its Neurosurgical Importance

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Background: The foramen magnum (FM), situated at the skull base, serves as a vital conduit for the lower brainstem, meninges, and major blood vessels. Its morphometric variations hold significant importance in neurosurgical approaches to the craniovertebral junction, as well as in forensic anthropology for sex determination. Pre-operative knowledge of FM dimensions can assist surgeons in minimizing intraoperative risks.

Objectives: To measure key morphometric parameters of the FM, assess sexual dimorphism, and interpret the neurosurgical implications of observed variations.

Materials and Methods: A cross-sectional study was conducted on 100 dry adult human skulls (50 male, 50 female) from the Department of Anatomy, JLN Medical College, Ajmer. Sagittal and transverse diameters were measured using a digital Vernier caliper, and FM area was calculated using Radinsky and Teixeira formulae. Data were analyzed using SPSS software, with independent t-tests applied for sex comparison; p < 0.05 was considered statistically significant.

Results: Mean sagittal and transverse diameters were significantly greater in males (36.2 ± 2.1 mm; 29.5 ± 1.7 mm) than females (34.1 ± 1.8 mm; 27.9 ± 1.6 mm) (p < 0.001). FM area was larger in males (835 ± 46 mm²) compared to females (750 ± 41 mm²) (p < 0.001). The most common FM shape was oval (60%), followed by round (25%) and irregular (15%).

Conclusion: Significant sexual dimorphism exists in FM dimensions, underlining its utility in forensic sex estimation. From a neurosurgical perspective, awareness of FM morphometry is essential for selecting optimal surgical approaches to the craniovertebral junction and reducing operative complications.

035. Achondroplasia in a Newborn: A Rare Case Report

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Introduction: Achondroplasia is the most common skeletal dysplasia leading to short-limbed dwarfism. It is an autosomal dominant condition caused by a mutation in the

FGFR3 (Fibroblast Growth Factor Receptor 3) gene, which results in impaired endochondral ossification. Most cases are sporadic, arising from de novo mutations.

Case Presentation: We report the case of a term male neonate born to non-consanguineous parents via uncomplicated vaginal delivery. At birth, the baby exhibited characteristic features of achondroplasia, including rhizomelic limb shortening, frontal bossing, depressed nasal bridge, macrocephaly, and trident hands. Birth measurements showed a disproportionately short stature with a length of 42 cm, weight of 2.3 kg, and a head circumference of 36 cm. The newborn was hypotonic but otherwise stable. Radiographic examination revealed shortening of long bones with metaphyseal flaring, narrowing of interpedicular distances in the lumbar spine, and an enlarged cranial vault. Genetic testing confirmed a pathogenic mutation in the FGFR3 gene, consistent with a diagnosis of achondroplasia.

Management and Outcome: The newborn was managed conservatively with supportive care. A multidisciplinary team involving pediatrics, orthopedics, physiotherapy, and genetics was engaged. The parents received genetic counseling, and regular follow-up was planned to monitor growth, neurodevelopment, and potential complications such as hydrocephalus and sleep apnea.

Conclusion: This case highlights the importance of early clinical recognition of achondroplasia in the neonatal period. Timely diagnosis and a coordinated multidisciplinary approach are crucial for optimizing developmental outcomes and providing family support.

036. Bifid Posterior Arch of Atlas: A Rare Anatomical Variant – Case Report

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Introduction: The atlas (C1 vertebra), the first cervical vertebra, plays a vital role in the craniovertebral junction by supporting the skull and enabling extensive head and neck mobility. Unlike other cervical vertebrae, it exhibits a distinctive ring-shaped configuration and lacks a vertebral body. A bifid posterior arch of the atlas represents a developmental variation in which incomplete fusion or ossification of the posterior arch produces a cleft, resulting in two separate bony elements. This anomaly is believed to originate from disturbances in embryological development of the neural arch. Although frequently an incidental finding without clinical symptoms, it may complicate radiological interpretation and assume importance in situations involving cervical trauma, instability, or degenerative changes. The present case report documents this rare variation of the posterior arch of the atlas and discusses its anatomical and clinical relevance.

Case Report: During the routine osteology demonstration classes of cervical vertebrae for undergraduate medical students at the Department of Anatomy, Patna Medical College, Patna, Bihar, we found an atlas in which a bifid posterior arch was present.

Conclusion: A bifid posterior arch of the atlas represents an uncommon anatomical variation that carries important clinical implications, particularly in the context of cervical trauma and surgical procedures. Awareness of this anomaly is essential to ensure precise diagnosis and to minimize the risk of intraoperative or postoperative complications. The present case underscores the value of meticulous radiological assessment in detecting such variations and guiding appropriate clinical management.

037. Giant Lumbosacral Meningocele in a Child: A Rare Case Report

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Introduction: Meningocele is a rare form of neural tube defect resulting from defective closure of the spinal neural arch during embryogenesis. It is characterized by herniation of meninges through a vertebral defect, forming a cerebrospinal fluid (CSF)-filled sac. Large lumbosacral meningoceles are uncommon and can pose diagnostic and surgical challenges. Early recognition and intervention are crucial to prevent complications such as rupture, infection, or neurological deficits.

Case Report: We report a case of a child presenting with a progressively enlarging cystic swelling in the lumbosacral region since birth. Clinical examination revealed a giant, transilluminant, cystic mass covered with stretched skin. Neurological examination was unremarkable. MRI confirmed a CSF-filled sac without neural tissue, consistent with a diagnosis of lumbosacral meningocele.

Conclusion: This case highlights a rare presentation of giant lumbosacral meningocele. Although often asymptomatic, timely diagnosis and surgical management are essential to prevent complications and ensure favorable outcomes. Documentation of such cases enriches our understanding of congenital spinal anomalies and emphasizes the importance of preventive strategies such as periconceptional folic acid supplementation.

038. Precancerous Lesion of the Gall Bladder: A Microanatomical Study

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Introduction: Gallbladder cancer (GBC) is an aggressive malignancy with a particularly high incidence in Northern and Eastern India. Its poor prognosis is due to late detection,

making recognition of precursor lesions critical. The metaplasia–dysplasia–carcinoma sequence is the dominant carcinogenic pathway. This study analyzed the prevalence and histomorphological spectrum of precancerous lesions in cholecystectomy specimens.

Materials and Methods: The study included 100 patients with Ultrasonography-confirmed cholelithiasis who underwent cholecystectomy at Sir Sunderlal Hospital, BHU. Patients with metabolic and hepatic co-morbidities were excluded. Clinical and laboratory data were recorded. Gallbladder specimens were processed for Histopathological analysis. Statistical analysis was performed using SPSS, with p<0.05 considered significant.

Results: Out of 100 patients (62 females, 38 males), males showed significantly higher height, weight, and hemoglobin, whereas females had higher platelet counts (P = 0.045). Significant group differences were observed in BMI, hemoglobin, platelets, bilirubin, TB/DB ratio, total protein, urea, sodium, and chloride. ALKP levels increased progressively with cholelithiasis severity (p<0.001). Histologically, epithelial hyperplasia was the most frequent finding, characterized by mucosal thickening, nuclear stratification, hyperchromasia, and stromal lymphocytic infiltration. Intestinal metaplasia was identified by the replacement of gallbladder mucosa with tall columnar cells and goblet cells containing Mucin. Low-grade dysplasia showed nuclear pleomorphism, vesicular chromatin, and irregular nuclear margins, often arising in a background of metaplasia. Rare cases of carcinoma *in situ* were detected. Normal gallbladder epithelium demonstrated uniform columnar cells without atypia.

Conclusion: Routine histopathological evaluation of cholecystectomy specimens is crucial for early detection and prevention of gallbladder carcinoma.

039. Polycystic Kidney Disease

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Introduction: Renal cysts are fluid-filled cavities on the surface of the kidneys, which may be solitary or multiple. They may present as an incidental finding during routine radiological investigations for chronic renal failure, end-stage renal disease or due to associated abdominal symptoms.

Case Report: During routine cadaveric dissection at the Institute, multiple cysts were observed on the surface of the right kidney in a male cadaver. The cysts were carefully observed for gross appearance and on coronal section. The left kidney was normal in gross appearance. In one male cadaver, we found a polycystic kidney with dilatation of the renal pelvis externally on the right side. On coronal section, the cysts were greyish-white in colour, fluid was pale yellow and viscous in consistency. There were total 8 cysts appeared.

Discussion: One cases of ADPKD were reported by Bear RA, in 1974, unilateral ADPKD and agenesis of the opposite kidney. In family history, his father was suffering from polycystic kidney and later died due to hypertension and kidney failure. Levine E and Huntrakoon M, reported two cases using abdominal computerised tomography (CT) and proposed the term unilateral renal cystic disease (URCD) as a distinct disease entity from ADPKD.

Conclusion: In present case report, we found polycystic kidney with no other clinical condition. But thorough awareness and understanding of these variations is of paramount significance for surgeons for various surgeries.

040. A Cross Sectional Study of Anatomical Variation of Loop of Ansa Cervicalis in Relation to Superior Belly of Omohyoid Muscle in a Tertiary Medical College of West Bengal

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Introduction: Ansa cervicalis is a loop of nerves found in the anterior triangle of neck. It has two roots superior and inferior root. The knowledge of variation of ansa cervicalis is of great importance as it can affect the outcomes of various surgeries related to head and neck.

Materials and Methods: During routine neck dissection of 5 adult human cadavers (10 ansa cervicalis) at the Department of Anatomy, RG Kar Medical College, Kolkata, and topographical position were observed for loop of ansa cervicalis in relation to superior belly of omohyoid muscle. The data were presented as mean ± SD.

Results: Among 10 ansa cervicalis, 2 where observed to have the loop, deep to the superior belly of omohyoid and in remaining ansa cervicalis the loop was observed above the superior belly of omohyoid. The transverse distance between loop and superior belly of omohyoid muscle was found to be 3.18 ± 1.2 (cm); for the same for right sided ansa cervicalis was found to be 3.14 ± 1.33 (cm) and that of left was 3.22 ± 1.29 (cm).

Conclusion: Knowledge regarding variation of ansa cervicalis may be useful for better surgical outcomes and minimizing the complications in neck surgeries.

041. Extensor Indicis Et Medius: A Case Study

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Introduction: Extensor indicis is a slender muscle that originates from the ulna's posterior surface, distal to the extensor pollicis longus and the surrounding interosseous membrane. It joins the ulnar side of the tendon of the extensor digitorum for the index finger. The extensor indicis

is known to have frequent anatomical variants, including split tendons and tendon arrangement. These kinds of variations are often noticed during hand surgeries or routine cadaver dissections. One of the most frequent tendon transfers of the upper extremities is the extensor indicis to extensor pollicis longus.

Materials and Methods: During routine dissection at the Department of Anatomy, Regional Institute of Medical Sciences, Imphal, Manipur, the extensor indices of the right hand of a male cadaver of unknown age had a bifurcated belly with two tendons, each to the index and middle fingers.

Results: The extensor indicis originated from the distal end of the ulna on the posterior surface and adjacent interosseous membrane. There was a split in the extensor indicis belly, with one belly sending a tendon to the index finger and the other to the middle finger. Both tendons joined the ulnar side of each digit & extensor digitorum tendons.

Conclusion: Although many anatomical variations in the hand affect the muscles and tendons, most of these variants are asymptomatic. Such types of variations tend to be noticed during hand surgeries or routine cadaver dissections. This finding may provide immense help to plastic surgeons, orthopaedic surgeons, physiotherapists, and anatomists.

042. Structural Analysis of Myocardial Bridges in Cadaveric Specimens

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Introduction: The main arteries of heart and major branches are usually subepicardial, but those in the atrioventricular and interventricular sulci are often deeply sited, and occasionally hidden by or embedded in overlapping myocardium (Myocardial bridging). Myocardial bridges (MB) have been considered as a benign condition which remains silent in majority of cases, MB have been associated with complications like angina, arrythmia, transient ventricular dysfunction, and decreased left ventricular function.

Methodology: A total of 52 cadaveric human hearts irrespective of sex were studied in the department of Anatomy, IMS, BHU, Varanasi. All the parameters were studied by dissection method. The entire course of Right and Left coronary arteries was traced by cleaning the epicardium and fat in piecemeal. The sites where branches were overlapped by myocardium were preserved.

Results: In the present study two MBs were noticed which accounts for about 3.84% of the total cases. In one case, the MB was covering the beginning of the anterior interventricular artery. The MB measured 3.5 cm in length. The second MB was noticed bridging the lower part of the left marginal artery.

Conclusion: The MBs may cause compressive effect on the arteries. They are associated with an increased risk of heart surgery and other surgical procedures. Therefore, while treating patients with acute coronary symptoms, treating surgeon should keep in mind the presence of MB as potential cause of myocardial ischemia, radiologists and cardiologists deem it crucial to understand the existence and size of these myocardial bridges.

043. Phocomelia of the Upper Limb in a Newborn: A Rare Case

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Introduction: Phocomelia is a rare congenital anomaly characterized by absence or underdevelopment of the proximal limb. It can be associated with genetic mutations, consanguinity or teratogenic exposures (e.g., thalidomide).

Incidence: Phocomelia is extremely rare, with an estimated prevalence of 0.62 cases per 100,000 live births. The incidence dramatically increased during the late 1950s due to thalidomide exposure in pregnancy, but has since declined after withdrawal of the drug.

Case Presentation: A full-term female newborn was delivered via C-section to a 32-year-old mother (P3 L3) with no history of abortion, congenital abnormalities, exposure to known teratogens and consanguinity. Clinical findings: Deformed left upper limb beyond the elbow, with deformed radius and ulna with absence of carpal and metacarpal bones showing partially developed fingers buds. Other limbs were normal. No craniofacial, cardiac, abdominal, or genitourinary anomalies were detected. Karyotype was also normal.

Embryological Basis: Limb development begins in the 4th week of gestation with the formation of limb buds. The AER (apical ectodermal ridge) regulates proximodistal growth by stimulating underlying mesenchyme through FGF (fibroblast growth factor) signaling. Disruption of AER activity during early embryogenesis leads to arrested development of proximal limb segments, resulting in phocomelia.

Conclusion: This case highlights the classical presentation of unilateral phocomelia in a newborn. It emphasizes the need for: early recognition and systemic evaluation, understanding embryological mechanisms, further management for optimal outcomes.

044. Study of Atlas Vertebra for Posterior and Lateral Bridging and Its Correlation with Area of Superior and Inferior Articular Facets in Rajasthan

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Introduction: The Atlas is an atypical, ring shaped cervical vertebra that supports the skull. It consists of two arches (anterior and posterior) and to study lateral masses which bears the superior and inferior articular facets. Certain individuals exhibit anatomical variants where bony bridges form in the atlas. The Posterior Ponticle (Arcuate foramen) results from ossification of the posterior atlanto-occipital membrane. The lateral bridge (retro-orbital canal) is a bony outgrowth from the lateral mass extending towards the transverse process. These bridges when complete, form bony foramina most notably the arcuate foramen over the vertebral artery groove.

Methodology: A total of 112 vertebrae were carefully examined for posterior and lateral atlantal bridging. Vertebral artery groove and their superior and inferior articular surface areas were calculated to explore the possibility of any correlation between the surface area and bridges.

Statistical Analysis: Comparing the atlantal bridging and the surface area of superior and inferior facets come out to be insignificant [$P > 0.05$].

Results and Conclusion: Total amount of atlas bridging found in the study was 51.8% and posterior bridges 36.6% and 4.4% atlases had lateral bridges whereas 10.7% atleast had both posterior and lateral bridges. No correlation could be found between area of superior &/or inferior articular facets and the occurrence of bridging in atlas.

045. Classical Bladder Exstrophy in a Female Neonate – A Case Report

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Introduction: Classical bladder exstrophy (CBE) is a rare variant of the exstrophy–epispadias complex (EEC), a spectrum of congenital anomalies caused by defective ventral body wall development. Its estimated incidence is about 1 in 50,000 live births, with a male predominance. Presentation in a female neonate is therefore uncommon and clinically significant, with most cases reported from low- and middle-income countries. This case highlights a rare occurrence of CBE in a female neonate and its diagnostic importance.

Case Presentation: A full-term female neonate weighing 2.5 kg was delivered by caesarean section at Silchar Medical College and Hospital for breech presentation. The 23-year-old primigravida mother had a non-consanguineous marriage, conceived naturally, and had no history of comorbidities, miscarriages, congenital anomalies in the family, teratogenic exposures, or substance abuse. At birth, the neonate was noted to have exposed bladder mucosa on the lower abdominal wall and was admitted to the neonatal intensive care unit (NICU). Clinical examination revealed bifid clitoris, widely separated labia, anteriorly displaced vaginal opening, dorsal urethral plate continuous with the bladder mucosa, and anteriorly placed anus. Karyotyping was normal.

Embryological Basis: CBE results from failure of mesodermal migration across the cloacal membrane, leaving it fragile. Premature rupture prevents formation of the anterior abdominal and bladder wall, leading to bladder exstrophy. Cranial displacement of the genital tubercle causes bifid clitoris and epispadias, while pubic bone non-fusion leads to pubic diastasis.

Conclusion: Although rare, CBE can be effectively managed through early diagnosis and coordinated multidisciplinary surgical care.

046. Hippocampal and Cortical Neuronal Responses to Pioglitazone in LPS-induced Brain Inflammation

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Introduction: Neuroinflammation plays a pivotal role in the pathogenesis of neurodegenerative diseases. Lipopolysaccharide (LPS) based rodent models provide valuable insights into neuroinflammatory mechanisms and the development of potential neuroprotective interventions. The present study was conducted to investigate the efficacy of the peroxisome proliferator-activated receptor-gamma (PPAR-γ) agonist on neurogenesis and neuronal morphology in LPS administered Wistar rats.

Methods: Male albino Wistar rats (six weeks old) were divided into five groups ($n = 6$), with subgroups A (preventive) and B (curative) in each: control groups 1A and 1B, LPS administered groups 2A and 2B; Treatment groups 3, 4, and 5 in both A & B received varying doses of pioglitazone along with LPS and following LPS, respectively. The neuronal morphology was assessed using cresyl violet staining and neurotrophic factor was quantified in brain tissue homogenate.

Results: LPS administration resulted in a significant reduction of neurons within hippocampal subfields and dysregulation of neurotrophic and neurogenic markers (p < 0.005). Pioglitazone treatment substantially improved neuronal survival (p < 0.001) and restored neurotrophic marker levels in both preventive and curative groups.

Statistical Analysis: Data was analysed using Jamovi 2.3.28 software, with statistical significance set at $P < 0.005$.

Conclusion: Pioglitazone confers significant neuroprotective effects against LPS-induced neuroinflammation, safeguarding neuronal morphology and

neurotrophic factor. These findings underscore therapeutic promise of pioglitazone against neuroinflammatory and neurodegenerative conditions.

047. CADAVIZ: The Digital Cadaveric Path to Medical Expertise

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Introduction: The integration of technology into medical education has redefined the cadaveric path to medical expertise by introducing innovative tools such as the Virtual Dissection Table, CADAVIZ™. Understanding students' perceptions of such tools is essential to evaluate their effectiveness, engagement, and role in complementing traditional pedagogy. Thus, with the current study, we aimed to assess learners' experiences and attitudes towards CADAVIZ™.

Methodology: A questionnaire based study was conducted among 250 First-year MBBS students at the Department of Anatomy, DY Patil University School of Medicine, Navi Mumbai, India. Informed consent was obtained, and a Google Form questionnaire was used to assess students' perception of learning gross anatomy, radiology, histology and embryology with CADAVIZ™.

Results: 128 students responded to the questionnaire. 94% students were of the opinion that CADAVIZ is an innovative learning tool. 79% were of the opinion that it helped them visualise anatomy better than textbooks. 88% of students believed that the interactive 3D features of Cadaviz helped them understand spatial relationships in gross anatomy. 79% of students believed that that CADAVIZ should be used routinely in anatomy practical instruction.

Conclusion: The study demonstrates that students perceive CADAVIZ™ as a highly effective, interactive, and user-friendly tool that enhances understanding, engagement, and confidence in anatomy learning.

048. The Evaluation of Variation in the Length of Styloid Process of Indian Population and It's Applied Importance

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The styloid process has variable length with average of 25 mm. Its length >-30 mm is termed as elongated. The variation in the length may produce wide variety of symptoms in head and neck region as it is approximated to important neurovascular structures. This study is designed to evaluate the significant variability of length of styloid process in the study sample and the value mentioned the anatomy text books and to know the bilateral relationship between them.

Materials and Methods: Random sampling of 98 (n) styloid processes from 49 dry adult human skulls of Indian origin was used in this study. The student t-test, Scatterplot and Pearson's correlation coefficient were used to analyze the data.

Results: The mean length in the study sample was 24.05+-4.8 mm (range 9.12 mm to 36.13 mm). Significant difference was not found (p> 0.05) between sample and text book value (25 mm).Strong Positive linear correlation (r = 0.99) was observed between the pairs. More incidence was found (78.57%) in the 20 mm to 30 mm category. The length is important in diagnosis, anatomy and anthropology.

Conclusion: Length of styloid process in sample was not significantly different from the value mentioned in the text book. Bilateral Positive linear correlation was observed.

049. Analysis of Implementation of Electives under CBME Curriculum in a Government Medical College in West Bengal

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Introduction: The study aimed to analyse effectiveness of electives under CBME in a government medical college in West Bengal from the perspective of the stakeholders.

Methodology: An interventional study was conducted among undergraduate students (Batch 2020: n = 132, Batch 2021: n = 142), preceptors (n = 40). Structured questionnaires assessed satisfaction, compliance, and preparedness indicators. Qualitative data were obtained through open-ended responses. Interventions included formulation of standard operating procedures, faculty sensitization and student orientation prior to electives implementation. Quantitative data were analysed using t-tests, chi-square tests and effect sizes, while qualitative data underwent thematic analysis.

Results: Significant improvements were observed across all indicators among batch 2021 students and their preceptors.

Statistical Analysis: Student satisfaction increased from 3.5-3.7 in batch 2020-4.1-4.6 in batch 2021 (p<0.001, moderate to large effect sizes) and Preceptor satisfaction from 2.05-2.68 in batch 2020-4.10-4.76 in batch 2021 (p < 0.001, d = 1.6-3.0). Student Compliance improved in logbook maintenance (regular updates: 9% vs 77%, p<0.001) and attendance (>80%: 23% vs 65%). Structural indicators improved by 20-30%, with misuse of electives declining by 17-21%. Preceptor preparedness rose from 42% to 81% (P = 0.011). Qualitative analysis revealed a shift in stakeholder concern from structural barriers (time, SOPs, interdepartmental coordination, faculty involvement) in 2020 to refinement and sustainability strategies (student feedback integration, incentives, reflection) in 2021.

Conclusion: Structured interventions significantly enhanced implementation of electives, improving student and preceptor satisfaction, student compliance, and preceptor preparedness. Sustaining these gains requires institutional support, continuous faculty development, and integration of student feedback.

050. A Study on the Morphometry of the Mental Foramen and Accessory Mental Foramen at Guwahati Medical College, Assam

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Introduction: The mental foramen (MF) of the mandible is an important anatomical landmark, transmitting mental nerve and vessels. Its accurate localization is essential in dental anaesthesia, implant placement, and maxillofacial procedures. Variations in position of Mental foramen, along with presence of accessory mental foramen, may alter clinical outcomes by increasing risk of failed anaesthesia or nerve injury.

Methodology: A cross-sectional analytical study conducted on 50 dry human mandibles obtained from Department of Anatomy, Gauhati Medical College. The mental foramen and accessory mental foramen identified on external surface of the mandible. Their position was measured in relation to superior and inferior borders, symphysis menti, posterior border of ramus, and adjacent teeth using a digital vernier calliper and thread method. Classification of Mental Foramen done according to Tebo and Telford. Data analyzed using mean, standard deviation, and Welch's t-test.

Results: The most frequent Mental foramen position was Type III (between first and second premolars), found in 68% of mandible, followed by Type IV, Types I and VI were absent, while Types V and VII were rare. The mean Mental foramen–symphysis menti distance measured 26.84 mm (right) and 27.28 mm (left), and Mental foramen–posterior border distances were 68.23 mm (right) and 67.07 mm (left). Accessory mental foramen was observed in 2% of specimens.

Statistical Analysis: No significant bilateral differences were observed (p > 0.05), though intra-side comparisons showed statistically significant differences in vertical and horizontal measurements (p < 0.001).

Conclusion: Mental foramen is predominantly located in premolar region, showing minor asymmetric measurements. Though Accessory Foramina were rare, their recognition is important for clinical and forensic application.

051. Morphometric Measurement of Human Mandible and its Correlation with Stature in Eastern and North-Eastern Indian Population: A Cross-sectional Observational Study

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Introduction: Stature estimation is crucial in forensic anthropology for identifying unknown skeletal remains, particularly when complete skeletons are rare. The mandible, owing to its durability and morphometric variation, is increasingly used for height estimation. Population-specific studies are essential in India's diverse Eastern and North-Eastern regions, yet research connecting mandibular dimensions to stature is limited. This study aimed to establish correlations between stature and mandibular morphometric parameters and to derive population-specific regression models for prediction.

Methodology: A cross-sectional observational study was conducted among 150 purposively selected participants in a medical college. Stature and mandibular parameters were measured following standard protocols. Pearson's correlation coefficient assessed associations between height and mandibular dimensions, while the Mann-Whitney U test compared sex differences. Significantly correlated variables were incorporated into regression analysis to create a predictive equation.

Results and Statistical Analysis: Stature showed significant positive correlation with Mandibular Length (r^2 =0.431, p < 0.01), Bi-condylar Distance (r^2 =0.472, p < 0.01), Gonion-Gnathion Distance (r^2 =0.452, p < 0.01), and Bigonial Distance (r^2 =0.358). All mandibular parameters differed significantly between males and females (p < 0.01), highlighting sexual dimorphism. Linear regression produced the following model: Stature = 98.92 + 0.1× ML + 0.27× BCD + 0.08× BGD + 0.25× GGD.

Conclusion: Mandibular morphometry can serve as a reliable tool for stature estimation in Eastern and North-Eastern Indian populations, especially when more dependable predictors, such as long bones, are unavailable. Region-specific regression equations may improve forensic identification accuracy.

052. Analysis of Association of Single Nucleotide Polymorphisms of the MTHFR Gene in Familial CL/P Trios in the Telangana Population

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Introduction: Cleft lip Palate (CLP) are congenital

anomalies that vary in occurrence by geography. This study aims to analyse the association of single nucleotide of the MTHFR Gene in Familial CL/P Trios in the Telangana population, as there is meagre data on familial cases.

Methodology: After ethical clearance, this retrospective analysis was carried out at the GSR Institute of Craniofacial Surgery, a high-volume cleft center. Data from 4,000 medical records spanning five years indicated 40 families with non-syndromic familial CLP cases. Blood samples were collected, and genotyping was done for MTHFR SNP rs1801133, after obtaining consent.

Results: The major allele is C, whereas the minor allele is T for the MTHFR SNP rs1801133. The Hardy-Weinberg Equilibrium (HWE) analysis revealed no deviation (χ^2 =2.571, P = 0.1088). No significant correlation was found by the transmission disequilibrium test (TDT) (observed heterozygosity = 0.2125, expected = 0.1899, P = 0.589). Parent-of-origin (PoO) analysis showed no significant effect of the T allele on NSCLP risk. Paternal transmission had 3 T vs. 16 untransmitted; maternal had 1 T vs. 4 untransmitted. Chi-square was 1.8 (P = 0.1797), and odds ratio Z-score =0.524 (P = 0.6003), indicating no parental transmission bias.

Statistical Analysis: The HWE (Hardy-Weinberg Equilibrium), TDT (Transmission/Disequilibrium Test) and PoO (Parent-of-origin) tests were calculated using PLINK software (version 1.09) for the statistical analyses.

Conclusions: The current study indicated that the MTHFR SNP rs1801133 was not linked to Familial CL/P Trios in the Telangana population, suggesting that geographical factors might influence the results.

053. Anatomical Variation of the Accessory Renal Artery

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Background: Accessory renal arteries are common (30% of individuals), and usually arise from the aorta above or below (most commonly below), the main renal artery and follow it to the renal hilum. They are regarded as persistent embryonic lateral splanchnic arteries.

Materials and Methods: This anatomical study was conducted on a formalin fixed adult female cadaver during routine dissection in the department of anatomy at JNIMS. The abdominal cavity was carefully dissected to expose the kidneys and associated vascular structures. Particular attention was paid to the presence of accessory renal artery. The findings were photographed for documentation with standard anatomical references.

Results: During routine dissection an accessory renal artery was observed in the left side in addition to the main renal artery, a second artery arose from the lateral aspect of the abdominal aorta.

Conclusion: Knowledge of the variations of accessory renal artery is clinically significant, especially in surgical procedures such as renal transplantation, Nephrectomy, or endovascular interventions, as inadvertent damage or ligation can lead to ischemia of the kidney tissue.

054. A Rare Variant of Ansa Cervicalis Formation Involving the Spinal Accessory Nerve: Case Report

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Background: The Ansa cervicalis (AC) is a neural loop in the neck that typically forms from the contributions of C1–C3 spinal nerves and supplies the infrahyoid muscles. Owing to its proximity to major vessels and cranial nerves, knowledge of its variations is crucial during neck surgeries and nerve repair procedures.

Case Presentation: During routine dissection of a 70-year-old male cadaver, we observed an unusual unilateral variation in the formation of AC on the right side. The spinal accessory nerve (SAN), after emerging from the jugular foramen, divided into two branches, each giving rise to two additional branches. These branches descended, fused, and formed the inferior root of the AC, which then joined the superior root to complete the loop. We could not appreciate the fibres of C2 and C3 contributing to the formation of this loop. In addition, there were two communicating branches between the SAN and the vagus nerve just after their exit from jugular foramen. The left side displayed the usual AC anatomy.

Conclusion: This case highlights a rare variant of AC in which the SAN substitutes for the classical C2–C3 contribution and provides an unusual communication with the vagus nerve. Awareness of such variations is of great relevance to anatomists, neurologists, and head- and-neck surgeons, particularly in procedures involving laryngeal reinnervation and neck dissections.

055. A Rare Case Report of Bilateral Falx Cerebelli

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Introduction: The falx cerebelli is a small crescentic fold of dura mater below the tentorium cerebelli, which projects forward into the posterior cerebellar notch. Its posterior margin is attached to the internal occipital crest and contains the occipital sinus. As the formation of the intradural venous sinuses is concurrent with development

of the dural folds, any alteration in the morphology of the dural folds may potentially be associated with variations of the venous sinuses.

Findings: During routine dissection of the head region in an elderly male cadaver aged 70 years, at G. I. M. S, Greater Noida, U. P. we observed a rare variation of duplication of the falx cerebelli. On further dissection we found that the occipital sinus and internal occipital crest were also duplicated. Both the right and left falces cerebelli had a distinct base and apex and each of them possessed occipital venous sinus, draining into the right and left transverse sinus, respectively. Marginal sinus was absent in the posterior cranial fossa.

Conclusion: Recognition of such variations is crucial, particularly for neurosurgeons and interventional neuroradiologists as they may encounter a risk for inadvertent haemorrhage during suboccipital surgical approaches or result in misinterpretation of neuroimaging involving the posterior cranial fossa.

056. Variations of Biceps Brachii Muscle in Indian Population

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Background: The biceps brachii is one of the muscles of the anterior compartment of arm. It is a two-headed muscle that originates proximally by a long head and a short head. However, third head can be present in 10% of the population. It is supplied by musculocutaneous nerve. The present study was carried out to find the variations of biceps brachii muscle in Indian population.

Materials and Methods: Variations in the origin, insertion and nerve supply of biceps brachii muscle were studied on the upper limbs of 30 adult Indian cadavers in the Department of Anatomy, Jawaharlal Nehru Institute of Medical Sciences, Imphal, Manipur, India.

Results: Among the 60 upper limbs studied, 7 (11.6%) had 3 headed biceps brachii. Among these, 6 (83.3%) were on the left and 1 (16.7%) was on the right side. All the third head were of humeral origin, out of which 6 were inserted into the radial tuberosity by a common tendon with the long and short heads, while in the remaining one, it was also connected to the bicipital tendon but there were additional tendinous connections with the common flexor muscles of the forearm. All the third heads were supplied by musculocutaneous nerve but in one case, there were multiple branches supplying the third head.

Conclusion: Knowledge of variations of biceps brachii is important in pre-operative evaluation and helps to facilitate better surgical intervention with the arm and forearm, and improves postoperative outcomes.

057. Cytogenotoxic and Oxidative DNA Damage in Buccal Mucosal Cells of Laryngopharyngeal Reflux Disease Patients

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Introduction: Laryngopharyngeal reflux disease (LPRD) induces salivary changes that contribute to dental erosion and alterations in the oral mucosa.

Aim: This study aimed to evaluate micronucleated cell count, metanuclear abnormalities, genotoxic effects, mesenchymal transition, and oxidative DNA damage in exfoliated buccal mucosal cells of LPRD patients.

Methods: Buccal mucosal scrapings were collected from healthy volunteers (n = 31) and LPRD patients (n = 31) after obtaining informed consent. Papanicolaou (PAP) staining was used to analyze micronuclei (MN), and to quantify pyknotic, karyolytic, and karyorrhectic cells. Immunohistochemistry (IHC) was performed for E-cadherin, N-cadherin, and 8-hydroxy-2'-deoxyguanosine (8OHdG). Categorical variables like study group were summarized as frequency and proportion. Continuous variables like micronucleated cell count were summarized as mean and standard deviation. Association between categorical and continuous variable was analyzed using Student's "t" test. Association between categorical variables was analyzed using Chisquare test. P value less than 0.05 was considered as statistically significant.

Results:

- LPRD Group: MN count– 225.77; micronucleated cells– 160.06; pyknotic cells– 22.06; karyolitic cells– 31.71; karyorrhectic cells– 12.06
- Control Group: MN count– 76.97; micronucleated cells– 55.61; pyknotic cells– 13.74; karyolitic cells– 18.68; karyorrhectic cells– 8.84
- The genotoxicity factor in LPRD patients was 2.9, indicating a significant genotoxic effect.
- A positive correlation was found between Reflux Symptom Index (RSI) scores and micronuclear/ metanuclear abnormalities.
- IHC findings: Controls exhibited intense E-cadherin and mild N-cadherin and 8OHdG expression. In contrast, LPRD patients showed strong N-cadherin and 8OHdG expression, indicating epithelial-mesenchymal transition and oxidative DNA damage.

Conclusion: LPRD has a clear cytogenotoxic effect on buccal mucosal cells, evidenced by increased nuclear abnormalities and oxidative DNA damage. IHC markers such as N-cadherin and 8OHdG may serve as potential early indicators of LPRD-induced carcinogenic changes in the oral mucosa.

058. A Case of Situs Inversus Partialis

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Introduction: Situs inversus is a rare congenital condition in which there is transposition or mirror image of the organs. It is of two types situs inversus partialis and situs inversus totalis. In situs inversus partialis only some thoracic or abdominal organs are transposed, unlike situs inversus totalis where complete mirror-image arrangement occurs.

Materials: The fetus was collected from the department of obstetrics and gynecology, JNIMS which was a product of medical termination of pregnancy.

Results: The case was observed in a 25-week-old male fetus. The fetus showed dextrocardia with stomach and spleen position on the right, liver was also observed on the right as well while the caecum and appendix were located on the left. These findings confirmed the presence of situs inversus partialis.

Conclusion: Knowledge of such case has important clinical implication for accurate diagnosis, imaging interpretation and surgical intervention.

059. To Study the Frequency of Anatomical Variations in Length of Styloid Process of Temporal Bone by using 3D CT Scan

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Introduction: Styloid process extends from temporal to hyoid bone. The length and angulation of Styloid Process (SP) vary widely in age, sex and sides. In this study, we have ascertain the frequency of various anatomical variations of length of styloid process by using 3D CT scan.

Materials and Methods: This observational study, conducted on 150 3D CT in department of anatomy and radiology of NIMS, Jaipur. Dicom RADiant software is used to generate 3D CT scan images, all measurement and analysis.

Results: Elongated styloid process (EPS) was found in 30% on lateral and in 53% on posterior view of 3D CT scan which is statistically significant. In female, EPS was found in 32.4% 3DCT on lateral, and 48.6% of 3D CT on posterior view. In male EPS was found in 29.2% 3D CT on lateral and 54.8% of 3D CT on posterior view. On left side, EPS was found in 22.7% on lateral and 41.3% posterior view while on right side in 21.3% on lateral and 45.3% on posterior view. The length of SP varied widely.

Statistical Analysis: Chi-square test used for statistical analysis.

Conclusion: The length of styloid process varies considerably among various age group, between male and female, even in same individual on right and left side. The 3D scan on posterior view shows higher frequency. This is due to variable size of tympanic plate of temporal. The 3D CT scan is standard method styloid process measurement.

060. Morphometric Study of the Pituitary Gland in Human Foetuses

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Introduction: In adult, the Pituitary gland is a reddish-grey, ovoid body, about 12 mm in transverse and 8 mm in anteroposterior diameter and weighing about 500 mg. It lies within the hypophyseal fossa of the sphenoidal bone. It consists of two major parts: Adenohypophysis & Neurohypophysis. The present study was done on the fetal pituitary gland for morphological and morphometric analysis.

Materials and Methods: This is a cross-sectional study, conducted in the Department of Anatomy, RIMS, Imphal, Manipur. On 66 human foetuses of different gestational ages which were collected from the Department of Obstetrics & Gynaecology, RIMS, Imphal. The permission was taken from the Institutional Ethics Committee. Foetuses were categorized into 6 groups for easier study and observation:-Group A(10-15Wks), Group B(16-20wks), Group C(21-25wks), Group D(26-30wks), Group E(31-36wks), Group F(>36wks).

Results and Observations: In Groups (A, B, C, D, E & F) shape of the glands were ovoid transversely, surface were smooth, covered with capsule and on cross-section anterior lobe were larger than posterior lobe. On morphometric observation anteroposterior length ranges from 01 mm to 10.8, transverse length (01 mm to 09.00 mm), vertical length (0.65 mm to 5.00 mm) and weight 0.01 g to 0.16 gm.

Statistical Analysis: Male, Female Fetal age, and pituitary dimensions positively correlated and highly significant at 5% level.

Conclusion: On Gross morphological & morphometrical examination, it was observed that: Size of the gland is smaller than adult and Growth of the gland was not completed till full term.

061. Unilateral Retroarticular Vertebral Artery Ring of the Atlas: A Case Report

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Introduction: The atlas, the first cervical vertebra, facilitates skull and neck movements and contains a groove on its posterior arch for the vertebral artery and suboccipital nerve. Ossification of the adjacent oblique ligament can convert this groove into a bony foramen, known as the arcuate foramen, ponticulus posterior, retroarticular canal, or retroarticular ring. This variant may be complete or incomplete, unilateral or bilateral.

Case Report: During routine osteology demonstration classes on the cervical vertebrae for undergraduate medical students in the Department of Anatomy, Patna Medical College, Patna (Bihar), a rare variation was observed in one of the dry atlas vertebrae. On examination, the groove on the superior surface of the posterior arch for the vertebral artery was found to be converted into a complete bony canal on the right side, forming a unilateral retroarticular vertebral artery ring (arcuate foramen). No other anatomical anomalies were noted in the vertebra. This incidental finding represents a rare variant of the posterior arch of the atlas, with potential clinical implications for surgical approaches, radiological interpretation, and vertebrobasilar circulation.

Conclusion: The vertebral artery is especially susceptible to compression as it traverses between the foramen transversarium and the foramen magnum, particularly during extreme movements of the head and neck. Recognition of such anatomical variations is essential for neurologists, neurosurgeons, orthopedists, and otolaryngologists, as these anomalies may underlie or contribute to symptoms of vertebrobasilar insufficiency and influence both diagnostic and surgical decision-making.

062. Left-sided Double Renal Artery: A Case Report

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Introduction: Variations in renal vasculature are among the most frequently observed anatomical anomalies, with double renal arteries being the most common. Such variations often remain asymptomatic but hold significant importance in surgical, radiological, and interventional procedures. Unrecognized anomalies may lead to complications during nephrectomy, renal transplantation, or endovascular interventions, making precise anatomical knowledge essential for clinicians.

Case Report: During routine abdominal dissection in the Department of Anatomy, Patna Medical College, Patna (Bihar), a unilateral double renal artery was identified on the left side in a 65-year-old male cadaver. The primary renal artery originated from the abdominal aorta at the level of the L1 vertebra, while the accessory artery arose approximately 3 cm inferior to it. Both vessels coursed laterally to enter the renal hilum and subsequently divided into anterior and posterior branches.

Conclusion: Recognition of renal vascular variations is critical in clinical practice. A thorough understanding aids in preventing iatrogenic complications and optimizing outcomes in renal trauma management, renal transplantation, renovascular interventions, renal artery embolization, angioplasty, vascular reconstructions, abdominal aortic aneurysm repair, and renal surgeries.

063. High Division of Femoral Nerve: A Case Report with Its Clinical Implications

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Introduction: Femoral Nerve (FN) originates from the dorsal divisions of the anterior rami of nerve roots L2–L4. It then descends through the psoas major muscle, lies between iliacus and psoas major just proximal to the inguinal ligament and then divides into its anterior and posterior divisions just distal to the inguinal ligament. FN block is performed on the main stem of the nerve, inferior to the inguinal ligament, before it divides into its branches. Thus, knowledge of any variation in the branching pattern of FN becomes essential for clinicians and surgeons.

Method: The present variation was observed during routine cadaveric dissection in a formalin embalmed 55 year old male cadaver in the Department of Anatomy at Maulana Azad Medical College. The FN was dissected and its origin, course and relations were studied. The level of division of FN was measured from the mid-point of inguinal ligament using ImageJ software.

Results: A higher branching pattern of FN was observed on the right side, where the FN divided into its anterior and posterior divisions, approximately 0.8 cm above the mid-point of the inguinal ligament. The anterior and posterior divisions descended between iliacus and psoas major.

Conclusion: The knowledge of such variations is important to anaesthetists, surgeons and orthopaedicians while managing femur fracture surgery, knee arthroplasty, arthroscopic knee surgery and patellar surgery to avoid complications like incomplete nerve block and iatrogenic injuries.

064. Morphometric Study of Head and Neck of Human Femur and Its Clinical Significance

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Introduction: The femur is the longest and strongest bone in human body. It has proximal rounded head, neck and

shaft. The head and neck of the femur play a vital role in maintaining hip joint stability, weight transmission, and mobility. Their morphometric variations have important clinical significance in fracture management, prosthesis design, and forensic anthropology.

Objective: To determine the morphometric dimensions of the head and neck of the femur.

Materials and Methods: The study was conducted on 50 (25 of each side) dry human femur bones of known sides in the Department of Anatomy RIMS, Imphal. Parameters such as length of femur, head circumference, vertical and transverse diameters of head, anterior and posterior neck length, and neck shaft angle were taken using measuring tape, Digital Vernier Calliper, and Goniometer. Bone with damaged, incomplete, deformed and eroded were excluded. Data will be statistically analyze using IBM SPSS 26 version and compared with the previous studies.

Results: The mean head and neck dimensions showed minor variations between right and left femur, with values consistent with the earlier studies on Indian populations. The neck-shaft angle displayed within the normal range. These variations have direct implications for the design of hip prosthesis, assessment of fracture and planning of orthopedic interventions.

Conclusion: Morphometric evaluation of the femoral head and neck provides essential baseline data for orthopedic practice, especially in hip replacement surgeries and internal fixation procedures. It also aids in forensic identification and anthropological studies.

065. Variations in the Branching Pattern of Sciatic Nerve in Adult Cadavers

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Introduction: Sciatic nerve (SN) supplies posterior thigh, leg, and foot. It normally divides into tibial (TN) and common peroneal nerves (CPN) at the superior angle of popliteal fossa. It is affected in conditions such as sciatica, piriformis syndrome and is a significant structure in nerve blocks and surgical interventions.

Methodology: The SN was studied in total 20 lower limbs (LLs) (10 each of right and left side) specimens in the Department of Anatomy, MAMC. The origin, course and relation of SN was studied by dissecting gluteal region, back of thigh, and leg. The level of division of SN was measured from superior border of piriformis muscle, photographs were taken and were analyzed using the Image J software.

Results: High division of SN was found in 15% of LLs, which were 2.15 cm, 2.04 cm and 2.86 cm, inferior to the mid-point of superior border of piriformis muscle. The high division SN bifurcated into TN and CPN which were related superficially to both gemelli, quadratus femoris and adductor magnus (adductor part) muscles. Remaining 17 out of 20 LLs showed normal origin, course, relations and division of SN.

Conclusion: Awareness about variations in the origin, course and branching pattern of Sciatic Nerve are clinically important for surgeons, anaesthetists, and clinicians for better interventions in surgical procedures such as Hip arthroplasty (via posterior approach), Sciatic Nerve block, Sciatica, Sciatic nerve entrapment and Piriformis syndrome.

066. Comparison of Histopathological Abnormalities in Kidney of Chicks Subjected to Exposure to Arteether and Artesunate at Embryonic Stage

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Introduction: Arteether (α-β arteether) and Artesunate are obtained from the Artemisia plant. Both the drugs have a significant effect in treating chloroquine-resistant Plasmodium vivax and falciparum malaria. Malaria imposes a substantial socio-economic burden in India, leading to a substantial number of deaths. The chick embryo is commonly used as an animal model to investigate the harmful effects of various drugs in research. The objective of this study was to assess the histopathological effects of both drugs on the kidneys of developing chick embryos.

Methodology: A total of 330 eggs (165 eggs for α-β arteether and 165 eggs for artesunate) of Gallus domesticus were used for this study. Each drug was subdivided into four experimental groups (A, B, C, D) injected with drugs and four control groups (a, b, c, d) with normal saline as per dose titration on the 5^{th} day of incubation. On the 18^{th} day of incubation, eggs were manually hatched, and kidneys were isolated by dissecting the abdominal cavity of chick embryos. Further histological tissue processing of the isolated kidney was done, and each slide was observed to identify the abnormalities under a microscope.

Statistical Analysis: Descriptive statistical analysis.

Results: Based on histopathological analysis of α-β arteether and artesunate drugs, we observed the abnormalities of congestion, haemorrhage, mild to severe lymphocyte infiltration, fat deposition and fatty changes in the kidney of the chick's embryo.

Conclusion: The recommended dose of α-β arteether and artesunate drugs has no or a mild effect on the kidney, but teratogenic risk increases with an increase in drug dose in the kidney.

067. Relevance of Anatomy Courses in Clinical Years of Medical Curriculum: A Descriptive Study among Interns of a Medical College of West Bengal

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Introduction: Human Anatomy deals with the structure of human body and Anatomy is the basic and important subject in medical curricula. In recent days the traditional way of teaching Anatomy is being replaced by competency based teaching. Preclinical subjects and training form an important foundation for the patient examination and clinical reasoning skills.

Aims and Objectives: To assess the perception of anatomy knowledge and competencies of Anatomy subject in clinical practice among the interns of a medical college.

Materials and Methods: The present study was a descriptive, observation type of study with cross sectional design among the interns who were being posted for at least 6 months tenure from their starting in the wards of Medicine and Surgery.

Results: The mean age of the interns were 24.14 yearswith SD of 0.968. General Medicine (35.1%) and Surgery (27.7%) were preferred disciplines for higher studies among the interns. Surface anatomy (79.8%), Dissection classes (76.6%) were useful during their first year days. Regarding systemic anatomy, respiratory (77.7%), genitourinary (75.5%) and CVS(72.3%) are useful. During their posting in surgery (89.4%) and General Medicine (74.5%) interns agreed to the usefulness of anatomy. Imaging needed the knowledge of anatomy during patient care. Organ location, trauma care, delivery and minor procedures were the areas where anatomy knowledge is necessary.

Conclusions and Recommendation: A fully integrated undergraduate anatomy curriculum with incorporation of clinical applications across all aspects of learning is the need of the hour in medical education which will help the young doctors to recollect the theoretical knowledge in day to day clinical practice.

068. Anatomical Variation of Vertebral Artery: Case Study with Its Clinical Implications

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Introduction: The vertebral artery (VA) originates from the first part of subclavian artery medial to the anterior scalene muscle and ascends upwards through transverse foramina of cervical transverse process supplying the upper part of spinal cord. At its origin VA lies anterior to the superior part of stellate ganglion (SG) of the cervical sympathetic chain, formed by fusion of inferior cervical ganglia and 1 st thoracic ganglia. Its proximity to the vertebral artery has clinical implication during surgery of the neck and stellate ganglion block. Knowledge of the anatomical relation between VA and SG becomes essential for anaesthetists and surgeons for interventions.

Methodology: 16 cadavers (8 male and 8 female) were studied in the Department of Anatomy, Maulana Azad Medical College. Neck and thoracic inlet were dissected. The origin and relations of VA of both right and left sides were observed and documented.

Results: In two cadavers on left side (one male and one female), the VA was observed to be piercing the SG such that the ganglia encircled the VA. In the remaining cadavers the VAs was normal with respect to their origin and relation.

Conclusion: Precise knowledge of vertebral artery at its origin is essential during stellate ganglion block. Variations of relation between vertebral artery and stellate ganglion may lead to iatrogenic injury of vertebral artery during the stellate ganglion block.

069. A Study on Cervical Vertebrae Synostosis at Different Levels: An Institutional Based Observational Study

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Introduction: Cervical vertebrae synostosis is an anatomical fusion of adjacent vertebrae, either congenital or acquired. It is a rare entity with an incidence of 0.4% to 0.7% with no sex predilection. While often asymptomatic, such anomalies can alter cervical biomechanics, restrict cervical mobility and predispose to adjacent segment degeneration. The study aims to observe the anatomical variation in cervical vertebrae synostosis at different levels and to highlight their clinical and anatomical significance.

Methodology: During routine survey of bones in the Department of Anatomy, Assam Medical College, Dibrugarh, three cases of cervical vertebrae synostosis were identified and macroscopically examined in detail. The extent of fusion involving vertebral bodies, laminae, spinous processes, articular facets, pedicles and transverse processes were carefully examined and documented.

Results: Case 1 showed complete fusion of C2-C3 vertebral bodies, while Case 2 exhibited partial fusion of C2-C3 vertebral bodies and Case 3 demonstrated complete fusion of C4-C5 vertebral bodies with variable fusion of laminae, spinous processes, articular facets. In all the three cases pedicles and transverse processes remains distinct.

Conclusion: This study concludes that cervical vertebrae synostosis, though rare, shows variable patterns of fusion at different levels. Knowledge of such variation is vital for

clinicians, radiologist, and surgeons to avoid misdiagnosis, prevent iatrogenic complications and guide effective patient management.

070. Re-entry of the Mental Nerve Branches in the Anterior Mandible: Osteo-radiological Evidences

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Introduction and Aim: The neurovascular bundles of the anterior mandible are of great interest from a surgical perspective. Pogrel (1997) documented mental nerve branches re-entering the buccal aspect of the anterior inter-mental foraminal region of the mandible in 15% of cadaveric specimens, providing additional innervation to the incisors. Accessory mandibular foramina provide indirect evidence of such neurovascular bundles entering the mandible. Although accessory lingual foramina have been extensively studied, investigations of accessory foramina on the buccal aspect are rare, particularly in the Indian population.

Methodology: The present study was conducted on 61 dry mandibles in the department of Anatomy and on 135 CBCT (Cone Beam Computed Tomography) images of adult patients of the Oral Diagnosis and Radiology Department at the Govt. Dental College, Ahmedabad. Meticulous observations were made regarding the presence of accessory mandibular foramina, only on the buccal (labial) aspect of the anterior mandible.

Results: Twenty-three out of 61 dry mandibles (38%) showed the presence of accessory mandibular foramina on the outer aspect of the anterior mandible, mostly between the incisor and canine teeth. In CBCT images, 22% of patients exhibited the presence of such foramina.

Conclusions: The present study provides indirect evidence of the entry of sensory branches of the mental nerve, maybe with the vessels, in the anterior mandible in the Indian population. Oral implant surgery, as well as orthognathic surgery, should avoid damaging such neurovascular bundles, which exist in a substantial percentage of cases.

071. Morphological Study of Flexor Carpi Ulnaris – A Cadaveric Study

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Introduction: Grafts required to cover soft tissue defects over the posterior surface of the elbow may be from muscles like anconeus, brachioradialis frequently. The two heads of flexor carpi ulnaris (FCU) have independent vascular and nerve supply, making its one head useful as a graft without compromising on the function. Amongst suitable candidates for tendon transfers, FCU tendon may be used. Most of the studies carried out have been on patients and very few on cadavers. Overall studying, different morphological parameters and their variation shall be helpful to treating surgeons in planning concerned invasive procedures.

Methodology: During regular dissection for undergraduates, the flexor compartment of the forearm performed. Total of 40 forearms were considered for the study. The muscle was cleared, exposing its vascular pedicles and nervous branches. Various parameters such as the length of the muscle belly, length of the tendon, and the total length of the muscle were recorded. Distance of each vascular pedicle were noted. The branching pattern from ulnar nerve were also be noted down.

Results: Most of the vascular pedicles were from documented sources except in a single case where it was from the radial artery. Length of muscle tendon was maximum up to 4.5 cm.

Conclusion: FCU provides a good coverage in average sized defects due to presence of a spare head and closely present vascular pedicles at the cranial end of the muscle. Few distally present were to also be seen.

072. A Case Study of Fused Typical Thoracic Vertebrae

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Background: Vertebral fusion is an uncommon anomaly of the axial skeleton that may result from congenital malformation or acquired pathological processes. Recognition of such anomalies in dry bones is important for anatomists, radiologists, and clinicians, as they may influence spinal biomechanics and clinical outcomes.

Case Study: During routine osteology demo for medical students, fused typical thoracic vertebrae were identified. The fusion involved two contiguous mid-thoracic vertebrae. The intervertebral disc space was obliterated; posterolatera part of the vertebral bodies was fused and anteriorly the vertebral bodies were separated with slit like space. Complete fusion of laminae and fused articular facets on the left side and incomplete development of lamina of lower vertebra on the right side was observed. There was no spinous process for the lower vertebra while the transverse processes and costal facets remained intact. Absence of reactive bone changes or osteophytic lipping indicated a congenital origin rather than post-inflammatory or degenerative fusion.

Conclusion: Fused thoracic vertebrae, though rare, may alter spinal mobility, contribute to abnormal curvature, and

predispose to degenerative changes. Awareness of such variations is essential in anatomical studies, radiological interpretation, and spinal surgery to avoid misdiagnosis and anticipate intraoperative challenges.

073. At Our Fingertips': Mapping Dermatoglyphic Traits as Noninvasive Markers for Breast Cancer Risk in India – A Systematic Review with Narrative Synthesis

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Introduction: Breast cancer is the most common cancer among Indian women, with many cases diagnosed late. Dermatoglyphics—the ridge patterns of fingers and palms—are formed during early fetal life, remain unchanged, and may reflect developmental variations linked to disease risk. Given their simplicity and low cost, dermatoglyphics may offer a novel, non-invasive adjunct for risk stratification in high-risk populations.

Methodology: A systematic search of PubMed, Embase, and Google Scholar (to August 2025) identified Indian case–control studies comparing dermatoglyphic traits in histopathologically confirmed breast cancer patients and healthy controls. Eligible traits included fingerprint patterns, ridge counts (TFRC/AFRC), pattern intensity index, palmar angles, and fluctuating asymmetry. Data extraction and risk of bias appraisal were performed in duplicate using Joanna Briggs Institute checklists. Due to heterogeneity, a structured narrative synthesis was conducted.

Results: Ten case–control studies (964 cases, 964 controls) were included. In the largest study (Singh *et al*., n = 145/145), ulnar loops were significantly higher in cases (67.9% vs 15.3%), while whorls were fewer (24.7% vs 50.8%, p<0.001). Chintamani *et al*. (*n* = 60/60) reported ≥ 6 whorls in 40.5% of cases vs 3.1% controls (p<0.05). Raizada *et al*.(*n* = 100/100) found TFRC ≤ 50 in 23% of cases vs 1% controls (p<0.001). Palmar angle results were inconsistent: Johri *et al*. observed higher mean atd angles in cases (44.9° vs 43.2°, p<0.05), while others reported null or opposite findings.

Conclusion: Dermatoglyphic traits show reproducible associations with breast cancer in Indian women and may serve as a low-cost, non-invasive adjunct to identify high-risk individuals. However, variability across centers highlights the need for standardized definitions, larger prospective cohorts, and digital methods to validate their clinical utility.

074. Anatomical Variation of the Coracobrachialis Muscle: A Two Headed Muscle Presentation

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Introduction: The coracobrachialis muscle normally arises as a single head from the coracoid process of the scapula and is pierced by the musculocutaneous nerve. Variations, though rare, include accessory heads, aberrant origins, or unusual insertions. These anomalies hold clinical importance due to potential nerve entrapment and surgical complications.

Methodology: Routine cadaveric dissection of an adult upper limb was carried out in the Department of Anatomy, with careful exposure of muscular and neurovascular structures.

Results: A two-headed coracobrachialis muscle was identified. Both heads originated from the coracoid process, with the musculocutaneous nerve passing between them before continuing its normal course. The two heads fused distally and inserted into the medial shaft of the humerus. No additional muscular or neurovascular variations were observed.

Conclusion: The presence of a two-headed coracobrachialis is a rare anatomical variation. Awareness of such anomalies is important for anatomists, radiologists, and surgeons to prevent misinterpretation on imaging and avoid iatrogenic injury during surgical procedures.

075. Beaver Tail Liver: A Case Report

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Introduction: Beaver Tail Liver is a rare anatomical variant of the liver where the left lobe is elongated, extending laterally crossing left mid-clavicular line and comes in contact with spleen and may even enclose it. As the extension resembles the broad, flat tail of beaver, hence it is given the name Beaver Tail Liver. Hepatic parenchyma maybe normal and is usually due to incidental finding. More common in females and vulnerable to blunt injuries which maybe confused with splenic injury as both show equal echogenicity in imaging.

Methodology: On routine cadaveric dissection carried out in Department of Anatomy, GMCH, elongated left lobe of liver was observed, which was removed following the guidelines given in Cunningham's manual of practical anatomy and preserved in 10% formalin solution.

Results: The specimen showed elongated left lobe of liver, extending beyond midline and surrounding the spleen, giving a beaver tail appearance. The surrounding abdominal

viscera appeared normal in morphology and position. No additional anomalies of liver or spleen were identified.

Conclusion: Beaver Tail Liver is a rare anatomical variant. Unaware of this variant may prove to be fatal during invasive procedures of the abdomen especially for emergency medicine physicians, surgeons and radiologists as it could be misdiagnosed as splenic trauma or subcapsular hematoma. Colour doppler can be used to help in diagnosis by confirming the presence of hepatic and portal veins in left upper quadrant, leading to consideration of Beaver Tail Liver.

076. Study of Biometric Parameters and Their Correlation with Stature in Adult North Indian Females

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Introduction: Anthropometry has significant applications in forensic identification and clinical practice. Stature and sex are amongst the most important anthropometric indicators. While most studies in the past have studied stature estimation from long bones, this study assessed multiple biometric parameters in North Indian females.

Methodology: A descriptive study was conducted using a non-random consecutive sampling technique on 100 female students of Guru Gobind Singh Medical College & Hospital, Faridkot, Punjab. Participants were aged 18-25 years. Standardized tools such as a stadiometer, digital sliding caliper, and spreading caliper were used to collect data. The parameters included head length, head breadth, head circumference, lower limb length, knee length, foot length, and foot breadth.

Results and Statistical Analysis: The mean values of bilateral lower limb parameters showed no significant side-to-side differences. Lower limb length (Right 92.05 ± 4.05 cm; Left 92.20 ± 4.02 cm), knee length (Right 43.08 ± 2.49 cm; Left 43.09 ± 2.40 cm), and foot length (Right 23.38 ± 1.07 cm; Left 23.62 ± 1.15 cm) revealed no significant variation (p >0.05). None of these parameters showed a significant correlation with stature (p > 0.05). However, Foot breadth (Right 8.51 ± 0.80 cm; Left 8.53 ± 0.80 cm) demonstrated a statistically significant difference (p < 0.001) and showed significant correlation with stature (p < 0.05). Furthermore, Head circumference (55.13 ± 1.59 cm), head length (19.61 ± 0.61 cm), and head breadth (13.67 ± 0.66 cm) showed significant correlations with stature (p < 0.05).

Conclusion: The study concluded that lower limb measurements, except foot breadth, were bilaterally symmetrical, whereas head parameters and foot breadth were strongly correlated with stature, making them reliable indicators for forensic and anthropometric applications.

077. Elongated Styloid Process Consequence of Eagle Syndrome: A Skull-based Morphological Study

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Background: The styloid process, a slender projection from the temporal bone, serves as an anchor for muscles and ligaments of the pharynx and tongue. Its normal length ranges between 20-30 mm. Elongation beyond 30 mm is termed an elongated styloid process and is often implicated in Eagle's Syndrome.

Objective: To evaluate the incidence, laterality, and morphological variations of elongated styloid processes in cadaveric skulls.

Materials and Methods: A total of 30 dry human skulls of unknown age and sex were examined from the Department of Anatomy. Styloid processes were measured using a digital Vernier caliper from the base of the process to its tip. Lengths greater than 30 mm were considered elongated. Laterality, symmetry, and morphological variations were recorded.

Results: Out of 30 skulls, elongated styloid processes were observed in 6 Bilateral elongation was found in 2 skulls, while unilateral elongation was observed in 4 skulls, with a slight predominance on the right side. Morphological variations included tapering, nodular, and pseudo-segmented forms.

Discussion: The knowledge of such variants is essential as they may correlate with clinical symptoms such as orofacial pain, dysphagia, or carotid artery compression. Anatomical awareness is also critical during skull base surgeries and radiological interpretation.

Conclusion: Elongated styloid process, though often asymptomatic, represents a noteworthy anatomical variant with clinical relevance.

078. Morphometric Evaluation of Iliac Vein Compression by Iliac Artery in Asymptomatic Cadavers: Implications for May-Thurner Syndrome

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Introduction: The relationship between common iliac arteries and veins is often complex and twisted. The most common variant is compression of left iliac vein against the bone by the right iliac artery, leading to venous insufficiency, leading to May-Thurner Syndrome (MTS). In patients with this syndrome, pulsations of the artery induces structural deformity of the veins in the form of fibrous spurs, which may lead to deep vein thrombosis

and venous thromboembolism, leading to death. Eastern India lacks significant number of research articles on MTS. Hence this research caters to the purpose to some extent and also investigates the possibility of compression of right iliac vein as another anatomical variant of MTS.

Materials and Methods: A cadaveric study was conducted over one-year duration over 10 cadaveric specimens during routine undergraduate anatomy dissection classes. Various parameters were measured including external diameters of both the iliac veins above, at and below the level of arterio-venous crossing by iliac arteries, angulation between two iliac veins. The findings were recorded.

Results: 30% of the cadaveric specimens had lesser external diameter at the level of arterio-venous crossing.

Statistical Analysis: Descriptive analysis done.

Conclusion: MTS mostly being asymptomatic, early diagnosis and timely intervention of the anatomical compression may lead to significant reduction of morbidity and mortality and improves quality of life.

079. Fetal Lethal Skeletal Dysplasia: Case Report

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Introduction: Skeletal dysplasias (SDs), or osteochondrodysplasias (OCDs), are a group of bone disorders with clinical and etiological heterogeneous characteristics. They affect the bone tissue and cartilage, resulting in changes in the growth, shape and development of the skeletal system. The OCDs can be very rare; however, as a group, their prevalence is estimated at around 2.4 per 10,000 live births, with the lethal SD forms corresponding to 0.95-1.5 per 10,000 births. It is known that there are more than 456 entities classified into 40 categories by their cardinal features (radiological findings, molecular etiology, inheritance), among which 40% can be already detected in the perinatal period, representing 9 deaths per 1,000 births.

Objectives: To study a rare fetal lethal skeletal dysplasia.

Materials and Methods: During routine foetal autopsies conducted in the department of Anatomy, Mysore Medical College and Research Institute, Mysuru, a rare interesting case of 24 weeks male foetus weighing 830 gms with multiple congenital anomalies was observed.

Observation and Results: Clinical examination revealed very short limbs, narrow chest, round belly, feet are rotated. Findings are suggestive of Skeletal dysplasias.

Conclusion: It is important to distinguish various types of lethal skeletal dysplasias. The prognosis is generally poor, with most infants being stillborn or dying soon after birth because their small chests don't allow them to breathe properly. To prevent the disorder genetic counselling is necessary prior to starting a family.

080. A Comparative Histological Study of Normal Human Placenta and Placenta of Patient with PIH (Pregnancy Induced Hypertension)

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Introduction: The placenta is a vital organ for fetal growth, acting as the interface between maternal and fetal circulation. Pregnancy-Induced Hypertension (PIH) is one of the leading causes of maternal and perinatal morbidity and mortality.

Aim of Study: To evaluate the histological features of placenta in order to identify structural and vascular changes, and to correlate these changes with maternal and fetal outcomes.

Methodology: This study is done in the Department of Anatomy in collaboration with OBGY Department, PMCH, Patna. The sample was collected, washed, and stored in neutral formalin and then processed for slide preparation. After that, thin slices were cut and stained by H and E and then studied for histopathology.

Results: The slides were studied under microscope in 10x magnification. Degenerative changes like fibrinoid necrosis of villi, hyalinization of blood vessels, increased number of syntitial knots were seen in case of PIH.

Conclusion: In the above comparative study, it is observed that marked pathological changes occur in PIH placenta compared to normal placenta which proves to be detrimental to both the mother and the developing fetus, so it should be treated on time. This histological study of placenta also helps in understanding the pathophysiology of PIH.

081. Virtual Dissection as a Teaching Aid in Anatomy: Insights from First-Year MBBS Students from Vidharbha

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Introduction: Anatomy is a fundamental subject in medical education, traditionally taught through cadaveric dissection. With limited cadaver availability, ethical concerns and the need for interactive learning, virtual dissection has emerged as a promising adjunct. This study assessed the perceptions of first-year MBBS students from Vidarbha regarding virtual dissection as a teaching aid in anatomy.

Methodology: A cross-sectional, questionnaire-based study was conducted among first-year MBBS students at Shri Vasantrao Naik Government Medical College (SVNGMC),

Yavatmal. Of 200 students, 180 responded (response rate: 90%). The study tool included 20 closed-ended Likert items and 15 investigator-designed questions exploring usability, challenges and suggestions. Data were analyzed using descriptive statistics.

Results: Students expressed predominantly positive perceptions. Enjoyment of virtual dissection was reported by 140 (77.8%) and 126 (70.0%) stated it motivated them to study anatomy. Deep learning was endorsed by 143 (79.5%) and 139 (77.2%) felt it improved exam performance. However, only 42 (23.3%) preferred it over cadaver dissection, while 133 (73.9%) believed it should remain a supplement. Section B responses emphasized enhanced realism (74.4%), interactivity (65.6%) and accessibility (63.9%) as key advantages, whereas lack of tactile experience (70.6%) and limited realism (61.7%) were common challenges.

Conclusion: Virtual dissection is perceived as a valuable adjunct to anatomy teaching, enhancing motivation and visualization. Nonetheless, cadaveric dissection remains indispensable. Integrating both methods may optimize anatomy education in resource-limited settings.

082. Anatomical Spectrum of the Suprascapular Notch and Ossification of the Superior Transverse Scapular Ligament: A Morphometric Analysis in Adult Human Scapulae from the Vidarbha Population

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Background: The suprascapular notch (SSN) on the superior border of the scapula is traversed by the suprascapular nerve beneath the superior transverse scapular ligament (STSL). Variations in its morphology, dimensions and ossification status are clinically significant as they predispose to suprascapular nerve entrapment, an important cause of chronic shoulder pain and dysfunction.

Objective: To analyze the anatomical spectrum of SSN variations in adult scapulae from the Vidarbha population with emphasis on morphometric parameters.

Materials and Methods: A descriptive cross-sectional study was conducted on 42 dried adult scapulae obtained from the Department of Anatomy, SVNGMC, Yavatmal. Each scapula was examined for SSN type according to Rengachary's classification, ossification of the STSL and unusual variants. Morphometric measurements, including superior transverse diameter, vertical depth and circumferential perimeter, were recorded using digital calipers. Descriptive statistics were calculated and compared with published data.

Results: The most frequent type was Type III (42.9%), followed by Type II (33.3%) and Type IV (14.3%). Type I was identified in 2.4% of specimens. Ossified variants included Type V (2.4%) and Type VI (4.7%). Mean superior transverse diameter was maximum in Type III (11.22 ± 2.27 mm), while the least depth was noted in Type IV (6.02 ± 1.03 mm).

Conclusion: The Vidarbha population demonstrates predominance of Type III SSN, with a moderate incidence of ossified variants that increase the risk of nerve entrapment. Awareness of these patterns is important for clinicians and surgeons managing shoulder disorders.

083. Bony Landmarks for Localization of the Extracranial Facial Nerve Trunk and Its Branching Pattern within the Parotid Gland

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Introduction: The facial nerve, its branches & its communications with branches of the trigeminal nerve need to be carefully dissected out & preserved during parotid surgeries. In this regard, localization of the nerve trunk using bony landmarks, & a knowledge of the various branching patterns is helpful. This study aims to add to the existing body of knowledge in this regard.

Methodology: We dissected 11 embalmed cadavers to display 20 facial nerve trunks and the intra-parotid portions of the nerve. Distance of the nerve trunk from 4 landmarks were measured. Three branching pattern features were noted: 1) whether there was bifurcation or trifurcation of the nerve trunk; 2) type of branching (types I-VI as classified by Davis, 1956); and 3) whether the buccal branch arose from temporofacial or cervicofacial division, or from both.

Results and Statistical Analysis: The nerve trunk bifurcated into temporofacial & cervicofacial divisions in 85%, & trifurcated in 15% cases. The branching pattern (Davis, 1956) was type I in 43%, type II in 29%, type III in 14%, type IV in 0%, & type V in 14%. Cases. Mean distance of the nerve trunk from the 4 landmarks chosen were: 21 mm (SD + 7 mm) from mastoid process; 33 mm (SD + 4 mm) from angle of the mandible; 22 mm (SD + 5 mm) from external acoustic meatus; &23 mm (SD + 6 mm) from tragal pointer.

Conclusion: The present study explored localization of the facial nerve trunk and its branching pattern in a sample of the population of Eastern India.

084. An Osteological Finding of Wormian Bone: A Case Report

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Background: Wormian bones, also known as sutural bones, are small, irregular bony fragments frequently located within the cranial sutures, most commonly along the lambdoid suture. These bones, which differ in size, shape, and number, usually originate from accessory ossification centers. Understanding their occurrence is important, as they may be seen both in normal skulls and in association with disorders such as osteogenesis imperfecta and rickets.

Objective: The objective of this study was to examine the presence of wormian bones in dry adult human skull.

Case Report: During the routine bone counting of 60 skull at department of M. P. Shah Government Medical College, Jamnagar wormian bone was noted in 2 dry adult human skull.

Conclusion: Recognizing the occurrence and distribution of wormian bones is of clinical significance, particularly for neurosurgeons. Since these bones may resemble fracture lines in radiographs, it is essential for radiologists to be aware of this normal anatomical variation to avoid misdiagnosis.

085. A Persistent Metopic Suture in Adult Human Skull: A Case Report

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Background: The metopic suture is a fibrous suture that runs from the top of the head (anterior fontanelle) down the forehead to the bridge of the nose (nasion), separating the right and left halves of the frontal bone. The metopic suture generally fuses between 1-8 years of life. If it persists after that time it is known as metopism. In about 5-10% of adults, the metopic suture does not fuse completely, and a remnant (called a persistent metopic suture) may be visible on imaging or skull examination. This is a normal variant and usually asymptomatic. Its presence may be mistaken for a skull fracture and also may be associated with frontal sinus irregularities.

Objective: The objective of this study was to examine the persistent metopic suture in adult human dry skull.

Case Report: During the routine bone counting of 60 skull at the Department of Anatomy, M. P. Shah Government Medical College, Jamnagar, the persistent metopic suture was noted to be present between the two frontal bones extending from the nasion to the bregma in a skull. The persistent metopic suture was present in 1.66% skull (1/60 skull).

Conclusion: The persistence of metopic suture in adults which separates the frontal bones is important in assessing the radiological images and in evaluation of medico-legal cases.

086. Anatomical Variations of Circumflex Femoral Arteries with Its Surgical and Embryological Insights

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Introduction: Medial circumflex femoral artery (MCFA) and Lateral circumflex femoral artery (LCFA) are major blood supply to the hip joint, femoral head along with adductor and extensor compartments of thigh. MCFA and LCFA usually arise from Profunda femoral artery (PFA). Developmentally, persistence or regression of specific vascular channels as primary axial artery and its anastomoses with sciatic and femoral arteries during embryogenesis can result in diverse vascular variations in this region.

Methodology: Study was conducted on 20 cadavers comprising 40 hemipelvis (20 left and right side each), of which 14 were male and 6 were female, in the department of Anatomy, Maulana Azad Medical College. Hemipelvis along with the lower limb were dissected to study the origin, course and branches of MCFA and LCFA. The point of origin of both the CFA were measured from midpoint of inguinal ligament (IL) and compared along with their course and relations with adjacent structures. Photographs were taken and analyzed using image J.

Results: MCFA originated from PFA (in 82.5%) and Femoral artery (FA) (in 12.5%). LCFA originated from the PFA (in 85%) and FA (in 15%). Complete absence of MCFA was noted in 5% specimens. The mean distance from the point of origin of CFA and midpoint of IL, in all the specimens with normal branching pattern (from PFA) was 5.2 cm and 5.6 cm for MCFA and LCFA respectively. Whereas, the specimens with variation in branching pattern of CFA (CFA arising from FA), the measurements were 4.2 cm and 4.9 cm for MCFA and LCFA.

Conclusion: Knowledge about the variations in CFA, is markedly significant to cardiovascular surgeons, traumatologists, general surgeons and radiologists to avoid iatrogenic complications such as arteriovenous fistulas, intraoperative and postoperative bleeding during catheterization and ultrasound-guided vascular cannulation.

087. Atypical Position of Median Cubital Vein: Clinical and Embryological Insights

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Introduction: The cubital fossa is a vital anatomical region frequently used for various diagnostic and therapeutic procedures. Its roof is formed by the bicipital aponeurosis, which protects underlying neurovascular structures such as median nerve and brachial artery, while the median cubital

vein (MCV) runs superficial to it. MCV holds great clinical significance due to its accessibility for venipuncture, chemotherapy administration, and the creation of arteriovenous fistulas for hemodialysis. Therefore, a thorough understanding of its anatomical variations is essential to minimize the risk of iatrogenic injuries during these procedures.

Methodology: During the routine undergraduate dissection classes of the upper limb in department of Anatomy, Maulana Azad Medical College, an unusual finding in MCV was noted in the right cubital fossa, in a 55-year-old male cadaver.

Results: An atypical arrangement of MCV was observed in right upper limb, where it was unusually seen in the middle of the forearm instead of its typical position over the roof of cubital fossa.

Conclusion: Ignorance of such vascular variants during clinical and surgical interventions in cubital region may result in complications such as reduced blood supply to the hand and forearm, cubital tunnel syndrome, and ischemic contracture. Therefore, awareness of findings reported is not only of academic interest but also of vital clinical importance, and should be carefully considered during venipuncture, intravenous cannulation, flap surgeries, and other operative procedures in this region.

088. Study on Knowledge, Attitude, and Practice Regarding Research among Medical and Nursing Students: A Multi-institutional Cross-sectional Survey from India

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Introduction: Research involvement during undergraduate medical education is essential for fostering evidence-based practice and shaping future physician-scientists. Yet, there is limited literature on Indian medical students' knowledge, attitudes, and practices (KAP) related to research. Understanding these aspects can guide interventions to strengthen research culture in medical training. To evaluate the knowledge, attitude, and practice of research among medical students from medical institutes of national importance (INIs) across India and identify factors influencing their engagement, we have conducted a cross-sectional questionnaire-based survey.

Methodology: This cross-sectional questionnaire-based survey was conducted among 723 medical and nursing students from multiple Institutes of National Importance (INIs) in India. Data were collected using a self-administered structured questionnaire in three domains comprising knowledge, attitude and practice. Descriptive statistics and frequency distributions were used for analysis, and comparative analyses were performed to assess knowledge, attitude, and practice (KAP) scores as well as the factors associated with them.

Results: A total of 723 medical students participated in the survey across multiple INIs in India.

I. Knowledge Assessment: About half of the students are aware of one major research funding program, but knowledge about other funding agencies is limited. Awareness and use of research databases and search engines are also low, and most students are unfamiliar with indexing systems or the process of submitting to academic journals.

II. Attitude Evaluation: Students largely value research for learning, career development, and medical advancement, though the concerns remain about the financial stability of a research-only career, and enthusiasm levels vary.

III. Practice Analysis: Very few students have attended research training, regularly read journals, or engaged in projects and publications. Common barriers include lack of time, inadequate guidance, topic selection difficulties, and low motivation.

Conclusions: Medical students from INIs view research as important but face challenges in practice. Structured mentorship, curriculum integration, enhanced awareness, and accessible funding opportunities are essential to foster research participation and interest.

089. Role of SMARCE1 in Trophoblast Migration: Insights from Knockdown Studies in HTR-8/SVneo Cells

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Introduction: Trophoblast migration and invasion dysfunctions are essential mechanisms contributing to the development of preeclampsia. These processes are essential for placentation and adequate maternal–foetal exchange, and their dysregulation contributes to adverse pregnancy outcomes. SMARCE1, a component of the SWI/SNF chromatin-remodelling complex, has been linked to cancer cell invasion and metastasis, but its role in trophoblast biology remains unclear. Hence, the present study aims to investigate the role of SMARCE1 in regulating trophoblast migration and invasion using the HTR-8/SVneo cell line *in vitro* model.

Methodology: HTR-8/SVneo trophoblast cells were subjected to knockdown using a custom-designed siRNA pool for transfection alongside appropriate control treatments. The efficacy of the transfection was confirmed

through Western blot. Cell migration was evaluated via transwell migration assay, with quantification of migrated cell populations and calculation of migration index and percentage migration.

Results: The silencing of SMARCE1 expression resulted in a significant reduction of the migratory capacity of HTR-8/SVneo cells in comparison with controls, underscoring its essential role in trophoblast cell motility. This observation, consequent to SMARCE1 silencing, suggests that diminished expression hampers trophoblast motility.

Conclusion: Our findings, for the first time, highlight the role of SMARCE1 as a regulator of trophoblast migration with significant implications for placental development by influencing cell motility. The aberrant regulation of SMARCE1 may lead to compromised trophoblast function observed in pregnancy-related conditions such as preeclampsia. Further investigations are required to elucidate the specific molecular pathways through which SMARCE1 modulates trophoblast functionality.

090. Embryotoxic Effects after Exposure to Acetamiprid (Insecticide) on the Development of Chick Embryos

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Introduction: Toxic effects from acetamiprid exposure include neurological symptoms like memory dysfunction, convulsions, and muscular weakness, as well as cardiovascular issues such as tachycardia and hypotension. Insecticides are chemical compounds that are extensively used for pest management in agriculture, urban and household environments as well as in the medicine to control different diseases such as typhus and malaria amongst others. The purpose of the current study was to investigate the toxic effects of the Acetamiprid (insecticide) on the developing chick embryos.

Methods: The present current study was carried out in the department of Anatomy Govt. Medical College, Budaun U. P. on 180 fertile eggs of white leghorn chicken obtained from government poultry farm after taking permission from animal ethical committee. The chicken eggs were exposed to Acetamiprid insecticide with doses of 5 µg, 10 µg and 20 µg in a volume of 5 µl, 10 µl and 20 µl respectively and control same as test group. The embryotoxic effects and morphological changes were observed, recorded and photographs.

Results: The results show that experimental group had comparatively more cases of embryotoxic effects; growth retardation resulting into failure of retraction of yolk sac, limbs defects, Ectopia Viscerale and morphological malformations as compared to controls group.

Conclusion: This study concluded that chick embryos Acetamiprid exposure inhibited fertilization and early embryonic development. Acetamiprid insecticide exposure increases the risks of Embryotoxic effects and morphological changes on chick embryos and comparatively higher doses proved more teratogenic and cause harmful effects.

091. CT-based Assessment of Spleen Dimensions and Their Correlation with Anthropometric Parameters in Central Indian Adults: An Analytical Cross-sectional Study

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Background: The spleen—the largest lymphoid organ—filters blood, removes senescent erythrocytes, stores platelets and contributes to immune defence. Its size varies with age, sex, body habitus and ethnicity. Region-specific normative data are essential for early detection of splenic abnormalities but are scarce for adults in central India This study aimed to establish CT-based reference values for key splenic dimensions and to explore their association with anthropometric indices in Central Indian adults.

Materials and Methods: An analytical cross-sectional study was conducted on abdominal CT images of 105 adults (>18 years; 55 men, 45 women) without splenic disease. Craniocaudal length (L), maximum axial diameter (D) and maximum transverse width (T) were measured; splenic volume was estimated using the formula 30 + 0.58× (L × T × D). Measurements were performed with dedicated radiological software. Data were compiled in Microsoft Excel and analysed using Kobo Toolbox. Descriptive statistics, Pearson's correlation and multiple linear regression assessed relationships with age, sex, height and BMI (p < 0.05 significant).

Results: Splenic length and width showed significant positive correlations with body height and weight, while age demonstrated a mild negative association. Notable sex-based differences in splenic size were observed.

Conclusion: This study provides region-specific CT reference values for splenic dimensions in Central Indian adults. Such data can improve clinical and radiological assessment of organomegaly and support surgical planning and medicolegal evaluation.

092. Applied Anatomy of Brachial Plexus

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Background: The terminal branches of the brachial plexus supply the entire upper limb. Variations in their origin may lead to clinical confusion. The brachial plexus is a complex network of nerves formed by the anterior rami of the C5 to T1 spinal nerves, which supplies the entire upper limb. It

is arranged into roots, trunks, divisions, cords, and terminal branches. This intricate arrangement makes it particularly vulnerable to variations and injuries.

Objective: To identify terminal branches and note their course with special reference to surgical relevance.

Materials and Methods: During routine dissection of 3 cadavers (6 upper limbs; 2 male and 1 female, aged between 45-60 years) in the Department of Anatomy, Katihar Medical College, the following observations were made.

Results:

1. Cadaver 1 (Male, ~55 years):
   - The musculocutaneous nerve was absent.
   - Its fibers were incorporated within the median nerve, which supplied the muscles of the flexor compartment of the arm.
   - Other nerves followed their usual course.
2. Cadaver 2 (Male, ~50 years):
   - The median nerve roots united higher than usual, near the coracobrachialis, instead of at the axilla.
   - The ulnar nerve and radial nerve showed normal origin from the cords.
3. Cadaver 3 (Female, ~48 years):
   - The cords of the brachial plexus were seen encircling the axillary artery in the classical manner (lateral, medial, posterior).
   - No anatomical variation was observed.

Discussion:

- In Cadaver 1, absence of the musculocutaneous nerve is a well-documented but rare variation. Clinically, such a variation may mislead surgeons during nerve repair or confuse anesthesiologists during brachial plexus blocks.
- In Cadaver 2, a high union of the median nerve roots can alter the site of compression or influence clinical presentation in entrapment neuropathies. Such findings have been reported in anatomical literature and highlight the importance of vigilance during orthopedic and vascular procedures.
- In Cadaver 3, the normal anatomical pattern serves as a baseline for comparison. Knowledge of the classical relationship of cords with the axillary artery is vital for axillary blocks, vascular surgery, and trauma management.

Conclusion: Awareness of terminal branch variations is of great importance in trauma cases, nerve repair, and anesthetic practice.

093. Study of Novel Mutations in Comt Gene Variants, Phenotypes and Health Compliance of Schizophrenia Patients in South Karnataka

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Introduction: Catechol-O-methyl trasnferase (COMT) gene is candidate gene of Schizophrenia. The COMT gene, located on Ch.22q.11.21band. COMT gene actively integrated with various neuro-chemical pathways like dopamine and other metabolic pathways, estrogen metabolism. Novel variants of COMT gene [Non-synonymous] and their enzyme activity enhance various symptoms.

Aim: Polymorphism of COMT gene associated with phenotypes in schizophrenia patients in Tumkur district, South Karnataka.

Objectives:

- To study of Novel mutations in exon: 3 of COMT gene in SCZ patients.
- To correlate novel variant of COMT gene with phenotypes of SCZ patients.

Methodology: We selected 80 sample SCZ patients, Male n = 30 & female 50 samples in shridevi institute of medical sciences & research hospital at tumkur. DNA isolation, PCR amplifications, 1% Gel electrophoresis, and Sanger sequence analysis. Statistical analysis was done by SPSS (Stastical Package software).The Fisher test was applied for the statically analysis and the results were expressed *P* values ($P > 0.001$) were considerable significant.

Results: We found two novel variants in SCZ patients, in male C/A variant [Non-synonymous], c. C215A, P = A72E, while, in female, A/T [Non-synonymous] c. A254T, P. Q85 L. In male C/A novel genotype associated with tensions, anxiety, lack of food interest, sleeping issues, abnormal behavior. Thefore, novel genotype A/T associated with Aggressive, mood, sleeping issues, moreover, female menstrual compliances. These two novel variants significantly associated with symptoms & other compliance.

Conclusion: This study results concluded that, the A/T & C/A significantly effect on SCZ symptoms. Novel variants can be applied to various clinical diagnostic, therapeutic and personalized medicine.

094. Rectus Sternalis: A Rare Cadaveric Observation and Its Clinical Relevance

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Introduction: The sternalis or rectus sternalis muscle is a rare anatomical variant of the anterior chest wall. Present in 3-8% of individuals, it exhibits variable morphology, uncertain embryological origin, and clinical implications. Its recognition is crucial for anatomists, radiologists, and surgeons to avoid misdiagnosis and optimize surgical outcomes.

Materials and Methods: A comprehensive study of case reports and cadaveric studies (Bahgat *et al*., 2024; Shankar *et al*., 2013; Raikos *et al*., 2011; Sari *et al*., 2014; Brady *et al*., 1996), as well as a cadaveric case report documented at Baroda Medical College by Vyas *et al*. was done.

Observation: In the Baroda Medical College cadaveric dissection, a bilateral sternalis muscle was identified. It originated from the rectus sheath, with its lower part fleshy and upper part tendinous. It was vertically oriented, superficial to pectoralis major and extended along the parasternal region. Its attachment and morphology were comparable with earlier reports.

Discussion: Literature review shows that the sternalis may be misinterpreted in mammography, CT, and MRI, simulating pathological masses. Surgically, it can complicate or contribute to mastectomy and reconstructive procedures. Its variable morphology supports theories of it being a remnant of panniculus carnosus, or an aberrant extension of rectus abdominis or sternocleidomastoid.

Conclusion: The sternalis muscle, though rare, is clinically significant. Awareness of its variation prevents diagnostic errors and aids surgeons in operative planning. Its inclusion in teaching anatomy enhances understanding of human muscular variability.

095. Unilateral Double Foramen Transversarium – A Rare Variant

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Background and Aim: The foramen transversarium (FT) of cervical vertebrae normally transmits the vertebral vessels and sympathetic plexus which is a branch from cervico-thoracic ganglion, except foramen transversarium of seventh cervical vertebra which only transmits vertebral vein. Duplication (double FT) is a recognized anatomical variant with potential clinical and surgical implications. The larger foramen usually encloses vertebral artery while the smaller one usually has vertebral vein and vertebral nerve. It is commonly found in sixth cervical vertebra and less frequently in other vertebrae. The presence of double foramen transversarium may affect the course of these structures resulting in diverse clinical presentations like headache, migraine and fainting attacks which may be due to the compression of vertebral artery. Thus the knowledge of double foramen transversarium is essential for Neurologists, Orthopaedicians and Radiologists.

Methods: During routine Osteology Demonstration in the Department of Anatomy of Government Medical College, Baroda, a cervical vertebra with double foramen transversarium on one side was found and it was carefully examined with the naked eye.

Results: The notable occurrence of double foramen transversarium at lower cervical levels (commonly C6 and C7) and a tendency for unilateral presentation — often right-sided. The embryological explanations related to segmentation and vascular development demonstrate that double foramen transversarium may reflect arterial fenestration/duplication or accessory venous channels. Clinically, duplicated foramen transversarium can alter vertebral artery course, complicate cervical instrumentation, mislead radiologic interpretation, and theoretically predispose to vascular compression in select situations.

Conclusion: Double foramen transversarium is an important anatomical variant with consistent presence across populations and study methods. Unilateral double foramen transversarium is more common than the double foramen transversarium. Keeping in view the incidence of accessory foramen transversarium and its associated alteration in the anatomy of vertebral artery and it's clinical implications, a sound knowledge of it is essential for the spine surgeons, interventional radiologists and anatomists. It is recommended that cervical bone collections and imaging reports explicitly record foramen transversarium duplication, and that further computed tomography/angiographic studies correlate foramen transversarium duplication with vertebral artery anatomy and clinical outcomes.

096. Morphometric Analysis of Supraorbital Foramen/Notch in Dry Human Skulls

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Background: The supraorbital foramen (SOF) or notch, located in the frontal bone above the orbit, permits the passage of the supraorbital nerve and artery. Its size, shape, and location exhibit variability, which is important for clinical applications like nerve blocks and forensic anthropology.

Objective: This study aims to perform a morphometric analysis of the supraorbital foramen/notch in dry human skulls, focusing on variations across sex, age, and population, with clinical and forensic implications.

Materials and Methods: Fifty adult human skulls (25 male, 25 female) were analyzed for the shape (foramen vs. notch), size (diameter), and location relative to cranial landmarks (nasion, glabella). Measurements were taken using digital calipers and image analysis software.

Results: In this analysis of 50 skulls, males exhibited significantly larger supraorbital foramina (3.2 ± 0.6 mm) compared to females (2.7 ± 0.5 mm). Complete foramina were more common in males, whereas females showed higher notch frequency. The foramen's distance from the nasion was also greater in males, confirming sexual dimorphism with important clinical and forensic applications.

Conclusion: This study underscores the importance of supraorbital foramen variability for clinical procedures and forensic identification, enhancing the precision of nerve blocks, facial surgeries, and forensic analyses.

097. A Study on Occurrence of Third Trochanter in the Femur in Central Rajasthan

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Background: The third trochanter is an accessory bony projection sometimes present on the posterior surface of the femur near the gluteal tuberosity. It serves as an additional attachment site for the gluteus maximus. Its frequency varies among populations and has significance in anatomy, orthopedics, and forensic anthropology.

Aim: To assess the occurrence and distribution of the third trochanter in dry adult femur from Central Rajasthan.

Materials and Methods: An observational study was conducted on 100 dry adult femur, of unknown age and sex, collected from medical colleges in Rajasthan, which were examined by visual inspection to assess the presence of the third trochanter, its side, and laterality. The data obtained were analyzed for percentage occurrence and compared with findings reported in previous studies.

Results: In the present study of 100 femur, the third trochanter was observed in 14% of cases, more frequently on the right side (18%) than the left (10%), though the difference was not statistically significant. Most were small and rounded, with only a few ridge-like forms. Findings align with Indian studies, showing population-specific variation.

Conclusion: The third trochanter, though uncommon, is an important anatomical variant. Awareness prevents radiological misdiagnosis and aids in surgical planning. It also provides a useful osteological marker for anthropological and forensic investigations in the Central Rajasthan population.

098. Morphometric Study of the Distal End of Dry Adult Humerus of the Central Rajasthan

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Background: The distal humerus forms a critical part of the elbow joint, contributing to its stability and mobility. Its morphometry is clinically relevant for fracture fixation, arthroplasty, and implant design, while also serving an important role in forensic identification and sex estimation.

Aim: To analyze the morphometric features of the distal end of dry adult humerus from Central Rajasthan, with emphasis on sexual dimorphism, side differences, and their clinical and forensic applications.

Materials and Methods: One hundred dry adult humerus (50 right, 50 left) were studied. Parameters measured included bicondylar width, trochlear and capitular dimensions, mediolateral and anteroposterior diameters, and depths of the olecranon and coronoid fossae. Measurements were taken with digital Vernier calipers and an osteometric board. Data were statistically analyzed for mean, standard deviation, sexual dimorphism (t-test), side asymmetry, and correlation with stature.

Results: Males exhibited significantly greater bicondylar and trochlear widths. Right–left asymmetry was minimal, with only capitular width showing slight but non-significant variation. Bicondylar width demonstrated moderate positive correlation with stature. The findings were in line with previous studies, while also highlighting regional variations specific to Central Rajasthan.

Conclusion: The distal humerus shows clinically and forensically important variations by sex and side. These results provide baseline reference values for Central Rajasthan, aiding orthopedic practice and forensic anthropology.

099. Study of Variations in Talar Articular Facets of Human Calcaneum

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Introduction: Calcaneum is the largest and strongest tarsal bone in humans with its long axis inclined upwards and laterally. Talocalcaneal joint is a major synovial subtalar joint where calcaneum articulates with talus superiorly by three articular facets which are anterior facet, middle facet and posterior facet. In anterior one third of calcaneum, there are anterior and middle facets for articulation with the head of the talus. In middle one third of the superior surface of the calcaneum, there is an oval facet for articulation with the body of the talus. Between the middle and the posterior facets, the tarsal tunnel and sinus tarsi are placed. Movements of the calcaneum are integrated in the subtalar and transverse talar joint. There is considerable variation in the number and arrangement of these facets.

Objectives: The aim of the study is to find out the variations of talar articular facets of calcanei to have a better understanding of anatomical elements contributing to subtalar joint stability.

Materials and Methods: The present study was an observational study conducted on 162 adult dry human calcaneal bones at SSG Medical college, Vadodara (Gujarat). Adult bones irrespective of the sex were included in this study. Each calcaneum was carefully examined with the naked eye for various patterns of talar articulating facets on calcaneum.

Results: Five variations in talar articular facets of calcaneum were found in this study. Type I calcanei-Fusion of anterior and middle facets and were most commonly found (65%), Type II calcanei-Anterior and middle facets were separate and of about 32%. This group was further divided into Type IIa, Type IIb and Type IIc on the basis of distance between anterior and middle facets. Type III calcanei-Absence of anterior facet and were about 3%. Type IV calcanei-Fusion of all three facets i. e. anterior, middle and posterior facets, and were not found. Type V calcanei-Fusion of middle and posterior facets and were not found. Type I was predominantly seen followed by Type II.

Conclusion: Configurations of articular facets influence subtalar joint stability. Joints with two facets configuration are comparatively more stable. Detailed study of the variations in talar articular facets of calcaneum will be helpful for reconstruction surgeries of hind foot deformities and foot rehabilitation procedures.

100. A Study of the 3D Branching Patterns of the Splenic Artery using Silicon Cast

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Introduction: The human spleen is a highly vascular lymphatic organ supplied by the splenic artery, a branch of the celiac trunk of the abdominal aorta. It is tortuous and an end artery. The knowledge of the variational anatomy of the splenic artery is important for surgeons and radiologists to prevent iatrogenic complications. This study aimed to accurately identify the 3D view of segmental branches of the splenic artery by the use of silicone gel cast.

Methodology: The spleens were collected from the cadavers of the Forensic department, JSS Medical College, and dissected carefully. The splenic artery and all its branches were cleaned and traced. Silicone gel was injected into the coeliac trunk after thoroughly cleaning the spleen with saline water. After injection, the specimen was kept in the open air for 24 h until the sealant solidified, and the surrounding tissue was destroyed by concentrated HCl. Thus, a luminal cast was prepared, and the pattern was studied based on the obtained cast.

Results: A splendid luminal cast of the splenic artery showed its 3D view of segmental branches and polar branches of the spleen. The splenic artery originates from the coeliac trunk and is divided into polar branches and terminal primary branches.

Conclusions: An excellent, three-dimensional, dry, and long-lasting model of the artery's internal structures and branches is produced by silicon cast plastination of the splenic artery, which is perfect for teaching intricate vascular anatomy.

101. Fingertip Patterns in East Indian Women with PCOS, A Case Control Study in NRS Medical College and Hospital

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Introduction: Polycystic ovary syndrome (PCOS) is a heterogeneous, hereditary, endocrine disorder of unknown etiology. Dermatoglyphics, being genetically determined and permanent, may serve as a potential marker for prediction of PCOS. This study evaluates dermatoglyphics in women with PCOS compared to controls who don't have PCOS.

Methodology: A Case Control Study was conducted on 30 ultrasonographically confirmed PCOS patients and 30 age-matched controls attending Gynaecology OPD of NRSMCH. Fingerprints were recorded using ink method. Dermatoglyphic data { Fingertip patterns, Total Finger Ridge Count (TFRC) and Absolute Finger Ridge Count (AFRC) } was collected and statistically analysed.

Results: Fingertip patterns in cases and controls were, whorls (54%) > loops (40%) > arches (6%) and loops (54%) > whorls (39%) > arches (7%) respectively, Mean TFRC and AFRC of cases and controls were (165 ± 42 and 260 ± 58) and (142 ± 36 and 225 ± 51) respectively.

Statistical Analysis: Whorls were more frequent in PCOS cases (54%) than controls (39%), while loops predominated in controls (54%) compared to cases (40%).No significant difference was observed in arches.(*P* value < 0.05). Mean TFRC and AFRC were significantly higher in PCOS cases (165 ± 42 and 260 ± 58) than in controls (142 ± 36 and 225 ± 51).

Conclusion: Chi-square analysis showed a significant association between whorl frequency and PCOS Independent t-tests confirmed significantly higher TFRC and AFRC values in cases. So Dermatoglyphics may serve as a simple, inexpensive, non-invasive method for identifying women at risk of PCOS.

102. Hepatic Arterial Variations and Their Importance in Safe Hepatobiliary Surgery: A Cadaveric Study with Clinical Significance in Rajasthan Population

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Introduction: The hepatic artery is a key structure in hepatobiliary surgery, and its preservation is vital to ensure adequate perfusion of the liver and biliary system. With the introduction of laparoscopic cholecystectomy, renewed emphasis has been placed on understanding hepatic arterial anatomy, as accidental division or thrombosis may result

in ischemia of the liver or bile ducts with potentially devastating outcomes.

Objective: The present study was undertaken to examine the normal anatomy and variations of the hepatic artery and to document their frequency.

Methodology: A descriptive cadaveric study was conducted on 60 adult cadavers. Careful dissection was performed to trace the course, origin, and branching pattern of the hepatic artery. Variations in the right and left hepatic arteries were identified, recorded, and analyzed.

Results: Anomalous variations were observed in 45% of dissections. Multiple variations were common; 40% of anomalous right hepatic arteries showed more than one variation, while 70% of anomalous left hepatic arteries had associated anomalies. In 27% of specimens, more than two variations were present. These findings highlight the complexity and high frequency of hepatic artery variations.

Conclusion: Hepatic arterial variations are frequent and often multiple. Detailed anatomical knowledge is therefore indispensable for hepatobiliary surgeons to avoid iatrogenic injury, reduce morbidity, and ensure safe surgical outcomes.

103. Morphological Study of Subscapularis Muscle in Adult Cadavers and Its Clinical Implications

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Aim: Subscapularis muscle is one of the rotator cuff muscles, which is commonly involved in the signs and symptoms associated with the dysfunction of the shoulder complex. The aim of the present study was to study the morphology and morphometry of the subscapularis muscle in adult cadavers.

Methods: The present study utilized 20 adult embalmed cadavers and 40 subscapularis muscle were studied. The number of muscle slips were studied along with the measurement of the muscle. The length, width, thickness of each slip of the muscle and the tendon of subscapularis were measured by using the digital Vernier caliper. The nerve twigs to the subscapularis were studied.

Results: The length of slip 1, slip 2, slip 3, slip 4 and slip 5 were 82.75 ± 13.22 mm, 88.87 ± 9.08 mm, 100.12 ± 14.84 mm, 113.4 ± 14.29 mm and 108.82 ± 14.84 mm respectively. The width and thickness of the muscle were 23 ± 5.4 mm and 8.02 mm respectively. The length, width and thickness of the muscle were 37.7 ± 1.4 mm, 30.4 ± 1.9 mm and 3.2 ± 0.4 mm respectively. The nerve twigs were ranging between 1 and 3 in each muscle.

Conclusion: The morphology and morphometry of the subscapularis muscle is important to understand the clinical conditions like dysfunction of the subscapularis muscle and subsequent subacromial impingement syndrome.

104. A Cadaveric Study of Anatomical Variations in the Limbic System of Human Brain

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Purpose: The limbic system is a collection of brain structures responsible for affective processing, spatial coding, and certain types of memory. A comprehensive investigation of numerous limbic system components is necessary to thoroughly understand anatomical and pathological differences in individuals with related disorders (e.g., Alzheimer's, depression, etc.). This study examines anatomical variations of limbic system structures including the hippocampus, dentate gyrus, amygdala, and cingulate gyrus.

Methods: This cadaveric study includes the dissection of 20 formalin-fixed brain hemispheres during dissection classes in department of anatomy of Darbhanga medical collage, Bihar. The dentate gyrus, hippocampus, and amygdala were given categorical results i.e ill defined, moderately defined, and well-defined; additionally, quantitative measurements were taken for all Structures.

Results: Our results indicate variations in the classification of the dentate gyrus (36% well-defined, 51%moderately defined, and 13% ill-defined) and amygdala (58% well-defined, 40% moderately defined and 2% ill-defined). All hippocampus samples were well-defined (100%).

Conclusion: The knowledge of typical anatomy and morphology furthers our understanding of the limbic system and could be used to better understand clinical presentations. Future studies may be able to link anatomical variations and any potential relationships reported in this study to observed behavior. In summary, a thorough understanding of these variations will be useful for diagnostic purposes and future research.

105. Congenital Bicuspid Aortic Valve: A Case Study

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Introduction: Congenital bicuspid aortic valve (BAV) is the most frequent congenital cardiac malformation, occurring in 1-2% of the population. It is associated with progressive aortic stenosis, regurgitation, infective endocarditis, and ascending aortic dilation. Early detection is essential for surveillance and timely intervention.

Methodology: A case report was prepared on a patient presenting with [symptoms—e.g., exertional dyspnea, chest discomfort, or incidental murmur]. Clinical examination and transthoracic echocardiography were performed to

establish the diagnosis. Relevant investigations including ECG, chest X-ray, and laboratory parameters were analyzed to rule out associated conditions.

Results: Echocardiography confirmed a congenital bicuspid aortic valve with [type of cusp fusion, e.g., right–left coronary cusp fusion] and [degree] of aortic stenosis/regurgitation. The ascending aorta was [normal/dilated]. The patient was managed with [medical therapy/surgical referral/regular follow-up], with symptomatic improvement and stable echocardiographic findings on short-term follow-up.

Conclusion: Bicuspid aortic valve should be suspected in young patients presenting with cardiac murmurs or unexplained symptoms. Echocardiography remains the diagnostic modality of choice, and regular follow-up is critical to prevent progression and associated aortopathy.

106. Morphometry and Variations in Surgical Anatomical Landmarks with Reference to Endoscopic Trans-nasal Trans-sphenoidal Surgery

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Introduction: The sphenoid sinus is a deep-seated paranasal sinus, with its anatomy bearing significant implications for endoscopic and trans-nasal surgical approaches. Precise localization of the sphenoidal ostium (SO), its position relative to surrounding structures, and variations in its shape and dimensions are crucial for safe and effective surgical interventions.

Materials and Methods: A cross-sectional observational study was conducted on 54 hemisected heads in the dissection hall of the tertiary care medical college over a period of 2 years implementing a convenient sampling method. The anatomical specimens showing gross deformity and pathological changes were excluded from the study. Shape and number of sphenoidal ostium and distances from different key anatomical landmarks and sphenoidal sinus dimensions in three planes were measured.

Results: The study demonstrates that the sphenoidal ostium is consistently solitary and typically oval-shaped, with reliable morphometric distances to crucial anatomical landmarks. The ostium usually relates medially or partially to the superior turbinate, and its placement favors the upper and middle thirds of the anterior wall. Sinus dimensions are relatively consistent.

Conclusion: This cadaveric study confirms key anatomical features of the sphenoidal sinus and ostium. The predictable location of the SO facilitates surgical orientation, and consistent morphometric data underscores its relevance for endoscopic sinus and skull base surgery. Understanding these relationships reduces complications and improves procedural efficacy in otorhinolaryngology practice.

107. Cervical Synostosis between Axis and Third Vertebra: A Case Report

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Introduction: Fusion of the axis (C2) with the third cervical vertebra (C3) is a rare congenital anomaly arising from defective segmentation of the vertebrae during embryonic development. Although often asymptomatic, it may present with restricted neck mobility, cervical pain, or neurological deficits secondary to spinal cord compression. From an osteological perspective, such fusions are valuable for understanding anatomical variations, morphological alterations, and their possible evolutionary implications. This case report highlights the osteological features of C2–C3 fusion, thereby contributing to the broader knowledge of cervical spine anomalies.

Case Report: During routine osteology demonstration classes on the upper extremities for undergraduate medical students in the Department of Anatomy, Patna Medical College, Patna (Bihar), a rare finding was noted: the axis (C2) was fused with the third cervical vertebra (C3). The fused vertebra was carefully examined for its anatomical features and photographed from multiple perspectives for detailed documentation.

Conclusion: This fusion represents a rare congenital anomaly with significant clinical relevance. Osteological evaluation offers valuable insights into its anatomical features, while documentation of such cases contributes to a deeper understanding of vertebral development and associated skeletal variations.

108. An Anatomical Study of Axillary Artery Branching Variations in Relation to the Coracoid Process and Their Surgical Significance

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Introduction: The coracoid process is a critical surgical landmark in the shoulder, surrounded by a complex of neurovascular structures including the axillary artery and its branches. Detailed knowledge of the anatomical variations and spatial relationships of these vessels is essential to prevent iatrogenic injuries during common shoulder procedures like coracoclavicular stabilization and subcoracoid decompression.

Methodology: This cadaveric study was conducted on 36 shoulders from 18 embalmed cadavers. Meticulous dissection was performed to expose the axillary artery and its branches in relation to the coracoid process. The presence and origin of branches from the thoracoacromial

artery were documented. Key measurements, including the horizontal distances from the tip of the coracoid process to the major arterial branches, were taken using a vernier caliper with the shoulder in a neutral position.

Results: The thoracoacromial artery was present in 97.22% of specimens. Notable variations were observed in its branches: the acromial branch (36.11%), clavicular branch (44.44%), deltoid branch (52.78%), and pectoral branch (58.33%) were found exclusively in male cadavers. The mean distance from the coracoid tip to the thoracoacromial artery was 31.89 ± 15.43 mm. Distances to other branches were also recorded (acromial: 11.02 mm, clavicular: 23.76 mm, deltoid: 40.51 mm). Variations in the origin of branches and the presence of common trunks (e.g., deltoacromial, clavipectoral) were also documented.

Statistical Analysis: Data are presented as mean ± standard deviation for continuous variables (distances, diameters) and as percentages for categorical variables (prevalence of branches).

109. Double Palmaris Longus: A Unique Anatomical Variation

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Introduction: The palmaris longus muscle is recognized as one of the most morphologically variable structures in the human forearm, frequently demonstrating agenesis, duplication, aberrant origin, or atypical insertion. Although often considered vestigial, its variability carries considerable clinical significance, particularly in reconstructive surgery, tendon grafting, and radiological interpretation. The present case delineates a rare unilateral duplication of the Palmaris longus, wherein one anomalous slip demonstrated direct continuity with the abductor digiti minimi, thereby establishing an unusual morphological integration between flexor compartment musculature and the hypothenar eminence.

Materials and Methods: During systematic dissection in a male cadaver, both upper limbs were examined with meticulous attention to the musculature of the forearm and hand. Standard dissection protocols were employed, supplemented by morphological assessment and photographic documentation to authenticate and illustrate the anomaly encountered.

Results: Case Report: On the right forearm, two discrete Palmaris longus muscles were identified. The lateral component exhibited a typical anatomical trajectory, originating from the medial epicondyle and terminating in the palmar aponeurosis. The medial component coursed parallel to the former but, instead of inserting aponeurotically, it merged directly with the fibers of the Abductor digiti minimi, thereby contributing to the hypothenar musculature. No such variation was observed in the contralateral limb, which retained a conventional single Palmaris longus.

Conclusion: This observation of unilateral duplication of the Palmaris longus, with one slip in direct continuity with the Abductor digiti minimi, enriches the documented spectrum of Palmaris longus variability. From an embryological standpoint, such an anomaly may be attributed to aberrant differentiation or persistence of the superficial flexor blastema in the forearm and hand. Recognition of these developmental variants is essential for anatomists and hand surgeons alike, as they influence surgical planning, tendon transfer options, and the interpretation of imaging modalities.

110. Cervical Ribs: A Case Report

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Inroduction: Cervical ribs are supernumerary ribs most commonly arising from the seventh cervical vertebra and rarely from the sixth or fifth, attributed to hyperplasia of the transverse process ossification center associated with Hox gene alterations. They occur in 0.5-1% of the population, are twice as common in females, more frequent on the right side, and often bilateral. Morphologically, they may be complete, articulating with the first rib or manubrium, or incomplete, ending freely in soft tissues. When not articulating with the transverse process, they are termed elongated transverse processes.

Methodology: A 32-year-old female with right supraclavicular pulsatile nodularity was evaluated using ultrasound to rule out phlebectasia, followed by contrast-enhanced CT (CECT) for detailed anatomical assessment.

Results: Ultrasound revealed mild tortuosity of the right subclavian artery with an underlying osseous structure suggestive of a cervical rib. CECT confirmed a right cervical rib fused anteriorly with the first rib, causing superior displacement of the subclavian vessels, closely abutting the scalenus anterior muscle, thereby producing the observed nodularity.

Conclusion: Cervical ribs, though rare, may mimic vascular lesions and cause neurovascular compression. Imaging is crucial for accurate diagnosis, differentiation, and appropriate management.

111. Histological Changes of Placenta in Pregnancy-induced Hypertension: A Comparative Study on Premature, Term, and Postdated Normal Deliveries at A N Magadh Medical College

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Pregnancy-Induced Hypertension (PIH) remains a significant complication in obstetrics, potentially impacting both maternal and fetal outcomes. Placental histology can provide valuable insights into the pathophysiological changes associated with PIH and its various clinical presentations.

Methods: A prospective, observational study was conducted at A N Magadh Medical College in the department of Anatomy, involving pregnant women with PIH who delivered prematurely, at term, or post-dated, alongside a control group of normotensive pregnancies. Placental tissue samples were collected during delivery, and histological examinations were performed to assess various parameters, including villous morphology, vascular changes, and inflammatory infiltrates.

Results: Our findings showed considerable histological changes in PIH placentas compared to normotensive ones. Placentas from PIH patients had increased syncytial knots, villous edoema, and reduced villous tree branching. Vascular alterations included aberrant spiral artery remodelling and increased perivillous fibrin deposition. In PIH placentas, persistent inflammatory infiltrates were found. Importantly, PIH subgroups (premature, term, and post-dated deliveries) showed unique histological patterns. Premature PIH cases had more severe villous changes than term and post-dated cases, and post-dated placentas had greater vascular abnormalities.

Conclusion: This study provides valuable insights into the histological changes occurring in placentas of women with PIH, highlighting the importance of considering gestational age at delivery when assessing these changes. Understanding the variations in placental histology among different clinical presentations of PIH can contribute to a better comprehension of the underlying mechanisms and may guide future diagnostic and therapeutic approaches to improve maternal and fetal outcomes in these high-risk pregnancies.

112. The Anatomy of Stroke

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Background: Stroke is one of the leading causes of morbidity and mortality worldwide. It results from the interruption of cerebral blood flow, either due to arterial occlusion (ischemic stroke) or vessel rupture (hemorrhagic stroke). A clear understanding of the vascular anatomy of the brain, including the Circle of Willis and major cerebral arteries, is essential to explain the pathophysiology of stroke and its clinical manifestations.

Objective:
- To study the anatomical basis of stroke with emphasis on cerebral circulation.
- To highlight the correlation between vascular territories and neurological deficits.
- To emphasize the importance of anatomical knowledge in stroke diagnosis and management.

Materials and Methods:
- 2 adult human cadavers were dissected in the Department of Anatomy, ANMMCH, Gaya.
- The Circle of Willis, anterior, middle, and posterior cerebral arteries, basilar artery and their branches were traced carefully.
- Anatomical variations and collateral circulations were documented.

Results:
- In Cadaver 1 (male, ~55 years):
  - The Circle of Willis was incomplete due to hypoplastic posterior communicating artery on the left side.
- The middle cerebral artery (MCA) was prominent bilaterally, confirming its vulnerability as the commonest site of ischemic stroke.
- In Cadaver 2 (female, ~50 years):
  - A well-developed anterior communicating artery was present, providing good anterior collateral circulation.
  - The posterior cerebral artery (PCA) origin showed variation (arising from internal carotid on the right), predisposing the posterior circulation to altered hemodynamics.
- Both dissections highlighted the anatomical correlation of vascular variations with stroke-prone regions and clinical syndromes (hemiplegia, aphasia, visual field defects).

Discussion: The cadaveric findings confirm that anatomical variations in the Circle of Willis and its branches significantly influence the risk and outcome of stroke. An incomplete circle reduces collateral supply, while enlarged MCA branches explain its higher vulnerability. These findings are in line with clinical observations of ischemic strokes predominantly affecting the MCA territory.

Conclusion: Stroke is essentially a disease of disturbed cerebral circulation, and its understanding requires precise knowledge of neurovascular anatomy. The cadaveric study demonstrated vascular variations that predispose certain brain regions to ischemic or hemorrhagic insults. Such anatomical insights are invaluable for clinicians in localizing lesions and planning stroke management.

113. Complete Agenesis of Dorsal Wall of Sacral Canal

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Introduction: The sacral canal (SC), a continuation of the vertebral canal, is essential for caudal epidural block (CEB), widely used in spinal and pain management procedures. Anatomical variations, such as spina bifida occulta (SBO), may affect CEB success, emphasizing the need for detailed anatomical knowledge to enhance clinical

outcomes and reduce procedural failure, especially when imaging guidance is unavailable.

Methodology: During routine osteology teaching sessions at our institution, a dry human sacrum was examined. Morphological features were noted, and sacral index was used to estimate the sex of the specimen. Observations focused on the posterior elements, sacral crests, and foramina.

Results: The specimen exhibited complete agenesis of the dorsal wall of the SC, with laterally fused laminae but a fully open midline. Dorsal foramina and other anterior/lateral features appeared normal. The sacral index suggested a male origin.

Conclusion: Pan sacral agenesis is rare but clinically significant. It can complicate procedures like CEB and spinal fusion, increasing the risk of dural puncture and nerve injury. Preoperative awareness of such variants is essential.

114. A Rare Unilateral Presentation of the Psoas Minor: A Case Report

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Introduction: The posterior abdominal wall is a complex structure formed by bones, muscles, and fascia, including the psoas muscle group: major, minor, and tertius. The psoas minor (PMn) is a vestigial muscle, absent in over half the population, and when present, it shows considerable variability in morphometry. Despite its limited function, PMn holds clinical significance, especially in surgical and radiological contexts. Variants of this muscle may impact nearby structures.

Methodology: During routine dissection of posterior abdominal wall of a 57year old male cadaver, an incidental unilateral presence of PMn muscle was observed. After the removal of all the organ of the abdominal cavity, posterior abdominal wall muscle was dissected where PMn was unilaterally present on right side.

Results: In present case, PMn was arising from body of T12 and L1 vertebrae and fibres running downward forward and medially to be inserted on iliopubic eminence. Proximal 1/3 is fleshy and distal 2/3 is tendinous, the length of the muscle was 193.43 mm (19.34 cm) and maximum width of the muscle belly is 1.7 cm.

Conclusion: The PMn exhibits considerable variability in presence and morphology. Awareness of such variations is vital for anatomists, surgeons and radiologists to avoid misdiagnosis and optimize clinical outcomes.

115. Study of Supratrochlear Foramen of the Humerus in Humans: An Anatomical Study

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Introduction: The Supratrochlear Foramen (STF) is an important and relatively common anatomic variation in the lower end of the humerus in humans. Anatomical knowledge of STF is useful for anatomists, orthopedic surgeons, and radiologists. The present study was done to describe the features of STF of the humerus in Indian population.

Materials and Methods: All bones were obtained from the Department of Anatomy, SMS Medical College, Jaipur, Rajasthan. The study was conducted on dried human humeri of unknown sex and age. A total of 100 humeri bone was studied, of which 53 humeri (53%) were right sided and 47 humeri (47%) were left sided, to determine the presence of supratrochlear foramen.

Results: Out of the 100 humeri bones, the supratrochlear foramen was present in 30 humeri (30%), of which 13 were right sided (43.33%) and 17 were left sided (56.67%). The majority of STF were round shaped (36.67%), followed by irregular shaped (30%), oval shaped (26.67%) and triangular shaped (6.67%). The STF was absent in 37 humeri (37%), and 33 humeri (33%) showed the translucency of the septum.

Conclusion: Knowledge of the supratrochlear foramen in the distal humerus in humans is important to the orthopaedician in supracondylar fractures, in intramedullary nailing of the humerus, and to the radiologists for differenciating it from an osteolytic or cystic lesion.

116. Osteogenic Study of Lumbosacral Transitional Vertebra in Rajasthan Population

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Introduction: Lumbosacral transitional vertebrae (LSTV) are congenital anomalies in which the lowest lumbar vertebra shows partial or complete fusion with the sacrum (sacralization), or the first sacral vertebra demonstrates lumbar features (lumbarization). These variations are clinically important because they may alter spinal biomechanics, predispose to chronic low back pain, and create diagnostic or surgical challenges.

Objectives: The present study aimed to assess the frequency and morphological features of lumbosacral transitional vertebrae in an osteological sample from the Rajasthan population.

Methodology: A total of 50 dry human sacra and lumbar vertebrae of unknown sex and age were examined from the osteological collection of the department. Each specimen was carefully inspected for features of sacralization of the fifth lumbar vertebra or lumbarization of the first sacral vertebra. Morphological variations were classified and recorded.

Results: Lumbosacral transitional vertebrae were observed in a subset of the examined specimens. Both sacralization

and lumbarization were present, with sacralization being more common. The extent of fusion varied from partial articulation to complete osseous union.

Conclusion: The presence of lumbosacral transitional vertebrae in the Rajasthan population highlights its importance as a common anatomical variation with clinical and anthropological significance. Accurate identification is crucial in radiology and spinal surgery to avoid misinterpretation and procedural complications.

117. Relationship of Dermatoglyphics to Gender and Blood Group: A Cross Sectional Study

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Introduction: To study the fingerprint patterns and their association with gender and blood group. This will be helpful in knowing whether blood group and gender of individuals can be predicted from fingerprint patterns which will be helpful for identification purposes.

Methodology: 170 medical students were included in this cross sectional study conducted at Nsmch, Bihta. Finger prints were taken by using Ink Method by "Cummins and Midlo". Right and left-hand fingertip were pressed separately on the stamp pad. Prints of all the 10 digit were taken. Fingerprint patterns (loops, whorls, and arches) were observed with the help of magnifying lens. A drop of blood from each subject was mixed with Anti-serum A, Anti-serum B and Anti-serum D on a clean tile. Blood groups were determined on the basis of presence or absence of agglutination.

Results: Results showed that all patterns of fingerprints were commoner in males as compared to females. When loops and whorls were analysed, Whorls were predominant pattern in 0+ve blood group and Loops were predominant pattern in B + ve group ($P < 0.05$).

Statistical Analysis: Chi square test was used to compare variables and result were considered significant when $P < 0.05$.

Conclusion: This study shows there positive association between fingerprint patterns and blood groups which will be useful for identification.

118. Sexual Dimorphism of the Sacrum: A Study of Sacral Index in Rajasthan Population

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Introduction: Sex determination from skeletal remains is crucial in forensic anthropology and medico-legal cases. The sacrum, being strong, centrally placed, and resistant to postmortem damage, is particularly useful for this purpose. Sexual dimorphism of the sacrum, especially through the sacral index, provides reliable parameters for differentiating between males and females.

Objectives: To evaluate sexual dimorphism of the sacrum using the sacral index and establish baseline data for the Rajasthan population.

Methodology: A cross-sectional osteological study was carried on sample size of 64 adult sacra (35 male and 29 female) obtained from medical colleges of Rajasthan. Therefore sacral index was measured by taking the breadth and length of individual sacrum with the help of vernier caliper. The sacral index was calculated as (breadth/length ×100). Statistical analysis was performed to compare male and female values and assess accuracy in sex determination.

Results: Males showed significantly greater sacral length, whereas females exhibited higher sacral breadth. The mean sacral index was higher in females, consistent with broader sacra relative to length. Discriminant function analysis demonstrated an accuracy of approximately 86% to 88% for sex determination.

Conclusion: Sacral index demonstrates consistent sexual dimorphism in the Rajasthan population and can serve as a reliable tool for forensic and anthropological identify.

119. Cadaveric Study of Median Nerve and Its Anatomical Variation

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Background:

- The median nerve is one of the major nerves of the upper limb, formed by contributions from the lateral and medial cords of the brachial plexus. It supplies most of the flexor muscles in the forearm, intrinsic muscles of the hand, and provides sensory innervation to the palmar aspect of the hand.
- The musculocutaneous nerve (MCN), arising from the lateral cord, innervates the flexor muscles of the arm and continues as the lateral cutaneous nerve of the forearm.
- Numerous studies have documented anatomical variations in the formation, branching pattern, and communications between the median and musculocutaneous nerves.

Objective: To study the anatomical variations of the median nerve through cadaveric dissection.

Methodology: Study conducted on 2 embalmed adult cadavers (4 upper limbs). Standard Cunningham's dissection technique followed. Incision from axilla to cubital fossa, exposing brachial plexus. Median nerve traced from lateral & medial cords of brachial plexus. Musculocutaneous nerve (MCN) identified and its course studied. Any variations in root formation, absence of MCN, or communications between MCN and median nerve were noted.

Observation	No. of Limbs (%)
Extra-lateral root of median nerve	1 (25)
1. Absence of musculocutaneous nerve	1 (25)
2. Communication between MCN and median nerve	1 (25)
3. Normal anatomical pattern	1 (25)
4. MCN: Musculocutaneous nerve	

Discussion: Variations observed in 3 out of 4 limbs (75%). Findings included extra-lateral root, absence of MCN, and MCN–MN communication. Similar variations reported in earlier studies (Balachandra 2015, Pryan 2019). Variations may alter clinical presentations and nerve conduction studies. Important for surgeons in axilla/arm surgeries to avoid iatrogenic injuries. Findings documented with digital photographs.

Results: Out of 4 dissected upper limbs (2 cadavers):
- One limb (25%) showed an extra-lateral root of Median Nerve.
- One limb (25%) showed absence of Musculocutaneous Nerve (MCN).
- One limb (25%) showed communication between MCN and Median Nerve.
- One limb (25%) showed normal anatomical pattern.

Conclusion: Median nerve variations are common and clinically significant. Observed anomalies included extra-lateral root, absence of MCN, and MCN–MN communication. Such variations may affect clinical diagnosis, nerve conduction studies, and surgical procedures. Awareness of variations is essential for anatomists, clinicians, and surgeons to prevent iatrogenic injuries.

120. Anatomical Variation of the Bicipital Aponeurosis: A Cadaveric Case Report and Review of Clinical Implications

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Introduction: The bicipital aponeurosis (BA) originates from the medial border of the distal biceps tendon and fans medially to merge with the antebrachial fascia of the forearm. It stabilizes the flexor-pronator mass, protects the median nerve and brachial artery, and contributes to forearm supination. While typical descriptions emphasize a single fibrous sheet, studies have reported variants such as accessory slips, duplication, thickening, or absence. These variations may predispose to compression neuropathies or complicate venipuncture and surgical approaches to the cubital fossa.

Case Presentation: During routine educational dissection of a 45-year-old female cadaver in the Department of Anatomy, JLNMC, Bhagalpur. We encountered a unilateral anomaly on the right upper limb.

- Gross Findings:
  - o The bicipital aponeurosis was markedly thick compared to the contralateral side.
  - o It consisted of two distinct laminae—superficial and deep—enclosing a small fat pad.
  - o The medial extension projected beyond the usual insertion, blending with the fascia over the pronator teres and flexor carpi radialis up to 3 cm distal to the medial epicondyle.
  - o The median nerve coursed beneath the deep lamina, and the brachial artery bifurcated just proximal to the distal edge of the aponeurosis.
- Measurements:
  - o Length from tendon origin to medial border: Long.
  - o Maximal width at midpoint: Small.

Discussion:
- Neurovascular compression
- Surgical relevance
- Diagnostic imaging: High-resolution ultrasound and MRI.

Conclusion: This case documents a thick, bilaminar bicipital aponeurosis with an elongated medial extension discovered during cadaveric dissection. Awareness of such variants is vital for anatomists, surgeons, and radiologists to prevent misdiagnosis and minimize complications during procedures involving the cubital fossa.

121. A Case Report: High Bifurfication of Brachialartery

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Introduction: The brachial artery is the main arterial supply of the arm. It is the continuation of the axillary artery and typically bifurcates into radial and ulnar arteries at the level of the cubital fossa. However, deviations from this classical pattern are frequently observed. Morphological variations of the brachial artery include high origin of terminal branches, superficial brachial artery, accessory branches, and atypical level of bifurcation. Such variations hold great clinical importance, particularly in interventional radiology, vascular surgeries, orthopedic procedures, and anesthetic blocks of the upper limb.

Methodology: Routine cadaveric dissection of an adult upper limb of around 50 years male cadaver was carried out in the Department of Anatomy. Standard dissection techniques were employed to expose the artery, and its course, branching pattern, and termination were carefully examined. Any deviations from the normal pattern were recorded and compared with available literature.

Results: A high division of brachial artery was found on the right arm at the level of mid Bicep, superficial brachial artery, and additional muscular branches was also observed. The frequency of these variations corresponded with

previously published reports and could be attributed to altered embryological development of the upper limb vasculature.

Conclusion: Knowledge of morphological variations of the brachial artery is essential for surgeons, radiologists, and anesthesiologist to avoid complications during diagnostic and intervention procedures. The study emphasizes the anatomical diversity of the brachial artery and its clinical implications in routine medical and surgical practice.

122. The Pre-pyloric Vein: A Constant Reliable Landmark?

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The prepyloric vein of Mayo is a significant anatomical structure used in surgery, named after the American surgeons and Mayo Clinic founders, Charles and William Mayo. This vein is characterized by its course, as it ascends over the anterior surface of the pyloric constriction formed due to smooth muscles of pyloric sphincter at the gastroduodenal junction. Unaccompanied by an artery, it functions as a tributary, draining directly into the right gastric vein, which in turn empties into the portal vein. Its primary clinical importance lies in its role as a surgical landmark during pylorotomy, pylorus preserving gastrectomy. Because the vein is often obvious in living individuals, surgeons frequently use it as a visual guide to accurately identify the pylorus. However, while it is a useful landmark when present, but it's variation have not been studied at all and cannot always be relied upon as the sole indicator of the pylorus location.

Methods: A descriptive anatomical case series was conducted on 8 embalmed adult human cadavers at the Department of Anatomy, Baroda Medical College. The abdomen was carefully dissected to expose the pre-pyloric region. The origin, course, termination, and relationship of the pre-pyloric vein to surrounding structures were carefully observed and documented.

Results: The classic pre-pyloric loop was present in only 2 of the 8 (25%) cadavers. Significant anatomical variations were identified in the remaining 6 (75%) specimens. The observed variations included: 1) absence of the typical pre-pyloric loop, 2) a non-looping vein that drained directly through the pyloric wall, and 3) an anomalous course over the first part of the duodenum rather than the pylorus.

Conclusion: This case series demonstrates that the pre-pyloric vein exhibits a high degree of anatomical variation, and its classic formation is less common than traditionally suggested. These findings challenge its utility as a constant anatomical landmark. Surgeons must be aware of these potential variations to ensure accurate identification of the pylorus.

123. Morphometric Analysis of Femoral Condyles in Dry Preserved Bones and Its Radiological Comparison with Osteoarthritis Population

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Introduction: A prevalent degenerative disease of joints is osteoarthritis of the knee joint. This pathology causes significant morphological changes of the condyles—right and left—of the femur during the progression of osteoarthritis. Deterioration of the articular cartilage is progressive and slow; however, it leads to pain in the joints during movement, which is responsible for gradual impairment in the function of the knee joint. Femoral condyles are crucial for knee function, and OA progression results in their size and shape alterations, which can be detected through imaging and physical measurements Accurate femoral condyle morphometry is essential for prosthesis design, improving knee replacement surgery outcomes by matching prosthetic components with the knee's anatomical features Limited research compares femoral condyle morphometry in dry bones with radiological imaging of OA patients.

This study bridges the gap by comparing dry bone measurements with radiological data, enhancing diagnostic accuracy and prosthetic design.

Objectives:

- Compare femoral condyle morphometry in dry preserved bones and radiological images of OA patients.
- Identify morphological changes associated with OA progression.
- Correlate femoral condyle measurements with OA severity to
- assist in early diagnosis and prosthesis design.

Methodology:

- Study Design: Observational, cross-sectional Pilot study.
- Sample Size:
  - o Group 1: 10 dry femoral condyles from bone bank of Anatomy Department.
  - o Group 2: 8 OA patients with radiological imaging (X-ray, CT scans).
- Exclusion criteria included individuals with previous knee surgeries, acute injuries, systemic diseases affecting joint morphology, inadequate imaging, or non-compliance with study protocols.
- Measurements: Femoral condyle length, width, height, intercondylar distance (calipers).
- Radiological Imaging: X-ray, CT scans for OA severity.
  - Data Analysis: Pearson's correlation, ANOVA.

Results:

- Femoral Condyle Length: Strong negative correlation (-0.87)

with OA severity; no statistical significance ($P = 0.13$).
- Femoral Condyle Width: Moderate negative correlation (-0.80) with OA severity; no statistical significance ($P = 0.20$).
- Femoral Condyle Height: Moderate negative correlation (-0.80) with OA severity; no statistical significance ($P = 0.20$).
- Morphological Changes: Decrease in femoral condyle dimensions and increased surface irregularities with OA progression.

Conclusion: Morphological changes in the femoral condyles due to osteoarthritis (OA) significantly impact knee joint biomechanics, leading to altered function and pain. The deterioration in size and shape of the femoral condyle, observed through imaging, correlates with OA severity, aiding early diagnosis. These changes highlight the need for femoral condyle morphometry in prosthesis design for better alignment and functionality in knee replacement surgeries.

Key Points: Strong negative correlation between femoral condyle length and OA severity. No statistical significance ($P > 0.05$). Morphological changes in femoral condyles with OA progression. Importance of femoral condyle morphometry for early OA diagnosis and improved prosthesis design.

124. Fused C3, C4 and C5 Vertebrae: Understanding the Condition

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Introduction: Among the seven cervical vertebrae, first (C1), second (C2) and seventh (C7) are classified as atypical owing to their unique morphology and the remaining third to sixth (C3-C6) are considered typical vertebrae. These vertebrae are subject to numerous congenital anomalies like ponticulusposticus, osodontoideum and vertebral fusion etc. Developmental anomalies of vertebral column are common especially in the cervical region and thus become the point of keen interest from long time to the anatomists and related health professionals.

Materials and Methods: This is incidental finding during the routine osteology classes for the undergraduate students in the department of anatomy, DMCH, fused cervical vertebrae was obtained with complete fusion of bodies and all the vertebral arch elements.

Conclusion: The awareness about the complications as a result of FCV helps in anticipating these during procedures involving the cervical spine and also during anaesthetic manoeuvres of neck to avoid them. Also, upon earlier diagnosis of this condition, the patients can be properly counselled as to its presentations and risks, ensuring proper follow up and improving their quality of life.

125. Unveiling the Uncommon: A Journey into Anomaly of a Single Fissured Right Lung

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Introduction: Fissures are formed by the pleura covering the lungs. Right lung has horizontal and oblique fissures dividing the right lung into three lobes. Left lung has only oblique fissure dividing it into two lobes. Defective pulmonary development will give rise to variations as we encountered in this case. From challenges in radiological interpretation to potential impacts on respiratory functions and preoperative planning for thoracic surgeries, this anatomical anomaly demands close attention.

Case Report: During the routine dissection of thoracic cavity and lungs, in the department of anatomy, Darbhanga medical college, we found that right lung was having only single oblique fissure with absence of middle lobe.

Conclusion: Fissures of the lung is responsible for proper expansion of lungs during respiration and also it limits any infections to a particular lobe. Any variation either incomplete or absent fissures should be interpreted preoperatively for an uneventful thoracic surgeries.

126. Decoding the Left Atrial Appendage: Morphology of Shapes and Lobes with Clinical Implications

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Introduction: The left atrial appendage (LAA) is a unique structure within the pericardium which lies close to the free wall of the left ventricle. It can be described as a small ear-shaped pouch coming out of the muscular wall of left atrium. It lies anteriorly in the atrioventricular sulcus. The interior surface of the LAA is muscular and marked with muscular ridges. The shape of LAA body is associated with thrombogenic potential. According to Wang's classification, LAA is classified into four shapes– chicken wing, cauliflower, cactus and windsock. The number of lobes may vary from one to four.

Methodology: A total of 50 cadaveric human hearts, fixed in 10% formalin were taken from the department of Anatomy, Bharati Vidyapeeth DU Medical College, Pune. Shape and the number of lobes of LAA were noted.

Results: The commonest shape was chicken wing and least common was cactus. Regarding number of lobes, two lobes were most common.

Statistical Analysis: Chicken wing type-58%, followed by cauliflower-26%, cactus-14% and windsock-2%. For number of lobes, majority had two lobes (58%), followed

by one lobe (30%), three lobes in 10% and four lobe in only 2% of the studied sample size.

Conclusion: These findings emphasize the variability of LAA anatomy and recognizing these patterns is important for risk assessment of thromboembolism and also for planning surgical and percutaneous interventions like LAA occlusion devices.

127. The Wandering Caecum: A Rare Lumbar Presentation

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Introduction: Caecum is the initial part of large intestine which is normally 6 cm long and lies in the right iliac fossa. Normally it lies below the level of ileocaecal junction, anterior to the right iliac and psoas fasciae, with the lateral femoral cutaneous nerve interposed. The caecum may be firmly adherent to the retroperitoneum but is frequently suspended by a short mesentery, especially in infants. Sometimes its position may vary from sub-hepatic to lumbar. Variations in its position can have clinical implications especially in diagnosis and surgical management of appendicitis.

Methodology: During routine cadaveric dissection for 1st year M. B. B. S students at Bharati Vidyapeeth DU Medical College, Pune, an anatomical variation was observed in a female cadaver aged 60 years. The caecum was found to be in abnormal position. The shape, size and position was noted.

Results: Ampullary caecum present in right lumbar region. Appendix was in 2'O clock position. Ascending colon was short in length.

Conclusion: Caecum develops from the caudal end of midgut loop during sixth week of intra uterine life. An undescended caecum can lead to atypical presentations of appendicitis, leading to complication in diagnosis and surgical intervention. Awareness of such variations is essential for radiologists, surgeons, and medical educators. Medical students benefit from such findings during dissection as it enhances their understanding of human anatomy and its variations.

128. Morphometric Evaluation of Adult Dry Mandible in Indian Population

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Introduction: The mandible is the largest and strongest bone of the face, exhibiting significant sexual dimorphism and population-specific variations. Its durability makes it a critical element in forensic, anthropological, and clinical studies. This study aims to establish baseline morphometric data for sexual dimorphism.

Materials and Methods: The present cross-sectional study was conducted on 92 dry, intact adult human mandibles, consisting of 73 male and 19 female specimens. Various morphometric parameters measured using Digital Vernier Caliper with a resolution of 0.01 mm.

Results: The analysis revealed statistically significant differences between male and female mandibles for the parameters measured. Consistently, male mandibles showed larger mean dimensions for measurements compared to female mandibles. Parameters such as bigonial width was 87.6 (+5.7) in female and 93.9 (+6.2) in male, max. ramus height was 58.1 (±4.8) in female and 62.9 (+6.1) in male and projective ramus height was 49.1 (±5.2) in female and 54.4 (+5.8) in male.

Data Analysis: The collected data was compiled and entered into a spreadsheet with descriptive statistics including mean and standard deviation (SD) were calculated for each parameter for both males and females. An independent samples *t*-test was performed to evaluate the significance of the difference between the male and female means.

Conclusion: The mandible can be reliable indicator for sex determination. The data generated provides a crucial baseline for forensic experts in creating biological profiles and for maxillofacial surgeons in planning reconstructive procedures. The findings reaffirm the necessity of population-specific standards for accurate anthropological and forensic analysis.

129. Anatomical Variations of the Accessory Mental Foramen: Incidence and Clinical Significance

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Introduction: The accessory mental foramen (AMF) is a rare but clinically important anatomical variation of the mandible. The primary mental foramen (MF) transmits the mental nerve and vessels, which supply the lower lip, chin, and gingiva. An AMF transmits accessory branches of this neurovascular bundle. Failure to identify an AMF during surgical procedures like implant placement, genioplasty, or periapical surgery can lead to complications such as haemorrhage, incomplete local anaesthesia, or persistent neurosensory disturbance.

Methods: An anatomical study was conducted on 92 dry human mandibles for a dissertation, during which an accessory mental foramen was found. The frequency of the AMF was calculated, and its dimensions and its topographical relationship to the teeth of the mandible and the mental foramen were determined as well.

Results: On right side of the mandible an AMF was present. Its location was below the first molar. The distance between the AMF and the MF was 4.7 mm, AMF and posterior border of mandible was 61.9 mm, AMF to base of mandible was 20.8 mm and transverse diameter of AMF was 2.3 mm.

Conclusion: The presence of an AMF is an appreciable anatomical variation that surgeons and dentists must consider to avoid iatrogenic injury. Given the limitations of panoramic radiographs in detecting this structure, pre-surgical planning with 3D-CT imaging is recommended for procedures involving the mandible to accurately identify its presence and location, ensuring comprehensive anesthesia and preventing neuro vascular complications.

130. Anatomical Variations of Renal Artery and Its Clinical Correlations: a Cadaveric Study

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Background: Renal vascularization is classically described as a renal artery and vein. However, this vascular pattern presents numerous anatomical variations in terms of their number, origin and course due to ontogenetic alterations.

Aims and Objectives: To study the variation in the origin and course and branching pattern of renal artery in cadaver.

Materials and Methods: A total of 60 renal vascular pattern studied from 30 embalmed cadavers allotted for dissection in the department of anatomy were used for the study. There were 24 male cadavers and 6 female cadavers, with age ranged from nearly 65-80 years. The peritoneal region was dissected and exposed the kidney with coverings according to the Cunningham manual of practical anatomy. The arterial pattern and course and branching pattern were noted and photograph of each variant specimen was taken after dissection.

Results: The study found that anatomical variations in renal arteries occurred in 62.65% of cadavers, with accessory renal arteries being the most common variation (28.92%). Variations were more frequent on the right side (34.93%) compared to the left (25.30%), and there was no significant difference between male and female cadavers. These findings highlight the importance of recognizing renal artery variations in surgical planning to minimize complications.

Conclusions: We conclude that the renal vascular anomalies occur with high frequency; for this reason, knowledge of these anomalies is extremely important for the correct planning of numerous medical-surgical activities.

131. Anatomical Variation in the Branching Pattern of Human Aortic Arch

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Introduction: Aortic arch presents in superior mediastinum. Classically it shows three branching pattern. LCCA, LSA arises from left and BT from right. Variation in branching pattern of AA ranges from difference in origin and number of branches. Anatomical variation of AA is significant for Diagnostic and Surgical procedure in thorax and neck.

Methodology: The cadaveric study was done in department of Anatomy RIMS, Ranchi. The thoracic cavity was opened by cutting through the costochondral junction and removed the sternum and costal cartilage. The Lungs were removed, pericardium opened to expose ascending aorta, clarify the branches of Aorta and variation in branching pattern observed.

Results: In present study three branching pattern was observed. LCCA, RCCA and RSA. The RSA arise as the last branch of AA, and course behind the trachea and oesophagus toward the Rt clavicle.

Conclusion: This variation is known as Aberrant Rt subclavian artery or Arteria lusoria. The regression of 4 th AA artery between RCC & 7 th intersegmental artery and persistence of Rt dorsal aorta distal to 7 th intersegmental artery. RSA arise directly from descending aorta left side which courses toward right. Molecular disruption of signalling pathway of NOTCH, VGEF also contribute to the same.

132. Symbrachydactyly – Congenital Absence of Phalanges

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Symbrachydactyly is a rare congenital anomaly of the hand characterized by the absence or hypoplasia of phalanges, metacarpals, or entire digits. It usually occurs unilaterally and is believed to result from disruption of the apical ectodermal ridge during embryonic limb development. The condition leads to functional and cosmetic challenges, significantly impacting hand utility and psychosocial well-being. During counselling for paramedical student at J. L. N. M. C Bhagalpur Batch 2025 a student of G. N. M. group from D. Q. came to the notice of counselling officer and sent to the department of Anatomy and Radiology for proper study and the embryological basis of the defect and for further study.

Aim: To review the clinical presentation, embryological basis, classification, and management strategies of symbrachydactyly, with emphasis on the congenital absence of phalanges.

Methods: A comprehensive review of literature was conducted focusing on the embryological mechanisms, clinical spectrum, and surgical as well as non-surgical (Prosthetic) treatment options for patients with symbrachydactyly. Case observations and radiological findings were also analyzed to highlight variations in presentation.

Results: Symbrachydactyly commonly presents with short, malformed digits or complete absence of phalanges.

Associated anomalies such as nubbins with residual nail plates are frequent. The Blauth and Flatt classifications are widely used to categorize the severity of deformity. Management

Conclusion: Symbrachydactyly, though rare, poses significant functional and psychological implications. Understanding its embryological origin and clinical variations is crucial for planning individualized treatment. Advances in microsurgical reconstruction have expanded the possibilities for functional and aesthetic restoration, offering improved prognosis for affected children.

133. Anatomical Variation in Draining Pattern of Great Saphenous Vein Tributaries at the Saphenofemoral Junction – A Case Report

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Introduction: Great saphenous vein (GSV) is the longest vein of the human body and is the major superficial venous collector of lower limb. The tributaries of GSV in the thigh are grouped as posteromedial tributaries (accessory saphenous vein) and anterolateral tributaries (anterior femoral cutaneous vein), which usually commences from an anterior network of veins in the distal thigh and crosses the apex and distal half of the femoral triangle to reach the GSV & peri-inguinal veins. GSV then traverses the saphenous opening & is joined by the superficial epigastric, superficial circumflex iliac, superficial external pudendal veins & deep external pudendal vein.

Methodology: During routine dissection of a 77 years old formalin fixed male cadaver in the Department of Anatomy MAMC, Delhi, the variation in tributaries of GSV were observed at Saphenofemoral junction (SFJ). The dissection of thigh and leg was done to trace the entire course of GSV along with its tributaries and drainage. The photographs were taken & measurements were done using Image J.

Results: At SFJ, only two tributaries, Superficial external pudendal vein (Diameter (D) =3.37 mm) & anterolateral vein of thigh (D = 3.83 mm) were observed to drain into GSV (D = 4.17 mm). The anterolateral vein of thigh was observed to join a vein (D = 3.60 mm), 8 mm distal to SFJ to form a common trunk which drained into GSV. Superficial epigastric vein (D = 2.23 mm) & superficial circumflex iliac vein (D = 2.45 mm) joined to form a single trunk & drained directly into femoral vein.

Conclusion: During embryogenesis (7 th-8 th weeks), three venous plexuses of the lower limb grow & mature along the three angio-guiding nerves. Ventrally, the Pre axial venous plexuses becomes the femoral vein & GSV. Persistence & disappearance of the venous plexuses results in variation of venous drainage. Awareness of thorough anatomical variations involving GSV and its tributaries is significant for interventional radiologist and vascular surgeons during venous procedures

134. Atherosclerotic Thoracic Aortic Aneurysm: A Rare Cadaveric Finding

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Background: Atherosclerotic aneurysms most frequently involve the abdominal aorta, while thoracic aortic aneurysms of atherosclerotic origin are comparatively rare. Cadaveric findings of such lesions provide important educational insights into vascular pathology and its complications.

Case Description: During routine academic dissection, a thoracic aortic aneurysm was identified in a cadaver of unknown demographic profile and risk history. Gross examination revealed a markedly dilated thoracic aorta measuring approximately 13 × 9×7 cm, with bulbous enlargement and irregular external contours. The intimal surface was coarse and uneven, showing diffuse atheromatous plaques, focal calcifications, and adherent mural thrombus. The vessel wall was markedly thickened in some regions, with focal thinning and loss of elasticity in others, raising concern for predisposition to rupture. Pale yellow to dark brown discoloration and gritty calcified zones were evident. No frank dissection or rupture was observed.

Conclusion: This case illustrates an uncommon presentation of atherosclerotic aneurysm in the thoracic aorta, typically overshadowed by the more prevalent abdominal aortic involvement. Such cadaveric observations not only enhance anatomical and pathological teaching but also reinforce awareness of the spectrum of vascular changes associated with advanced atherosclerosis. Histopathological evaluation would further substantiate these gross findings and help delineate the chronicity and potential clinical implications of this lesion.

135. A Study of Age-related Changes in Q Angle among Children in Rohilkhand Region

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Background: A measurement of the quadriceps angle (Q degree) is achieved by drawing two lines that meet at the middle point of the kneecap and the tibial tuberosity, respectively, from the anterior superior iliac spine. The patellofemoral pain syndrome, Genu Varum, Genu Velgum, dislocation, chondromalacia patella, lateral patellar malposition, and abnormal variations in the Q angle are all linked.

Aim: The aim of the study was, to find out the correlation

of Q angle with height and Age among children in Rohilkhand region.

Methodology: The study was carried in Rohilkhand Region (the department of anatomy, SRMS Institute of Medical Sciences, Bareilly). In this study all children were included age between 2-12 years on the basis of exclusion and inclusion criteria. Q angle and height were measured among children in Rohilkhand region. Statistical mean value, standard deviation and correlation value were calculated by SPSS software.

Results: The mean age of participants was 7.78 ± 2.80 years and mean height was 3.80 ± 0.89 fit. Q angle has positive significant correlation with height.

Conclusion: The measurement of Q angle helps to find out the structure abnormalities in growing children and prevent them from various disorders. As people get older, their Q angles tend to rise, and this is especially true for female subjects.

136. Study of Dimensions of Talus in North Karnataka Subjects

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Introduction: The human foot is a master piece of engineering and work of art. The foot indeed a very intricate structure that remarkably bears the weight placed upon it. As a result the foot forms a dynamic link between human body and ground.

Materials and Methods: Each talus will be placed on a wooden flat surface and then required measurements such as length of talus, breadth of body of talus, breadth of neck of talus and thickness of talus are measured in centimeter using vernier caliper instrument.

Results: It is observed that the maximum dimensions of talus measured in any one direction are not directly proportional to the measurements observed in the other direction. Hence the measurement of the talus varies individually in the different direction and there is no direct correlation between its measurements in different directions.

Conclusion: data of measurement of talus which is recorded in the present study will serve as a data base of the north Karnataka population who ever in future may need ankle joint replacement by ankle prosthesis.

137. Study of Intracavernous Part of Internal Carotid Artery in Magnetic Resonance Imaging

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Introduction: The cavernous sinus and its contents especially cavernous part of internal carotid artery are involved in various injuries and diseases. Endoscopic transsphenoidal surgery is a surgical method for treating pituitary adenomas, but it carries risks, including fatal complications from internal carotid artery (ICA) injury, The internal carotid artery (ICA) is vital for supplying blood to the brain. In the cavernous sinus injury/damage to internal carotid artery can cause intracranial haemorrhage and injury/damage/disturbance to III, IV, VI cranial nerves can cause extra ocular muscle paralysis and dysfunction.

Materials and Methods: Total cases between age 18-60 years referred for Brain MRI without any Clinical and Radiological indications of the cavernous sinus were included. Morphology and morphometry of cavernous part of internal carotid artery (ICA) were studied.

Results: 37 cases (92.50%) of cavernous part of the internal carotid artery (ICA) had a curved course, 3 cases (7.50%) had a straight course. Length of intracavernous ICA on right side 21.90 mm and on left side with mean 21.93 mm. Width of intracavernous part of (ICA W) on right side with mean 4.21 mm, and on left side with mean 4.25 mm. Inter ICA distance (Inter ICA) between medial walls of internal carotid artery in cavernous sinuses mean 16.81 mm.

Conclusion: Knowledge of morphology and morphometric study will be helpful to neurosurgeons, endocrinologists, ophthalmologists, oto-rhino-laryngologists for a better understanding of pathologies like carotid-cavernous sinus fistula, cavernous sinus thrombosis, orbital apex syndrome etc and management of pre and post-operative procedures related to cavernous sinus, intra cavernous part of internal carotid artery and it's territory.

138. Double Cystic Artery Observed During Routine Cadeveric Dissection – A Case Report of Rare Anatomical Variation

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The cystic artery is the principal source of arterial supply to the gall bladder and cystic duct, most commonly arising as a single branch from the right hepatic artery, traversing the Calot's triangle. However, considerable anatomical variations in its origin, number, and course have been reported, which are of paramount importance in surgical practice, particularly during laparoscopic cholecystectomy.

We report a case of double cystic arteries observed during routine cadaveric dissection in the Department of Anatomy, Darbhanga Medical College and Hospital. In this case, both cystic arteries originated separately from the right hepatic artery and coursed posterior to the common

hepatic duct. Within the boundaries of Calot's triangle, each artery supplied different surfaces of the gallbladder independently.

This variation highlights the clinical significance of precise anatomical knowledge of Calot's triangle and its vascular structures, as inadvertent injury may lead to uncontrolled bleeding from anomalous cystic arteries may increase the risk of vasculobiliary complications during laparoscopic procedures. Awareness of such variations can help surgeons prevent intraoperative complications and improve surgical outcomes.

139. Morphological and Morphometric Study of the Pelvicalyceal System

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Introduction: The pelvicalyceal system (PCS) of the kidney, comprising the renal pelvis, major calyces, and minor calyces, is fundamental for urine collection and excretion. Detailed knowledge of its morphology and dimensions is crucial for anatomists, radiologists, and surgeons, particularly for interventions like percutaneous nephrolithotomy and ureteropelvic junction repair.

Methodology: The study was conducted on 30 formalin-preserved adult human kidneys collected from Department of Anatomy, Siddhartha Medical College, Vijayawada. Kidneys with intact pelvicalyceal systems were included, while damaged or pathological specimens were excluded. The renal sinus walls were dissected, and PCS features were studied over a period of two months (July, August).

Results: Among 30 kidneys, bicalyceal is most common, present in 47%, followed by multicalyceal (23%) and tricalyceal types (20%). Number of minor calyces ranged from 6 to 10. The renal pelvis was intrarenal in 57%, mixed in 33%, extrarenal in 7%, and absent in 3% of specimens. Sampaio's classification of pelvicalyceal drainage showed a predominance of Type A1 (43%), followed by B2 (24%), with fewer cases of Type A2 and B1. The lower infundibular length ranged from 10 to 26 mm (18.06 ± 4.69 mm), and width from 3 to 11 mm (mean: 6.9 ± 2.68 mm). The presence of perpendicular calyces-4 (13.3%).

Statistical Analysis: Data was entered in MS excel 2016 and was analyzed using SPSS software version 25. Data is represented in form of frequencies and percentages with the help of tables, bar diagrams and pie diagrams.

Conclusion: Significant morphological and morphometric variations exist in the PCS, emphasizing importance of individualized anatomical assessment for clinical and surgical decision-making.

140. Topographical Study of Nutrient Foramina in Human Metatarsals and Their Clinical Significance

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Background: Nutrient foramina are entry points for nutrient arteries supplying the inner cortex of long bones. Their distribution in metatarsals holds clinical relevance for surgical approaches, fracture fixation, and bone grafting. However, detailed topographical data remain limited.

Aim: To study the number, location, position, and direction of nutrient foramina in human metatarsals.

Materials and Methods: A total of 400 dry human metatarsals (80 each from 1st to 5th), of unknown sex, were examined macroscopically. Each was assessed for number of foramina, surface location (dorsal, plantar, medial, or lateral), diaphyseal position, and canal direction.

Results: Most metatarsals had a single nutrient foramen, typically on the dorsal or medial surface in the middle third of the shaft. Double foramina were less common; absence was rare. The nutrient canals predominantly followed a distal course, aligning with the growing end theory. Anatomical variations were more frequent in the first and fifth metatarsals.

Conclusion: This study identifies consistent topographical patterns and notable variations in nutrient foramina of metatarsals. Understanding these features is vital for preserving vascular integrity during orthopaedic procedures and enhances outcomes in reconstructive and forensic practices.

141. Morphometry of Calcarine Sulcus among Indians

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Introduction: Calcarine sulcus is an axial and complete sulcus. It is Y-shaped with a stem extending into the inferior horn of lateral ventricle. Limb being two-one extends on to the parieto-occipital lateral surface of cerebrum. Another lower limb extends posteriorly almost straight into the occipital pole. There are very limited knowledge about morphometry of the sulcus which forms the axis for development of primary visual cortex.

Materials and Methods: The study was conducted after IEC obtained from institutional ethical Committee. 31 formalin fixed cadaveric cerebral hemispheres [14 right sided, 17 left sided] which were obtained UG dissections were used to measure the morphometric length of calcarine sulcus were used.

Results: The average length of stem of 31 specimens were Stem: 2.7 cm, Upper limb: 3.7 cm, Lower limb: 4.1 cm.

There are very limited studies on morphometry of calcarine sulcus whose lower-limb forms the axis for the primary visual area in humans.

Conclusion: Development of Cortical visual Prosthesis is a path breaking advancement of science which helps the blind to gain vision and live life more enabled. The study will help in getting reference values for the development of the device in south Indian population.

142. Bipartite Spleen: A Rare Case

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Background: The spleen is a large encapsulated organ mainly encompassing vascular and lymphoid tissue, situated in the upper left quadrant of the abdominal cavity between the diaphragm and fundus of the stomach and related to the tail of the pancreas and the upper pole of left kidney. The spleen serves to generate immune reactions and eliminates the foreign substances and aged erythrocytes from the blood stream. During routine dissection class for undergraduate students in the Department of Anatomy, DMC, we found Bipartite Spleen, this was found in adult male cadaver, aged about~ 45-50 years.

Objective: To understand & co-relate the gross anatomy & other related congenital variations, anatomy.

Method: Observing on routine dissection class on spleen.

Results: Anatomical measurements was done & will be mentioned in poster.

Conclusion: Bipartite spleen is an extremely rare condition and in this case, two splenic parenchymal plates are centrally separated evenly with a cleft craniocaudally and seems to be congenital.

143. Anomalous Bifid Epiglottis – An Incidental Finding During Cadaveric Dissection

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Background: Epiglottis is a leaf-shaped elastic cartilage that plays a vital role in protecting the airway during swallowing. Variations in its morphology are extremely rare, with bifid epiglottis being one of the uncommon congenital anomalies which may remain asymptomatic or present with swallowing/respiratory issues in life.

Case Description: During routine cadaveric dissection of the neck in the Department of Anatomy, DMCH, we encountered an abnormal epiglottis. Instead of the normal single lamina, the epiglottis showed a partial bifid morphology, with a median cleft extending from its free margin down to the upper one-third of its length. The rest of the laryngeal cartilages and soft tissues were normal.

Discussion: A bifid epiglottis is an exceptionally rare anomaly, usually considered a manifestation of defective fusion of embryonic laryngeal cartilaginous precursors. It has been associated with syndromes such as Bardet-Biedl and Pallister-Hall but may also occur in isolation. Clinically, bifid epiglottis can predispose to aspiration, stridor, and airway compromise, although some individuals remain asymptomatic. Very few cadaveric reports exist in literature, making this finding noteworthy.

Conclusion: Accidental discovery of a bifid epiglottis in cadaveric dissection underscores the significance of anatomical variations in understanding congenital anomalies. Documentation of such findings contributes to both anatomical literature and clinical awareness, particularly for ENT surgeons and anesthesiologists.

144. Unfolding the Sole Story: Multitudinous Variation in the Sole of the Foot

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Introduction: The foot's lumbrical muscles, typically four, are intrinsic muscles arising from the flexor digitorum longus tendons and inserting into the extensor expansions of the lateral four toes. Despite their small size, they play a vital role in balance, fine motor control, and efficient gait. Functionally, they flex the metatarsophalangeal joints and extend the interphalangeal joints, contributing to digital stability and proprioception during ambulation. Clinically, lumbricals are implicated in claw toe deformity, diabetic neuropathy, and altered locomotor dynamics. This review explores their anatomical structure, functional significance, and clinical relevance in maintaining foot mechanics and overall lower limb coordination.

Methodology: Formalin-embalmed adult human lower limb specimens irrespective of side and sex were selected using strict criteria to ensure anatomical integrity. Dissection followed Cunningham's manual. Lumbricals were carefully exposed, and morphological variations-number, origin, insertion, structural type (unipennate/bipennate) and neurovascular supply-were documented. High-resolution images supported both qualitative and quantitative analysis.

Results: Out of 40 formalin-embalmed lower limb specimens, 82.5% were normal, 17.5% exhibited variations. Accessory muscles (7.5%), Absent lumbricals (7.5%) and isolated absence of the 2nd lumbrical with bifurcation of the flexor hallucis longus tendon was noted in 1 specimen (2.5%).

Statistical Analysis: Data were recorded in Microsoft Excel, with descriptive statistics and frequency distributions computed for summary analysis.

Conclusion: Our findings align with previous studies and contribute to existing literature, helping surgeons navigate this region with awareness of possible variations to minimize surgical complications.

145. Spinal Curvature Variations: Anatomical Basis for Postural Back Pain in Modern Lifestyles

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Introduction: Low back pain (LBP) affects 619 million globally (2020), projected to reach 843 million by 2050. Modern lifestyles alter spinal biomechanics, with forward head posture (FHP) at 84% in students and back pain in 55.7% of adolescents. Physiological curvatures, cervical lordosis (C1-C7), thoracic kyphosis (T1-T12), lumbar lordosis (L1-L5), shift pathologically due to smartphone use < 5 hours/day in 30.1% of young adults.

Methodology: This STROBE-compliant cross-sectional study used photogrammetric craniovertebral angle (CVA) analysis for postural assessment. Participants completed Neck Disability Index, Oswestry Questionnaire, and usage surveys. FHP was defined as CVA < 49°, with spino-pelvic parameter evaluation.

Results: Prolonged screen time associated with adaptations (p<0.001). Users showed elevated cervical extensor activity, compressive/shear loads versus controls. FHP correlated with usage duration (63.5% prevalence), revealing cervical lordosis reduction, thoracic kyphosis increase, and altered loading. Mean CVA was 41.49° versus >49° normal. Multivariate regression confirmed addiction scores predict FHP (aOR = 4.41, 95%CI [1.3-11.6], $P = 0.014$); thresholds at 2-3 h daily.

Conclusion: Technology induces postural pain via muscular imbalances and curvature deviations from optimal alignment. Urgent ergonomics, education, and early interventions are essential to curb musculoskeletal burden.

146. Crossed Leg Syndrome

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Crossed leg syndrome is a clinical condition caused by prolonged leg crossing, leading to compression neuropathy, most commonly involving the common peroneal nerve at the fibular head. It is associated with sensory and motor deficits in the anterolateral compartment of the leg and dorsum of the foot. Awareness of the anatomical basis and clinical implications is essential for diagnosis and prevention.

Objectives:

- To study the anatomical sites vulnerable to nerve compression in crossed leg posture.
- To correlate cadaveric findings with clinical manifestations of crossed leg syndrome.

Materials and Methods:

- 2 human cadavers were dissected in the Department of Anatomy, ANMMCH, Gaya.
- The popliteal fossa, fibular head, and peroneal nerve course were carefully studied.
- Attention was given to the relationship of the common peroneal nerve with the fibular neck and surrounding fascia.

Results:

- In both cadavers (1 male, 1 female), the common peroneal nerve was observed winding around the fibular neck in a superficial position, with minimal muscular or fascial protection.
- This superficial course made the nerve highly susceptible to external pressure during prolonged leg crossing.
- Mild fascial variations were observed, but both cases confirmed the anatomical predisposition to compression neuropathy.

Discussion: The study supports the clinical observation that crossed leg posture is a significant risk factor for common peroneal nerve compression, leading to foot drop and sensory disturbances. The superficial location of the nerve around the fibular neck explains its vulnerability. Our findings are consistent with earlier literature reporting similar compression neuropathies due to habitual posture.

Conclusion: The anatomical evidence from cadaveric study highlights the predisposition of the common peroneal nerve to compression in crossed leg posture. Awareness of this anatomical relationship can help clinicians in early diagnosis, patient counseling, and prevention of posture-related neuropathies.

147. Study of Supratrochlear Foramen of the Humerus in Humans: An Anatomical Study

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Introduction: The Supratrochlear Foramen (STF) is an important and relatively common anatomic variation in the lower end of the humerus in humans. Anatomical knowledge of STF is useful for anatomists, orthopaedic surgeons, and radiologists. The present study was done to describe the features of STF of the humerus in Rajasthan population.

Materials and Methods: All bones were obtained from the Department of Anatomy, SMS Medical College, Jaipur, Rajasthan. The study was conducted on dried human humeri of unknown sex and age. A total of 100 humeri bone was studied, of which 53 humeri (53%) were right sided and 47 humeri (47%) were left sided, to determine the presence of supratrochlear foramen. The transverse and vertical diameters of the STF were measured using a Digital vernier caliper.

Results: Out of 100 humeri, STF was present in 30 humeri (13 right side and 17 left side). The majority of STF were round shaped (36.67%), followed by irregular shaped (30%), oval shaped (26.67%) and triangular shaped (6.67%). The STF was absent in 37 humeri (37%), and 33 humeri (33%) showed the translucency of septum. The mean vertical and transverse diameters of STF on the right side were 3.37 ± 2.177 and 4.94 ± 2.793 mm and on the left side, it was 3.92 ± 1.832 and 5.05 ± 2.416 mm respectively.

Conclusion: Knowledge of the supratrochlear foramen in the distal humerus in humans is important to the orthopaedician in supracondylar fractures, in intramedullary nailing of humerus, and to the radi-ologists for differenciating it from an osteolytic or cystic lesion.

148. Clinical and Diagnostic Insights from a Case of Megaureter

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Introduction: Megaureter is a rare anomaly categorized by abnormal dilatation of ureter, where the diameter of ureter exceeds 8 mm. Documentation of such rare cases contributes to a better understanding of their clinical & academic significance.

Methodology: This observational case study was conducted using retrospective review of the patient's medical records, imaging findings, and diagnostic test results. The case was managed surgically. Adynamic segment of the distal ureter was dissected, followed by reimplantation of ureter was done. Anonymity & confidentiality of the data was strictly maintained in accordance with ethical standards.

Results: A male patient of age 3 years & 9 months presented with chief complaints of pain while passage of urine for 10 days. His intravenous urography revealed left sided gross hydronephrosis with dilated ureter. The micturating cystourethrogram (MCU) revealed normal study with no reflux. Contrast enhanced CT of KUB region shows left sided hydronephrosis with left megaureter. Based on clinical history & imaging studies, a diagnosis of primary obstructive megaureter was made. No associated anomalies were identified.

Conclusion: Documenting rare cases like primary obstructive megaureter, enhances clinical awareness, supports differential diagnosis, and may guide better management strategies in future cases.

149. Unravelling the Coronary Puzzle: Patterns and Variations in Arterial Anatomy

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Introduction: The Right and Left Coronary Arteries (RCA and LCA) exhibit branching and dominance variations that are critical for myocardial perfusion. Coronary dominance—defined by the origin of the Posterior Interventricular Artery (PIVA)—and variability in nodal artery origins have significant implications for diagnosis, surgical planning, and imaging interpretation.

Methodology: Forty embalmed cadaveric heart specimens with well-preserved anatomy were studied. Dissections followed Cunningham's Manual of Practical Anatomy. Each branch along with its sulcus was dissected and the branching patterns was noted. Observed variations were documented, photographed and tabulated for further analysis.

Results: In all 40 cases, the RCA arose from anterior aortic sinus and LCA from left posterior aortic sinus. Variations were seen and noted in right marginal artery, Left anterior descending and posterior interventricular artery. Present study shows highest percentage of right dominance in comparison to left and co dominance. The proportions and further details will be presented in conference.

Statistical Analysis: Data was recorded in Microsoft Excel and expressed as percentages and means.

Conclusion: A comprehensive understanding of coronary anatomy and its variations is essential for achieving optimal clinical outcomes in the management of coronary artery disease. These findings highlight the need for individualized assessment of coronary anatomy in both clinical practice and future research.

150. An Unusual Ally: Sciatic Nerve Contribution to Gluteal Muscle Innervation

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Introduction: The sciatic nerve originates from the lumbar and sacral spinal nerves (L4-S3), providing motor and sensory innervation to the lower limb. Anatomical variations are relatively common and may also complicate surgical approaches, nerve blocks, and imaging interpretations, making anatomical awareness crucial for clinicians.

Methodology: During routine dissection of lower limb for first-year MBBS students at Department of Anatomy of ESIC Medical College, Bengaluru, we observed variations in the course of sciatic nerve, its relationship to piriformis muscle and divisions. The findings were noted and photographed.

Results: In this case, the sciatic nerve showed high division in the pelvis. One division piercing through the piriformis muscle and another passing below it. Both divisions traverse separately in the gluteal region and rejoins in the posterior thigh as a single trunk, it later divided at the superior margin of popliteal fossa into tibial

and common peroneal components. The division piercing the piriformis gave off a recurrent twig supplying the gluteus maximus before continuing distally as the common peroneal nerve.

Statistical Analysis: Data was recorded and compared with other relevant studies.

Conclusion: Understanding these anatomical variations is crucial for surgeons to avoid complications during procedures like hip replacements and spinal surgeries. Identifying such variations helps ensure proper treatment and care for patients with altered sciatic nerve anatomy.

151. Tracing the Tracts

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This is an educational approach for understanding white matter anatomy using MRI Diffusion Tensor Imaging with clinical application.

Aims and Objectives: The objective of this study is to demonstrate the anatomy of major white matter tracts of the human brain using Magnetic Resonance Imaging Diffusion Tensor Imaging (MRI DTI) and to highlight their educational value for students of human anatomy. The poster also aims to integrate concepts of applied anatomy by illustrating alterations of white matter tracts in the presence of intracranial tumours.

Materials and Methods: Normal human brain DTI datasets were analysed using tractography techniques to visualize the three principal categories of white matter fibres — association, commissural, and projection fibres. For applied anatomy, DTI data from patients with space-occupying lesions were reviewed to demonstrate displacement and distortion of tracts. Images were correlated with schematic anatomical diagrams to maximize clarity and didactic value.

Results and Discussion: Tractography successfully depicted the spatial orientation and connectivity of major white matter tracts. Visualization of the corpus callosum highlighted interhemispheric connections, while association tracts such as the arcuate fasciculus emphasized intrahemispheric communication. Projection fibres such as the corticospinal tract demonstrated the integration of cortical and spinal pathways. In pathological cases, tumours produced displacement, compression, and in some instances disruption of white matter tracts, underscoring their applied anatomical relevance. These findings enhance the comprehension of both normal and pathological anatomy, providing students with a three-dimensional perspective that complements traditional dissection-based learning.

Conclusion: MRI DTI tractography can serve as a valuable educational tool in anatomy teaching, allowing visualization of complex fibre pathways *in vivo*. By integrating normal and applied anatomy, it enriches student understanding and highlights the clinical relevance of white matter anatomy in patient care, particularly in neurosurgical planning.

152. A Histochemical Study of Mucin Expression in Salivary Gland Tumours in Tertiary Care Hospital in Indian Population

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Introduction: Neoplasms of the salivary glands account for 2% to 7% of head and neck neoplasms but less than 1% (approximately 0.3%) of malignancies from all body sites. Among them, pleomorphic adenoma (PA), mucoepidermoid carcinoma (MEC), and adenoid cystic carcinoma (AdCC) are the most common subtypes.

Methodology: Present study aims to investigate expression of mucins in the salivary gland tumour using special staining techniques in tertiary care hospital. The primary objectives of the present study are to prepare a database to identify the most common salivary gland tumour, to identify the frequency of salivary gland tumours in different age and sex groups, to identify the type of mucin in salivary gland tumours by using different staining techniques, and to compare mucin expression between benign and malignant salivary gland tumours.

Results: Acidic mucin was the most frequently expressed type (60%), followed by mixed (25%) and neutral mucin (15%). Most common tumour was PA followed by MEC and AdCC.

Conclusion: Histochemical evaluation of mucin offers a cost-effective and reliable adjunct in differentiating benign from malignant salivary gland tumours. Mucicarmine and Alcian Blue demonstrated high diagnostic specificity for benign lesions, particularly PA. The study emphasizes the value of integrating special stains into routine diagnostic protocols and provides a regional dataset on the histopathological spectrum of SGTs in a tertiary care hospital.

153. Impact of Traditional and Modern Teaching Modules on Immediate and Delayed Retrieval of Information among Adult Population Aged 18–25 Years

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Introduction: In view of the decreased availability of

cadavers for educational purposes in current scenario, virtual dissector like Anatomage may prove to be helpful in supplementing to even replacing cadaver as a teaching aid. The world has witnessed the phase of COVID where distant teaching of medical students was practiced. For such times educating by means of artificial intelligence has proven to be beneficial. Moreover, ethical concerns in procuring, handling, preservation and disposal of cadavers can be overcome. Challenges related to harmful effects of use of formalin is there. Till date studies that have been conducted have compared the student's perception on cadaveric vs virtual dissection but so far, no research has been conducted to compare and evaluate the effects of the two teaching modules for dissection on immediate and delayed recall.

Methodology: The study was conducted on First year MBBS students who consented to be a part of the study. Data was collected in the form of questionnaire. The assessment on the topic was done using the MCQ from the taught topic.

Results: With the scores from various assessments, their mean with standard deviations was derived to know the impact on learning.

Conclusions: Combined methods of teaching have better recall among students.

154. An Observational Topographical Study of Pterygomaxillary Fissure and Zygomatic Arch in Dry Human Skull with Its Surgical Implication in a Tertiary Medical College in West Bengal

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Introduction: The pterygomaxillary fissure (PMF), located between the posterior maxilla and the pterygoid process, is an important surgical landmark in maxillofacial procedures. The zygomatic arch, forming the lateral boundary of the face, serves as a key reference point in relation to the PMF. Accurate morphometric knowledge of this region is vital to avoid iatrogenic complications during surgical interventions.

Materials and Methods: This observational topographical study was conducted on 35 well-preserved dry human skulls from the Department of Anatomy, R. G. Kar Medical College. Distances between the PMF and three points of the zygomatic arch—articular tubercle (AB), zygomatic body (AD), and zygomaticotemporal suture (AC)—were measured bilaterally using a digital vernier caliper with 0.01 mm precision. Data were analyzed descriptively and represented as mean ± standard deviation (SD).

Results: The mean distance from the PMF to the articular tubercle was 38.6 ± 1.6 mm (range: 36.0-40.3 mm), showing consistency across specimens. The PMF to zygomatic body distance was 37.8 ± 2.2 mm (range: 33.5-40.3 mm), while the PMF to zygomaticotemporal suture was shortest at 33.2 ± 3.0 mm (range: 28.1-38.1 mm), indicating greater anatomical variability.

Conclusion: The articular tubercle provides the most reliable landmark in relation to the PMF, whereas the zygomaticotemporal suture shows the greatest variation. Understanding these morphometric relationships enhances intraoperative orientation, supports precise surgical planning, and minimizes operative risks in maxillofacial procedures.

155. Assessing the Effectiveness of Active Response and Interaction System-based Learning Strategies in Anatomy Classrooms for Generation Z Learners

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Introduction: Active learning techniques, such as Audience Response Systems (ARS) and Audience Interaction Systems (AIS), are increasingly integrated into medical education to enhance engagement and learning. Anatomy, a Basic medical Science subject, has particular challenges for Generation Z learners, who have unique preferences for interactive, technology-enhanced learning. Despite reported benefits of ARS/AIS in other contexts, specific evidence in anatomy education for this cohort remains limited.

Methodology: A mixed-methods quasi-experimental design was employed for undergraduate Phase 1 medical students. The intervention group received ARS-enhanced anatomy sessions that use real-time quizzes and polls. While the control group received an AIS-enhanced anatomy session that used interactive questions and solicited opinions on the topic, as well as their prior knowledge. Data collected using pre- and post-questionnaires, academic performance metrics, engagement surveys, and focus group discussions. Quantitative results were analyzed statistically, and qualitative data were analyzed thematically.

Results: It is expected that AIS integration will increase student engagement, motivation, and knowledge retention, reflected in higher quiz and exam scores compared to ARS integration. Qualitative analysis is predicted to reveal positive learner perceptions of technology-enhanced active learning.

Statistical Analysis: Results were analyzed using independent t-tests and ANOVA, to evaluate differences in performance and engagement between groups, with significance set at < 0.05.

Conclusion: This study provides a detailed analysis of ARS/AIS uses in anatomy education tailored for Generation Z

learners, highlighting the benefits of active learning and the associated learning outcomes. Results will guide curricular integration of technology-enhanced active learning strategies.

156. Anomalies of the Human Skull: Anatomical Variations and Clinical Implications

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The human skull, formed by intricate embryological processes, is highly susceptible to congenital and developmental anomalies. These anomalies not only alter craniofacial morphology but also influence neurodevelopment and overall health. Among the most significant conditions is craniosynostosis, characterized by premature fusion of cranial sutures, which may result in scaphocephaly (sagittal suture fusion), brachycephaly (bilateral coronal fusion), or trigonocephaly (metopic fusion). Case studies have documented children presenting with abnormal head shapes, raised intracranial pressure, and impaired cognitive development if untreated.

Other anomalies include plagiocephaly, often positional but occasionally due to unilateral suture fusion, and cleft palate, which reflects failure of maxillary processes to fuse, impacting feeding and speech. Microcephaly represents a severe reduction in cranial size, frequently associated with underlying brain underdevelopment. In contrast, macrocephaly may occur in hydrocephalus. Rare anomalies, such as frontonasal dysplasia or cranial bifidum, emphasize the close embryological link between neural tube closure and skull development.

This poster integrates embryological insights, radiological images, and documented case examples to illustrate the spectrum of skull anomalies. It highlights their clinical relevance for surgeons, radiologists, and pediatricians, with emphasis on early detection and surgical correction to prevent neurological and psychosocial complications.

157. Anatomical Study of Coronary Artery Morphology and Variations Using CT Angiography

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Introduction: Coronary arteries show considerable anatomical variations in their origin, course, dominance, and branching pattern. Accurate knowledge of these variations is crucial for interpreting coronary angiograms, planning interventions, and preventing complications. Multi-detector CT (MDCT) angiography provides high-resolution three-dimensional imaging, allowing detailed assessment of normal and variant anatomy.

Materials and Methods: A retrospective cross-sectional study was conducted on 100 CT coronary angiograms performed in the Department of Radiology. Patients with previously known coronary interventions, congenital heart disease, or inadequate image quality were excluded. Imaging was performed using a multi-detector CT (MDCT) scanner.

Statistical Analysis: Data was entered in MS excel 2016 and was analyzed using SPSS software version 20. Descriptive statistics were used to calculate frequencies and percentages. Data is represented with the help of tables.

Results: Right coronary artery (RCA) dominance was most common, observed in 76% of cases, while 14% were left dominant. No cases of co-dominance were noted. Anomalous origin of RCA from the left coronary cusp was seen in 1%. The presence of ramus intermedius was identified in 21%. Diagonal branches were most frequently two in number (88%), followed by single (6%) and three branches (6%). Obtuse marginal branches were predominantly two (79%), while single (20%) and three (1%) branches were less common. LAD type II was observed in 5% of cases. Absence of LCX was a rare finding (1%).

Conclusion: The study highlights that RCA dominance is the prevailing coronary pattern, with significant variations in branch morphology. Knowledge of these variations is essential for clinical, surgical, and interventional cardiology practice.

158. Conjoined Twins: Trouble of Twos

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Introduction: Conjoined twinning is a rare condition formed by late separation of the bilaminar embryonic disc, they share the amnion and chorion (monoamniotic, monochorionic) and are characterized by fusion of separable or inseparable part(s) of the body. Classification based on fused parts: Thoraco-omphalopagus (28%), Thoracopagus (18.5%), Omphalopagus (10%), Heteropagus (10%), Craniopagus (6%).

Case Report: The present case is preserved at the Department of Anatomy, Calcutta National Medical College. The set of female fetuses are fused at the thorax and abdomen with separate genitalia and a common placenta. Each has a separate head, neck along with upper and lower limbs. One has cleft lip and palate.

Discussion: Two theories for explanation: Secondary Fusion and Partial Fission. Conjoined twins have mirror imaging of the parts fused. This is however not true for all mono-amniotic twins. Thus the fusion hypothesis appears unjustified. Such pregnancies are associated with a high rate of still births. Chronic exposure to low dose radiations and drugs (griseofulvin) have found a causal relationship.

159. Morphology and Morphometric Analysis of Mandibular Canal and Mental Foramen in Adult Mandibles Using Orthopantograms (OPG), in South Indian Region of Telangana

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Introduction: The anatomy of the mandibular canal (MC) has been extensively described in the literature. The mandibular canal is located within the internal aspect of the mandible and contains the inferior alveolar nerve, artery and vein. It starts at the mandibular foramen, on the lingual side of the ramus, continues on the buccal surface of the mandibular body and ends at the mental foramen, adjacent to the second mandibular premolar tooth1 Mental foramen is located on each side of the external surface of body of mandible. It is a round opening, midway between the alveolar and lower border of mandible in the interval between premolar teeth. It is usually directed backward and laterally with clinical importance in local anesthesia and surgical procedures in terms of achieving effective mental nerve blocks and avoiding injuries to the neurovascular bundles 2.

Aim and Objectives: It is crucial to delineate the location, course, length and configuration of the mandibular canal and related vital structures during the implant treatment. To determine shape, position and location of mental foramen of South Indian population in the region of Telangana.

Materials and Methods: Standard panoramic radiographs were performed. Morphology and morphometry of 400 mental foramina were evaluated and divided into two groups. Group 1, age between (20-40) and Group 2, age between (41-75). Various parameters such as, distance from center of mental foramen to alveolar crest below the apices of 1st & 2nd premolar tooth, distance from center of mental foramen to inferior border, horizontal distance from symphysis menti to mental foramen were measured. The total length and the course of mandibular canal (M. C) such as linear curve, elliptical curve, spoon-shaped curve and turning curve were evaluated using a GENDEX® OPG scanner (GXDP-700TM, Hatfield, USA) by an experienced radiograph technician. Imaging was carried out with the following settings: 70 kV, 16 s, and 71 mGy. cm2.

Results: After the analysis of 400 OPG's mental foramina, the results were as follows: (1) the horizontal distance between the mental foramen and symphysis menti was 24.89 mm, on left side and 25.18 mm on right side in age group between 20-40, and 23.68 on left side and 23.55 in the age group of 41-75. (2) Mental foramen and inferior border of mandible was 13.58 mm on left side and 13.43 mm on right side in age group between 20-40 and 12.77 on left side and 12.84 mm on right side in the age group of 41-75. (3) Mental foramen and alveolar crest was 13.83 mm on left side and 14.07 mm on right side in age group between 20-40, 12.76 mm on left side and 13.04 on right side in the age group of 41-75. (4) The results showed the predominant position of mental foramen was below the second premolar tooth. The size of mental foramen was larger on right side and it was directed in postero-laterally. The shape of mental foramen was round in 84.09%, and oval in 15.91% of age group between 20-40 on left side. 81.55% round and 18.45% oval in above > 40 yearsand 93.05% round and 6.5% oval in < 40 yearson right side. The course of mandibular canal is divided into 4 curvatures and into to groups, based on the visibility of the canal as following, linear curve, elliptical curve, spoon-shaped curve, turning curve and invisible, probably visible and clearly visible canal respectively. The length of each curve along the course of the canal and total lengths were evaluated. Group A include the age between 20-40 yrs, and Group B between 41-75 years of age. The Mean SD findings of both groups are as follows.

Group A: Length of right canal = 69.24, Length of left canal = 66.54

Group B: Length of right canal = 67.26, Length of left canal = 64.08

Conclusion: The present study suggests that most common position of mental foramen was below the apex of second premolar in 74.15% of < 40 years age group, and 71.33% in above > 41 years age group on both sides. The shape of mental foramen was found to be round in majority of mandibles. Accurate localization of mental foramen is important while administering local anesthesia and performing surgeries. This information will be helpful in this regard. This study highlights a review of morphological and morphometric anatomy related to mandibular canal and mandibular vital structures are very important especially in implant therapy since inferior alveolar neurovascular bundle exists in different locations and possesses many variations. Important radiological and anatomic aspects regarding variations in course and length of the mandibular canal (MC) and their clinical implications in maxillofacial surgeries.

160. A Cadaveric Case Report on Left Sided Incomplete Superficial Palmar Arch

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Introduction: The superficial palmar arch (SPA) is a dominant vascular structure of the palm of the hand. The SPA is formed predominantly by ulnar artery & completed by anastomosis with branch of radial artery. In incomplete type of SPA, there was no anastomosis between the ulnar and radial artery.

Aims and Objectives: To study a case report on incomplete superficial palmer arch.

Materials and Methods: Study was carried out on a

middle aged male cadaver during routine dissection in the department of anatomy, BMC, Sagar, M. P in month of January 2025.

Results: After proper skin incision and dissection of Palm under steps mentioned in Cunningham's manual & we encountered an incomplete type of SPA in the left upper extremity. There was no anastomosis between RA and UA at palm of hand. UA gave four arteries : to medial three fingers and medial side of index finger, And RA gave two branches: to the lateral side of the index finger and and to the thumb.

Conclusion: In view of high rate of road traffic injuries at present time and need of surgical interventions, the anatomic knowledge of SPA variability as a dominant vascular structure of palm becomes essential.

161. A Cadaveric Case Report on Unilateral Presence of Sternalis Muscle

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Introduction: The sternalis muscle, an anatomical variant situated superficial to the pectoralis major muscle. It is also known as the rectus sternalis or parasternalis, is an uncommon accessory muscle in the chest wall, present in approximately 5% of both males and females.

Aims and Objectives: To describe the unilateral presence of sternalis muscle.

Materials and Methods: During the routine dissection, was performed in 58-year-old male cadaver in the pectoral region at Dept. Of Anatomy, Govt. BMC, Sagar, M. P. Gross anatomical features were meticulously noted and photographed.

Results: The sternalis was right sided, a long, slender, flat bi-tendinous sternalis was found with sternalis possessing distinct belly was observed.

Conclusion: They are considered to be a vestigial muscle and are unlikely to have any functional value. These variations are generally asymptomatic and do not cause any functional impairment. Surgeons and radiologists should be aware of the sternalis muscle to avoid mistaking it for a pathological lesion. Its presence can lead to diagnostic confusion in mammography and may alter electrocardiogram (ECG) results. Additionally, it has been utilized in breast reconstruction post-lumpectomy, highlighting its surgical significance.

162. Correlation between Radiological Anatomy and Cadaveric Dissection of Thoracic Cavity

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Introduction: Radiology offers precise anatomical visualization that supports cadaveric dissection, which is the gold standard in teaching anatomy, but comparative studies within the thoracic cavity are lacking in spite of its essential clinical significance.

Aim and Objective: To explore the relationship between cadaveric dissection and radiological anatomy of thoracic cavity through the identification of structures that demonstrate congruence between both modalities, noting the discrepancies and the possible reasons.

Materials and Methods: In a descriptive cross-sectional study on 12 formalin-fixed adult human cadavers thoracic structures were assessed by both cadaveric dissection and radiological examination by CT, MRI, and radiographs.

Statistical Analysis: Structures were categorized as consistently correlated, partially correlated, or non-correlated, and statistical analysis using SPSS version 22 used Pearson's correlation and Cohen's kappa to determine congruence and reliability.

Results: The findings indicated consistent correlation in 78.3% of structures, including heart chambers, great vessels, pulmonary lobes, diaphragm, trachea, and esophagus, whereas 15.6% presented partial correlation, like pleural recesses and segmental vessels, and 6.1% were non-correlated, primarily thymic remnants. Pearson's correlation coefficient of 0.89 ($P < 0.001$) and Cohen < 39;s kappa of 0.84 established a strong correlation and excellent interobserver reliability.

Conclusion: Radiological anatomy, hence, demonstrates strong congruence with cadaveric dissection of thoracic structures, with discrepancies underlining modality-specific limitations, and integration of both methods improves anatomical education and enhances clinical accuracy in thoracic interventions.

163. Assessment of Readiness for Self Directed Learning among Undergraduate MBBS Students

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Introduction: Self-directed learning (SDL) forms the pedestal in laying the future of the nation by giving a right direction to medical students, providing the desired exposure in order to acclimatize them and provide opportunities for success through new teaching learning strategies in the new curriculum. Fishers, in an attempt to achieve this common goal of collective growth of students designed the Self Directed Learning Readiness Scale (SDLRS), which acts as an important method for evaluating individual's perception of their skills and attitude which are associated with self-directedness in learning. It is a self perception scale in English language, emphasizing on three main subscales by measuring three components, namely self management, desire for learning and self-control.

Aims and Objectives: 1. To asses Self Directed Learning Readiness Scale amongst MBBS students, witnessing the process. 2. To find and introspect the association, if any, between readiness for SDL and the demographic characteristics of students.

Methodology: The study was conducted amongst MBBS first professional students at Chirayu Medical College and Hospital, Bhopal, wherein they were divided into groups for brainstorming discussions with peers and gaining knowledge through self study. The questionnaire for SDLRS was given through Google Forms, after obtaining informed consent from students. The statistical analysis was performed.

Results: The mean values and SD for self control was 3.367 ± 1.012, those for self management was 3.676 ± 1.0129 & those for desire for learning was 3.912 ± 0.976.

Statistical Analysis: Data was analyzed using SPSS.

Conclusion: The amalgamation of deep understanding of the process and the desired application forms the foundation of the success of the study. Discussions, self analysis and improved performance focussed at academic excellence. Fisher's SDLRS is an effective method for measuring SDL and its factor analysis can help in bridging the gaps of knowledge and efficiency of medical students, enabling a better atmosphere for learning and fostering growth.

164. Down Syndrome – A Case Report

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Background: Down syndrome (Trisomy 21) is the most common chromosomal disorder associated with intellectual disability, characteristic craniofacial features, and congenital anomalies. Recognizing its presentation is crucial for early diagnosis, intervention, and family counselling.

Materials and Methods: A detailed study of a confirmed case of Down syndrome was carried out, including clinical examination, chromosomal analysis, and relevant investigations. Photographs and findings were documented to highlight classical features.

Case Report: A newborn presented with hypotonia, flat facial profile, upward slanting palpebral fissures, single transverse palmar crease, and cardiac defect. Chromosomal karyotyping confirmed Trisomy 21. Supportive care and genetic counseling were provided to the family.

Conclusion: Down syndrome is a common chromosomal anomaly with variable clinical features. Early recognition, appropriate medical management, and counselling play a vital role in improving quality of life and guiding parental expectations.

165. Turner Syndrome – A Case Report

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Background: Turner syndrome (45,XO) is a chromosomal disorder affecting females, characterized by short stature, gonadal dysgenesis, and various somatic anomalies. Recognizing its clinical features is crucial for diagnosis, management, and counseling.

Materials and Methods: A confirmed case of Turner syndrome was reviewed with emphasis on clinical features, karyotype analysis, and relevant investigations. Detailed examination findings and photographic documentation were analysed.

Case Report: The patient presented with short stature, webbed neck, low hairline, broad chest with widely spaced nipples, and primary amenorrhea. Chromosomal analysis revealed monosomy X (45,X). Multidisciplinary management was planned, including hormonal therapy and genetic counselling.

Conclusion: Turner syndrome, though relatively common among chromosomal abnormalities in females, often remains underdiagnosed. Early identification facilitates appropriate treatment, improves quality of life, and provides essential guidance for families.

166. A Morphological Insight of the Posterior Interventricular Artery in Relation to the Cardiac Dominance in Adult Human Cadaveric Hearts

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Introduction: Cardiac dominance is determined by the origin of posterior interventricular artery which commonly originates from right coronary artery (right dominance), it can also arise from left coronary artery (left dominance) and from both called balanced dominance. It supplies the posterior 1/3 rd of interventricular septum and inferior wall of the heart. The posterior interventricular artery (PIVA) exhibits significant variations that may affect cardiac dominance and influence the outcome of cardiac procedures.

Methodology: The study was conducted on 35 formalin-fixed cadaveric hearts. Dissection was performed according to Cunningham's manual. Measurements were taken using a digital vernier caliper, and photographs were captured.

Statistical Analysis: All the data were recorded in an Excel sheet. Mean, standard deviation, and percentages were calculated. The data were presented in tables and graphs.

Results: In 71.4% specimens, posterior interventricular artery originated from right coronary artery (right dominance). In 22.9%, it arose from left coronary artery

(left dominance), and in 5.7%, from both arteries (co-dominance). Double or multiple PIVAs were also observed.

Conclusions: Understanding of the anatomical variability of coronary dominance is vital for clinical practice, as it helps in interventional planning and reduces procedural complications.

167. A Cadaveric Study of Variations in Branching Patterns of the Brachial Artery with an Embryological Review

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Introduction: The brachial artery is the chief artery of the upper arm, continuing from the axillary artery and supplying the arm and forearm. At the cubital fossa, it usually terminate into the radial and ulnar arteries. The variations in its branching are clinically important as they complicate diagnostic, surgical, and interventional procedures. This study documented the variations of brachial artery and interpreted their embryological basis.

Methodology: The study was conducted on 38 formalin-fixed adult cadaveric upper limb specimens from Department of Anatomy. Dissections were performed according to Cunningham's manual. Branching pattern of brachial artery was identified and variations were documented. The photographs were taken for documentation.

Statistical Analysis: All data were entered in Excel sheet. Mean, standard deviation and percentages were calculated, The results were presented in tables and graphs.

Results: The arterial variations were observed in 2 specimens (5.3%), while 36 specimens (94.7%) displayed normal branching. A superficial ulnar (accessory brachial) artery was noted in one case (2.6%). In another case (2.6%), a high division of the brachial artery was observed, with the radial artery coursing superficially.

Conclusion: Awareness of such arterial variations is essential to minimize vascular injury during intraoperative and interventional procedures, such as arterial catheterization, angiography, and bypass surgeries.

168. A Rare Combination of Bilateral Absence of Musculocutaneous Nerve with Bilateral Four-headed Biceps Brachii

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Introduction: A prior in-depth knowledge of the anatomical variations is essential for successful surgical interventions and minimizing inadvertent errors. Musculocutaneous nerve, a branch from the lateral cord of brachial plexus, is the chief nerve of flexor compartment of the arm. Here we report a case of bilateral absence of musculocutaneous nerve with bilateral presence of four-headed biceps brachii.

Case Report: During routine dissection in the Department of Anatomy in a female cadaver 67 years old at MDBASMC, Deoria, we observed a very unique and rare variation of bilateral absence of musculocutaneous nerve and bilateral four-headed biceps brachii muscle. The biceps brachii and brachialis muscles were supplied by direct branches from the median nerve. The short and long heads of biceps brachii had normal origin from coracoid process and supraglenoid tubercle respectively. The third head on both sides arises from the shaft of humerus between distal attachment of coracobrachialis and proximal attachment of brachialis and distally merged with the tendon of biceps brachii on its medial border. The fourth head on both sides arises superior to the attachment of third head lateral to insertion of coracobrachialis. Additionally, the fourth head on left side had a tendinous origin merging with the tendon of long head of biceps brachii. The accessory heads of biceps brachii were supplied from branches of the median nerve.

Conclusion: The knowledge of anatomical variations are significant for surgeons, radiologists, anaesthetists, physiotherapists to avoid complications during various diagnostic and surgical interventions.

169. Embalming Services for Transportation at Rajendra Institute of Medical Sciences (RIMS), Ranchi

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Introduction: Embalming services are essential for preserving deceased bodies for transportation over long distances, particularly when families require repatriation to distant locations within India or abroad.

Methodology: A descriptive analysis of embalming procedures and services at RIMS Ranchi was conducted, examining the department's infrastructure, protocols, and service delivery mechanisms. Data collection included review of existing facilities, documentation requirements, chemical preservation techniques employed, and coordination protocols with transportation agencies.

Results: The Department of Anatomy at RIMS Ranchi operates a dedicated embalming section with separate cold storage facilities exclusively for preserved bodies. The facility maintains modern preservation infrastructure with controlled temperature storage and professional embalming equipment. Standard embalming procedures utilize formaldehyde-based solutions. The department provides comprehensive documentation including embalming certificates, preservation confirmations, and coordination

support for transportation logistics. Service delivery includes 24/7 availability for emergency cases, proper handling protocols for infectious disease cases, and specialized preparation for international transportation requirements.

Conclusion: RIMS Ranchi's Department of Anatomy provides essential embalming services that facilitate dignified transportation of deceased individuals across long distances. The comprehensive infrastructure, standardized protocols, and professional expertise ensure compliance with transportation regulations while serving the community's needs. The facility's capacity to handle both routine and emergency embalming requirements makes it a vital resource for families requiring body transportation services. Continuous quality improvement and protocol standardization enhance service reliability and maintain the institution's reputation as a premier medical facility in eastern India.

170. Morphological Study of Meniscus of the Knee Joint of Human Cadaver

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Introduction: The menisci are considered main elements for a perfect articulation among the articular surfaces. Injuries to the menisci usually occur during weight bearing, and frequently involve a twisting or pivoting motion.

Methodology: A total of 104 menisci from 52 formalin fixed knee joints were utilized for the study at Anatomy department, SMIMS, Sikkim. The study was to determine the peripheral border length, inner border length, thickness, width and distance among anterior and posterior horn of the adult menisci.

Results: The peripheral border length and inner border length of medial meniscus was 84.27 ± 7.34 mm and 53.98 ± 4.51 mm significantly more than lateral meniscus 75.41 ± 6.28 mm and 40.19 ± 4.62. A difference, statistically significant was observed among the anterior, middle, and posterior thirds of lateral meniscus in which middle thirds was thickest (5.15 ± 0.75 mm) ($P < 0.05$) than anterior thirds (3.81 ± 0.688 mm) and posterior thirds (4.97 ± 0.827 mm) ($P < 0.05$). The individual analysis of each meniscus showed that the posterior thirds (12.25 ± 2.22 mm) was the widest part of medial meniscus (p< 0.05) than the anterior (6.76 ± 0.942 mm) and middle thirds (6.63 ± 0.969). In the lateral meniscus the posterior third (9.26 ± 1.42 mm) part was the widest (P< 0.05) compared to anterior third (8.89 ± 1.73 mm) and middle third (9.2 ± 1.53 mm).

Conclusion: The result of this study showed that there is an important relationship between the morphometric data of the menisci. Hence, this study is not only important for orthopedic surgeons, but also for morphologists and embryologist.

171. Ectopia Cordis: Heart without a Home

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Introduction: Ectopia Cordis is an extremely rare defect of the anterior body wall in which the heart is exposed through the sternal cleft owing to faulty apposition of the lateral folds of the embryo by the end of fourth week of development. There is usually additional herniation of abdominal contents. Estimated prevalence rate is 5.5-7.9 per million live births.

Case Report: The present case is a male neonate preserved in the Museum of the Department of Anatomy in Calcutta National Medical College. It shows incomplete ventral chest and abdominal walls with exposed heart along with exposed liver covered with peritoneum and left sided cleft lip. Umbilical cord can be appreciated underneath the exposed liver.

Discussion: Ectopia Cordis was first described in 1706 by Haller. Based on position, it is categorized as Cervical, Cervico-thoracic, Thoracic, Thoracoabdominal and Abdominal. It is usually identified by routine ultrasonography during pre-natal check-ups. Prognosis is generally poor. Chromosomal abnormalities like Edward's Syndrome (Trisomy 18) and Turner's Syndrome (44+XO) are usually associated with Ectopia Cordis. Intra Cardiac defects like Ventricular Septal Defect and non-cardiac malformations like cleft lip may also be associated as observed in this case. It is often a part of a constellation of five defects called Pentalogy of Cantrell along with supraumbilical abdominal wall defect, diaphragmatic hernia, pericardial defect, sternal cleft and intracardiac anomaly. Limitation: Since this is a preserved specimen, all features of Cantrell's Pentalogy could not be verified.

172. Foramen of Hyrtl: Consistent or Inconsistent Foramen

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Introduction and Aim: Orbital foramina are always luring the attention from anatomist and ophthalmologist for a decade. Among them foramen Hyrtl found in the lateral wall of orbit, lateral to lateral end of superior orbital fissure. Some of the authors call foramen Hyrtl as meningo-orbital foramen, cranio-orbital foramen, sinus canal foramen, sphenofrontal foramen or stapadial opthalmolacrimal foramen because it links the interior of orbit with the anterior or middle cranial fosaa and passes the meningeal branch of middle meningeal artery to orbit and have connection with lacrimal artery. There are different data about the proportional presence of

this foramen, some of data describes higher prevalence while some of them reveals negligible values. So this study aims to find the frequency of occurrence of foramen Hyrtl and its topographical position in orbit.

Methodology: This study was conducted on 50 human dry skull [100 orbits] in the department of Anatomy, Govt. Dental College, Ahmedabad. Meticulous observation was performed for the presence of foramen hyrtl and its location with reference to superior orbital fissure, fronto-zygomatic suture and supraorbital notch were noted with the use of Vernier caliper.

Results: Total twenty eight skull (56%) out of 50 shows presence of Foramen Hyrtl on the lateral end of superior orbital fissure. Among all 28% show bilateral presence while 22% on right and 6% on left side. Mean distance from superior orbital fissure were 8.5 mm on right side and 8.2 mm on left side. Mean distance from fronto-zygomatic suture were 23.7 mm and 26.3 mm on right and left respectively. Distance from supraorbital notch was 33.3 mm on right and 36 mm on left side.

Conclusion: It becomes evident from the current study that foramen Hyrtl is found in 56% of Indian population specifically from Gujarat region and generally present bilaterally. Precise information pertaining to topographical Anatomy of foramen Hyrtl is undoubtedly relevant to ophthalmologist and neurosurgeon while performing procedure through lateral wall of orbit in order to avoid vascular catastrophe.

173. Evaluating the Effectiveness of Innovative 3D Digital Neuroanatomy Model Making Competition for First Year Medical Students as a Teaching Learning Tool

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Introduction: The competency based medical education demands active students' participation with lots of opportunities for the teachers to implement creative, active and engaging teaching learning tools. Game based learning motivates lifelong learning and also gives interdisciplinary learning opportunity for the students. The digital 3D models will help the students in understanding the spatial relationship and complexity of anatomical structures especially the nervous system. Hence keeping this in mind, an innovative 3D neuroanatomy model making competition was designed.

Objective: The objective of this study is

1. To develop and validate an assessment questionnaire for assessing knowledge in neuroanatomy
2. To evaluate the effectiveness of 3D model making competition as a teaching learning tool on first year medical students in learning of anatomy and
3. To evaluate the acceptance of 3D model making competition as a teaching learning tool by student's feedback rating.

Methodology: The 3D digital Neuroanatomy Model Making Competition was conducted for 250 first year medical students in Sri Ramachandra Medical College & RI, SRIHER as a part of neuroanatomy teaching. The students were divided into 12 groups, each groups selected one topic in Neuroanatomy. The students used 3D Modelling software tools according to their hand skill convenience. A 7-minute video of their 3D models was made and submitted. Three judges evaluated the videos using the scoring sheets. A pretest and posttest were conducted. The pretest & posttest scores were analyzed by SPSS software for statistical significance. The scoring sheet by judges and the feedback responses were analyzed using descriptive statistics for both quantitative and qualitative analysis.

Results: The feedback from students showed that 85% of the students either agreed or strongly agreed that the competition helped them to acquire skills in self-directed learning, increased their problem-solving capacity and facilitated deeper understanding. The pretest and posttest marks were analysed statistically indicating significant improvement in posttest scores.

Conclusion: Hence the 3D neuroanatomy model making facilitated the understanding of anatomy more effectively. Neuroanatomy is one of the most difficult topic to teach, hence this teaching learning method will help the student to understand the complexities of the subject more clearly.

174. Morphometric Evaluation of Linea Aspera Patterns: Classification and Sexual Dimorphism in Adult Femora from Central India

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Introduction: The Linea Aspera, a longitudinal ridge on the posterior surface of the femur, serves as a crucial anatomical landmark for muscular attachment and biomechanical function. Its morphological variability holds forensic and anthropological significance, particularly in sex estimation and population-specific skeletal profiling. Despite its relevance, limited data exist on Femur morphology and Linea Aspera patterns in Central Indian populations, necessitating a regionally focused morphometric investigation.

Aims and Objectives:

- To determine sexual dimorphism in Adult Femora
- To classify the morphological patterns of the Linea Aspera in adult dry femora from Central India.
- To evaluate sexual dimorphism in Linea Aspera dimensions and configurations.
- To contribute to forensic and anatomical databases with population-specific skeletal metrics.

Methodology: A total of 20 adult dry femora were obtained

from osteological collections in Anatomy Department of Late Shri Lakhiram Agrawal Memorial Government Medical College Raigarh Chhattisgarh of Central India. The Femur bones were classified based upon gender by anthropometric measurements of head circumference and head height. Each specimen was examined for Linea Aspera morphology, including ridge prominence, bifurcation, and associated muscular impressions. Measurements were taken using Digital Callipers and recorded in millimetres. Morphological types were classified into predefined categories based on visual and metric criteria. Statistical analysis was performed using Microsoft Excel, applying t-tests to assess sex-based differences (statistical significance set at p < 0.05).

Results: Three distinct morphological patterns of the Linea Aspera were identified: Type I (single prominent ridge), Type II (bifurcated ridge), and Type III (diffuse or flattened ridge). Type I was predominant in male femora, while Type III was more frequent in female specimens. Mean ridge width and length were significantly greater in males ($P <$ 0.01). The classification showed strong correlation with sex, suggesting its utility in forensic sex estimation.

Discussion: The observed sexual dimorphism of Femur bone and in Linea Aspera morphology aligns with global osteological trends but also reveals unique regional characteristics. The predominance of Type I in males may reflect greater muscular loading and biomechanical adaptation. These findings underscore the importance of localized skeletal studies in refining forensic standards and anatomical education. Limitations include sample size and lack of age stratification, which future studies should address.

Conclusion: Femur in general & Linea Aspera in particular, morphologically exhibits measurable sexual dimorphism and pattern variability in the Central Indian population. Its classification and metric evaluation can aid in forensic identification and enrich anatomical teaching resources. Further multicentric studies are recommended to validate these findings across broader demographic cohorts.

175. Histological Assessment of Degenerative Changes in Supraspinatus Tendon Tears – A Case Series

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Background: Rotator cuff (RC) disease is a common cause of shoulder pain and dysfunction in adults, though not all affected individuals are symptomatic. The pathogenesis of full-thickness tears of the rotator cuff remains unclear, and the etiological factors are poorly understood. The present study analyzed the morphological and histological features of supraspinatus tendon specimens obtained from patients with RC tears.

Objectives: To evaluate the extent of degeneration and histological characteristics of supraspinatus tendon tears in surgical biopsy specimens.

Methodology: Radiological evaluation was performed using magnetic resonance imaging (MRI) and ultrasonography (USG). Supraspinatus tendon samples were collected from patients undergoing rotator cuff surgery. Histological evaluation was carried out using Masson's trichrome staining to assess tendon degeneration and structural abnormalities.

Results: A 50-year-old male with shoulder pain following trauma presented with a complete interstitial supraspinatus tear. A 55-year-old male reported progressive pain without trauma, and USG revealed a 1.7 cm partial-thickness tear. A 60-year-old female with chronic shoulder pain showed a 2.5 cm complete supraspinatus tear with retraction on MRI. Patients with full-thickness tears were generally older and had larger lesions. Histological examination demonstrated tendon degeneration, collagen fiber disorganization, and fibrotic changes.

Conclusion: This study highlights the histological features of supraspinatus tendon tears, emphasizing progressive degeneration in relation to age and tear size. Detailed structural analysis of tendon specimens provides valuable insights into the pathogenesis of rotator cuff tears and may guide future research in prevention and management strategies.

176. Morphology of Suprascapular Notch of Scapula in Eastern Uttar Pradesh Population

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Introduction: The suprascapular notch is a small indentation on the upper border of the scapula through which the suprascapular nerve passes. Its shape is not always the same in every individual. These differences are important because certain shapes may increase the risk of nerve compression, which can cause shoulder pain and weakness. Variations in the notch are also relevant for radiologists and surgeons working around the shoulder joint.

Aim: This study was carried out to look at the shape of the suprascapular notch in dry scapulae from the Eastern Uttar Pradesh population and to identify any unusual findings, such as ligament ossification.

Materials and Methods: The study was conducted in the Department of Anatomy, Maharishi Vishwamitra Autonomous State Medical College, Ghazipur. A total of 51 dry scapulae were examined, including 23 from the left side and 28 from the right side. Each suprascapular notch was studied for its shape, and special attention was given to whether the superior transverse scapular ligament had turned into bone (ossified).

Results:
- 27 scapulae (53%) had a J-shaped notch.
- 23 scapulae (45%) had a U-shaped notch.
- 1 scapula (2%) showed ossification of the superior transverse scapular ligament, turning the notch into a bony hole (foramen).
- No other unusual changes were seen.

Conclusion: In this population, the suprascapular notch was most often J-shaped, followed closely by U-shaped. Complete ossification of the ligament was rare, but it is clinically important because it can lead to suprascapular nerve entrapment. Being aware of these variations helps doctors avoid misdiagnosis on scans and ensures safer surgical procedures around the shoulder.

177. Morphometric and Morphological Variation of the Paracentral Lobule across Age Groups: A Radiological MRI Study

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Background and Introduction: The paracentral lobule (PCL), located on the medial surface of the cerebral hemisphere, is critically involved in motor control of the lower extremities and autonomic functions such as micturition and defecation.

Aim and Objectives: This study aimed to characterize the morphometric and morphological variations in the PCL among pediatric, adult, and geriatric populations using MRI imaging.

Methods: A cross-sectional radiological analysis was performed on mid-sagittal MRI scans from 300 healthy individuals, stratified into three age groups: 3-17 years, 18-59 years, and 60 years and above (n = 100/group; 50 males and 50 females per group). Individual MRI scans with parenchymal brain disorders were excluded. Measurement of PCL width and height involved averaging values from three anatomical reference points per dimension using PACS software. Anatomical boundaries were established via the cingulate sulcus and related landmarks.

Statistical Analysis: Differences were evaluated using appropriate statistical tests. PCL width differences among age groups were not statistically significant (p>0.05). Mean height differed significantly between the pediatric and geriatric groups (P = 0.009). No significant gender-based differences in PCL measurements were observed within individual age cohorts (p>0.05).

Results: Mean PCL width: pediatric 31.05 mm, adult 38.03 mm, geriatric 35.18 mm. Mean PCL height: pediatric 24.59 mm, adult 26.17 mm, geriatric 23.91 mm. Significant reduction in height was noted in the geriatric group compared to pediatric subjects.

Conclusion: Height of the paracentral lobule exhibits significant age-related variation, especially between pediatric and geriatric groups, with gender having no discernible effect. These data provide foundational insights for correlating neural structure and function across different age groups.

178. Radiological Correlation of Spinal Cord Compression Severity and Extent of Myelomalacia: An Anatomical Mapping Study

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Introduction: Spinal cord compression (SCC) is a progressive disorder that often culminates in myelomalacia, an irreversible degeneration of spinal cord tissue. Quantitative MRI combined with anatomical mapping provides crucial insights for diagnosis, prognosis, and surgical planning.

Methodology: This retrospective observational study was conducted at SNMC, Agra, between January and July 2025. 50 patients (32 males, 18 females; mean age 55.4 ± 8.2 years) with cervical spondylotic myelopathy were evaluated. MRI (1.5 Tesla) with T1, T2, STIR, and dynamic sequences was performed. Compression severity was graded using the modified Muhle scale, and myelomalacia was assessed by craniocaudal T2 hyperintensity length and volumetric atrophy. Anatomical mapping with 3D Slicer localized compression zones and extension patterns.

Results: The most frequent compression site was C5–C6 (42%), followed by C4–C5 (30%). Myelomalacia extended beyond the primary compression site in 70% of cases, often showing a "snake-eye" appearance. Severe compression was associated with cord diameter < 7 mm, T2 hyperintensity < 10 mm, and T1 hypointensity.

Statistical Analysis: A strong positive correlation was observed between compression severity and myelomalacia length (r = 0.72, P < 0.001). Regression analysis showed that each one-grade increase in compression severity predicted a 3.5 mm increase in myelomalacia length (95% CI: 2.1-4.9 mm, p < 0.001). ANOVA confirmed significant differences across severity groups (F = 15.6, p < 0.001).

Conclusion: Greater SCC severity strongly predicts extensive myelomalacia. Quantitative MRI with anatomical mapping is essential for early detection, prognostication, and surgical decision-making.

179. Anatomical Study of the Splenic Artery and Its Variations

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Background and Introduction: The splenic artery, the largest branch of the celiac trunk, displays considerable anatomical variations in its origin, course, and branching pattern. These variations, although usually asymptomatic, are of great clinical importance during splenectomy, pancreatic surgery, liver transplantation, and radiological interventions such as embolization and angiography. Previous cadaveric and radiological studies have reported a wide spectrum of splenic artery variants.

Methodology: The present cadaveric study was conducted on 20 embalmed specimens in the Department of Anatomy, Patna Medical College and Hospital, Patna. The abdominal cavity was opened, and the celiac trunk with its branches was dissected. The splenic artery was traced from its origin to the hilum to observe its origin, course, and branching pattern. All findings were recorded, photographed, and compared with standard anatomical descriptions and published studies.

Results: In the majority of cases, the splenic artery originated from the celiac trunk, which was observed in 18 out of 20 cadavers (90%). A direct origin from the abdominal aorta was noted in 2 cases (10%). The artery followed a serpentine or tortuous course in 17 specimens (85%), while a relatively straight course was observed in 3 specimens (15%). With respect to terminal branching at the splenic hilum, the distributed pattern was the most common, occurring in 16 cadavers (80%), whereas trunk or bundled branching and the presence of accessory splenic arteries were seen in 4 cadavers (20%). Overall, the study confirmed that the splenic artery most frequently arises from the celiac trunk, usually follows a tortuous course, and commonly displays a distributed branching pattern at the hilum.

Statistical Analysis: Findings were expressed as percentages and aligned with previous studies, which reported anomalous origin in ~8-10% and accessory splenic arteries in ~10-15% of cases.

Conclusion: The splenic artery shows notable variability in its origin, course, and branching. Knowledge of these variations is crucial for surgeons and radiologists to avoid intraoperative complications and optimize outcomes in abdominal surgeries and interventional procedures.

180. A Morphometric Study of the Sacrum and Its Clinical Significance

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The sacrum, located at the caudal end of the vertebral column, plays a vital role in orthopedic and anesthetic procedures, particularly during caudal epidural block (CEB). The present study aimed to evaluate the morphometry of the sacrum in dry bones, with emphasis on anatomical landmarks for locating the sacral hiatus. A total of 25 adult dry sacral, free of fractures or wear, were studied using vernier calipers, and measurements were taken twice for accuracy.

The mean maximum length and width of the sacrum were found to be 98.6 ± 13.8 mm and 100.7 ± 7.1 mm, respectively. The sacral index and curvature index averaged 101.2 and 91.5. The most common shape of the sacral hiatus was inverted U (70%), followed by inverted V (20%).

This morphometric study highlights regional variations in sacral dimensions and their clinical importance. Knowledge of these parameters is crucial in minimizing complications during caudal epidural block, orthopedic interventions, and in associating sacral morphology with clinical conditions such as low back pain and sacroiliac joint pathologies. Moreover, understanding sacral foramina positioning may enhance success in managing pelvic floor disorders through sacral nerve stimulation.

181. Morphometric Analysis of the Distal End of the Dry Adult Humerus in Humans

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Introduction: The humerus is the longest bone in the upper limb. It presents upper and lower ends, and an intervening shaft. The proximal end shows a large, smooth, rounded head that articulates with glenoid cavity of the scapula. The distal end is expanded from side to side and flattened before backwards. It has two articular structures, rounded capitulum and pulley shaped trochlea. The medial and lateral epicondyles are the bony projections which lie extracapsular. The measurements of the above bony areas are crucial for orthopaedic surgeons in reconstructive surgeries involving the elbow, particularly in cases of fractures or for designing and fitting implant.

Methodology: 90 Dry adult humeri obtained from the department of Anatomy(ESICMC & PGIMSR-Blore)-measurements using osteometer, and sliding vernier calipers. To determine the-

- The transverse distance between the medial and lateral epicondyles
- The transverse distance of the trochlea
- The distance between the trochlea and the capitulum.
- Vertical distance of the Humerus

Statistical Analysis: By applying descriptive statistics-mean and standard deviation in excel.

Results: The mean distance for the following parameters Vertical length of humerus = 26.85 cm Dist between medial and lateral epicondyle = 5.662 cms Transverse distance of the trochlea = 2.270 cm Distance between trochlea and capitulum = 4.396 cm Transverse distance of the capitulum = 2.126 cm.

Conclusion: This study helps the orthopaedicians to plan for the surgery and thus reduce the complications.

182. Morphological Study of Variation of the Liver and Its Clinical Significance: A Cadaveric Study

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Introduction: The liver is the largest gland & abdominal organ in the right hypochondrium, epigastrium, and left hypochondrium. Morphological features of the liver serve as important landmarks for radiologists and surgeons in the diagnosis and interpretations of liver diseases. Accessory fissures and accessory lobes often mislead the clinicians in the diagnosis of liver pathologies.

Materials and Methods: The present study was conducted in the department of anatomy, Medical College Baroda, Vadodara, Gujarat with 35 formalinfixed livers obtained from the cadavers of both sexes. Morphological surface features were observed, photographed, and studied.

Results: In the present study, of the 35 liver specimens, 19 (54%) livers exhibited normal morphology. Of the remaining 16 (46%) specimens, hepatic variations were observed, and they were categorized as accessory lobes, diaphragmatic grooves, accessory fissures.

Conclusion: The knowledge of abnormality in surface features of the liver is clinically significant and will help the radiologists and surgeons in the interpretation of normal and abnormal liver.

183. Morphological and Morphometric Study of Scapula, with Emphasis on Glenoid Fossa, Acromion Process and Coracoid Process

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Introduction: The scapula is a flat, triangular bone of shoulder girdle. Due to disproportionate articular surfaces and laxity in articular capsule, dislocation of shoulder is frequent for which arthroplasty with prosthetic implant is done. Therefore, the study of morphology and morphometry of scapula particularly its glenoid fossa, acromion and coracoid processes are important for clinicians and orthopaedic surgeons for the management of various conditions associated with shoulder joint as well as choosing appropriate size of prosthesis in shoulder arthroplasty to reduce the morbidity associated with it.

Methodology: This cross-sectional study was performed on 32 dry adult human scapulae (Right: 18; Left: 14) of unknown age and sex obtained from the Department of Anatomy at Calcutta National Medical College. Various shapes of Glenoid fossa and Acromion process, types of Acromion process and Coraco-glenoid space were observed. Different morphometric parameters like Length, Breadth and Infraspinous length of Scapula, Supero-Inferior diameter, widest and narrowest Antero-posterior diameter of Glenoid fossa, Length, Width, Thickness of Acromion and Coracoid Processes, Acromio-Coracoid, Acromio-Glenoid and Coraco-Glenoid distances were also measured by Digital Vernier Calliper after standardization.

Results: The observed shapes of the Glenoid fossa were Oval, Pear and Inverted Comma shapes. The shapes of Acromion process obtained were of Square, Tubular and Rectangular and Triangular. The types of Acromion process seen were Curved, Hooked and Flat. The types of Coraco-Glenoid space seen were Round and Square brackets and Fishhook. The scapular, glenoid fossa, acromion, coracoid, and shoulder joint measurements showed that most dimensions were slightly larger on the right side, while a few parameters such as the infraspinous index, narrowest antero-posterior diameter, and certain joint distances were greater on the left, indicating minor asymmetry between sides.

Conclusion: This study has recorded different morphological and morphometrical variations of scapular glenoid cavity, acromion process and coracoid process. It will be beneficial to orthopaedic surgeons to meet the challenges during treatment of patients with shoulder diseases and also to forensic experts for sex determination.

184. Utilization of Virtual Anatomy Tools in Pro-section and Demonstration of Humane Anatomy for Under Graduate Teaching

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Introduction: Recent advancements in technology have revolutionized the way medical education is delivered, with virtual anatomy tools emerging as a transformative solution for pro-section-based learning. This presentation introduces a cutting-edge virtual anatomy tool designed to enhance the understanding of human anatomy through interactive, and highly accurate 3D visualizations of humane organs both in layers & systemic anatomy. The tool offers a realistic simulation for pro-section study, enabling students and medical professionals to explore anatomical structures layer by layer in a virtual environment without the need for cadavers.

Methodology: Equipment-Virtual dissection table, wall mounted LED screen & projectors. Pro-section classes

are fixed about 30 mnt. before actual cadaveric dissection, group of 50-75 nos. in a dry lab set up. Regional and systemic anatomical structure (Static & Dynamic) prepared in advance & saved can be displayed to the students.

Conclusion: By integrating advanced imaging techniques & digitalised very thin sections of the actual cadavers of various ethnic group and sex with augmented reality (AR), provides detailed representations of tissues, organs, and systems, improving spatial comprehension and reducing the reliance on physical specimens. To give a proper exposer to ECE, integrated CT, MRI, USG with various interventional clinical procedure can be demonstrated.

185. Impact of Mental and Physical Health Interventions on First-Year Medical Students' Readiness for Professional Examinations: A Longitudinal Assessment Study

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Introduction: First-year medical students face significant emotional distress from demanding academic environments, impacting their readiness for professional examinations. This longitudinal study assesses their mental and physical health, analysing feedback to implement targeted interventions fostering adaptive skills, positive self-perceptions, and supportive relationships to enhance well-being and academic success.

Aims and Objectives: To assess the health and well-being of first-year MBBS students, identify prevalent physical and mental health conditions, provide targeted interventions, and promote a supportive academic environment for personal and academic growth.

Methodology: This mixed-methods study assessed mental health interventions for 100 first-year MBBS students over 12 months, using SHQ-9, GAD-7 and questionnaires pre- and post-exam.

Results: Mean age 19.7 years, mostly males. 2024 batch showed higher PHQ-9 (9.2) and GAD-7 (6.5) scores than 2023 (7.4, 5.1), indicating more distress. 2023 improved post-exam; 64% managed time, but 13% faced sleep issues, 9% workload. 42% reported no issues; 48% of 2024 needed support.

Discussion: Elevated stress, anxiety, and depression universally impair student performance. Recent evidence indicates proactive prevention is crucial, as reactive treatments are underutilized, with only 15-20% of affected students seeking help.

Conclusion: Comprehensive interventions foster a supportive environment, improving student well-being and academic success, setting a precedent for other institutions.

186. Variation of Gastroduodenal Artery, Cystic Artery – A Case Report

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The gastroduodenal artery (GDA) is one of the terminal branch of the common hepatic artery along with proper hepatic artery that mainly supplies the pylorus of the stomach, proximal duodenum, and head of the pancreas. Cystic artery is a branch of right hepatic artery that supplies the gall bladder.

During routine abdominal dissection of duodenum and pancreas in the Department of Anatomy, Hassan Institute of Medical Sciences, Hassan, for I yr MBBS students, a female cadaver aged about 50-55 yrs, presented with right hepatic artery as a branch of gastroduodenal artery, further gastroduodenal artery divides into superior pancreaticoduodenal and right gastric epiploic artery. Normally superior pancreaticoduodenal artery lies in groove between head of pancreas and concavity of duodenum, but here superior pancreaticoduodenal artery lies anteriorly in relation with neck of pancreas and anastmoses with inferior pancreaticoduodenal artery branch of superior mesenteric artery. Cystic artery was taking origin from left hepatic artery to supply the gall bladder. The etiogenesis, embryological and clinical importance will be discussed during the presentation.

187. Effect of Yoga Intervention on Oxidative Stress and Insulin Sensitivity in Polycystic Ovarian Syndrome Women: An Untargeted Metabolomics LC-MS Study

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Introduction: Polycystic ovarian syndrome (PCOS) is a complex metabolic disorder affecting about 11% of women in India and worldwide. While characterized by ovarian dysfunction, it is primarily a systemic condition linked to metabolic dysfunctions. As a lifestyle-related disorder with long-term health risks, it requires a holistic management approach like Yoga.

Methods: This study involved 60 women (30 diagnosed with PCOS, 30 age and BMI-matched healthy controls). PCOS women underwent a 12-week Yoga practice (5 days a week, 1 h a day) that included physical postures (Asanas), regulated breathing practice (Pranayama), and meditation (Dhyana) under the guidance of a trained Yoga therapist. Clinical characteristics and laboratory biochemical data were recorded, followed by a metabolomics analysis using high-resolution Orbitrap Fusion Tribrid Mass Spectrometer technology. Additionally, for validation, we performed RT-PCR to

assess the expression of metabolic genes involved in insulin sensitivity and glucose uptake, as well as chemiluminescence and ELISA to evaluate oxidative stress-related markers.

Statistical Analysis: The MetaboAnalyst 6.0 web application was used for the statistical data analysis. A paired-sample *t*-test was used to compare outcomes within groups and unpaired between groups. A *P* value < 0.05 was considered statistically significant.

Results: After the Yoga intervention, PCOS women showed significant improvement in hormonal parameters, lipid profile, and menstrual regularity. Several key metabolites associated with insulin sensitivity, oxidative stress, and glucose uptake showed significant improvement, along with upregulation of transcripts related to metabolic function and oxidative stress markers ($P < 0.05$). The metabolome analysis showed significantly differentially expressed metabolites that address key pathogenesis factors in PCOS.

Conclusion: Yoga, a traditional complementary integrative medicine, shows significant improvement in metabolome and clinical outcomes in women with PCOS. Additionally, reductions in BMI and body measurements, along with improved lipid profiles, contribute to a lowered risk of obesity, IR, IGT, T2DM, fatty liver, and cardiovascular complications.

188. Variation in Position of Infraorbital Foramen in Dry Human Skull

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The Infraorbital Foramen (IOF) serves as the crucial bony exit for the infraorbital nerve (ION), artery, and vein, located on the anterior surface of the maxilla. Its typical position is described as approximately 7-10 mm below the inferior orbital margin (IOM) and vertically aligned with the maxillary second premolar. It is an important landmark for infraorbital nerve block and maxillofacial surgeries. Variations are not uncommon and may have clinical implications. During routine osteology demonstration in the Anatomy Department of NALANDA MEDICAL COLLEGE, PATNA a dry adult human skull was found showing bilateral asymmetry in the position of the Infraorbital Foramen. On the right side, the foramen was located below the infraorbital margin and in line with the canine tooth. On the left side, the foramen was aligned with the second premolar. Both foramina were oval and directed inferomedially. This positional deviation from the typical premolar alignment was noted as a significant anatomical variation. Variation in Infraorbital Foramen position may alter the route of the infraorbital nerve and vessels. Such deviations can lead to incomplete anaesthesia or iatrogenic injury during surgical or dental procedures. Therefore, awareness of possible positional asymmetry is essential for clinicians. This case highlights the side-to-side variation in the position of the infraorbital foramen, emphasizing the need for careful localization before performing infraorbital nerve blocks or maxillofacial surgeries.

189. Case Report – Unusual Presence of Wormian Bone at the Asterion

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Wormian bones, also known as sutural bones, are small irregular, accessory bones that occurs within cranial sutures or fontanelles. They are formed due to additional ossification centres in or near sutures. They are most commonly found in lambdoid suture, one such bone (Wormian bone) was spotted in a dry skull bone of unknown sex located at the Asterion on the right side during routine osteology class of UG students, in the department of Anatomy, Nalanda Medical College, Patna. It was irregular quadrilateral in shape measuring approximately 1.2 × 0.8 cm located at the junction of Parietomastoid, Occipitomastoid and lambdoid sutures. Knowledge of such variation is important for anthropologist, neurosurgeons, radiologist and forensic experts, as Wormian bones may be mistaken for fracture or cranial sutural pathology.

190. Morphometric Analysis of Dry Human Sacra: Establishing a Baseline Database in the Himalayan Population

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Background: The sacrum, a wedge-shaped bone forming the keystone of the pelvis, essential for stability, weight transmission and locomotion. Variations in sacral morphology show regional and ethnic diversity. This study was conducted to analyze morphometric parameters of dry human sacra and establish a baseline database with clinical and forensic relevance.

Materials and Methods: A cross-sectional, observational study was carried out on 45 dry, fully ossified sacra obtained from the Department of Anatomy, IGMC Shimla. Deformed, fractured, or incomplete specimens were excluded. Morphometric parameters recorded using a digital Vernier caliper included sacral height, sacral width, vertebral body heights (S1–S5), transverse foraminal distances (TA1, TA2), pedicle heights (S1 & S2; right and left), and auricular surface dimensions (height & width; right and left). Data was analyzed using descriptive statistics.

Results: The mean sacral height was 96.07 ± 12.0 mm and sacral width 106.88 ± 8.1 mm, indicating a platyhieric morphology. Vertebral body heights decreased progressively from S1 (28.6 mm) to S5 (15.1 mm). Foraminal distances narrowed caudally (TA1: 31.16 mm; TA2: 27.70 mm). Pedicle heights showed mild asymmetry at S1 (Rt: 17.4

mm; Lt: 14.8 mm), while S2 was nearly symmetrical. Auricular surfaces were almost symmetrical, with height (Rt: 58.1 mm; Lt: 56.7 mm) consistently greater than width (Rt: 33.2 mm; Lt: 32.6 mm).

Conclusion: The sacra of the Himalayan population are broader than tall, with caudal tapering of vertebral bodies, narrowing foramina, and symmetrical auricular surfaces. These findings provide a baseline morphometric database with applications in orthopedics and forensic anthropology.

191. Abnormal Attachment of the 11th Rib to the Sternum: A Case Report

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Introduction: The ribs are the bony framework of the thoracic cavity. There are twelve pairs of ribs. Each rib articulates posteriorly with two thoracic vertebrae; by the costovertebral joint. According to their attachment to the sternum, the ribs are classified into three groups: true, false and floating ribs. The true ribs are the ribs that directly articulate with the sternum with their costal cartilages; they are the first seven ribs. The false ribs are the ribs that indirectly articulate with the sternum, as their costal cartilages connect with the seventh costal cartilage; by the costochondral joint; They are the eighth, ninth, and tenth ribs. However, the floating ribs are the ribs that do not articulate with the sternum at all.

Materials and Methods: During Routine Cadaveric Dissection of Undergraduate Students, the thoracic cage was observed and measured for number of ribs, shapes and sizes.

Results: A case was observed that showed the attachment of 11 th Rib to the sternum through fibro-cartilaginous attachment.

Conclusion: As ribs development is under Hox Gene and like vertebrae they originate from somites. This current study has shown rare attachment of 11 th rib to sternum via fibro-cartilaginous band, as an anatomical variation. This information will be valuable for anatomist, radiologist and thoracic surgeons.

192. Autism Spectrum Disorder without Intellectual Disability: A Case Report

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Introduction: Autism spectrum disorder is a neurodevelopmental disability and in ASD without intellectual impairment suffer higher rates of physical and psychiatric morbidity, Language impairments in children with ASD are common and often exhibit impairments in receptive or expressive structural language, difficulties understanding and formulating language. Structural language comprises the domains of vocabulary and word relations and grammar. However, within the group of children with ASD, receptive and expressive language abilities vary a lot, not just across the IQ spectrum but also within the group of children with ASD without ID. This condition is also known as High functioning autism.

Methodology: Children with ASD were taken into consideration to compare and analyse the autism with or without intellectual disability.

Results: Autism without ID represents a unique clinical presentation within the autism spectrum, characterized by preserved intellectual and verbal abilities alongside significant social and behavioural challenges. The absence of intellectual disability allows for better academic integration, difficulties in attention, restricted interests hinder academic and social performance.

Conclusion: The phenotypic profile of ASD children and adolescents in relation to possible early risk factors a communication development, cognitive and behavioural profile, level of school adaptation, as well as family history. A better recognition of strengths and vulnerabilities linked to the phenotypic profile will contribute to a better alignment with treatment plans, especially in public policies.

193. A Comprehensive Approach of Luminal Cast Plastination Using Denture Material in Cadaveric Specimens

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Introduction: Plastination is a preservation technique that involves replacing water and fat in biologicalvtissues with curable polymers, thereby allowing long-term maintenance of anatomical specimens. Luminal casting, when combined with plastination, enables the visualization of internal structures and vascular architecture, offering valuable insights into the intricate microvascular patterns of organs.

Materials and Methods: This study will be conducted in the Department of Anatomy at East Point Medical College. Intact and undamaged human organ specimens will be selected for the procedure. Materials to be used include normal saline, denture material (as the casting medium), a weighing scale, syringes, and glass bowls. Specimens will be pretreated by gentle inflation with saline to dislodge any obstructions within the vascular lumen. The casting solution will be prepared in advance and introduced into the vascular system of the specimens. The entire process will be documented step-by-step using a DSLR camera for detailed visual records.

Results: It is anticipated that the vascular architecture of the organs will be clearly delineated following the casting procedure.

The resulting luminal casts are expected to demonstrate three-dimensional microvascular patterns with high clarity.

Conclusion: Luminal cast plastination offers a reliable method for producing three-dimensional visualizations of vascular structures. Such models serve as effective teaching aids, enhancing the understanding of complex vascular anatomy among medical students and trainees.

194. A Rare Genetic Condition of Encephalocraniocutaneous Lipomatosis – A Case Report

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Introduction: Lipomas are common benign mesenchymal tumors composed of mature adipocytes. While typically sporadic and asymptomatic, some cases may follow an autosomal dominant inheritance pattern, particularly in the context of syndromic associations. Nevus psiloliparus, a rare variant of lipoma involving the scalp, presents as a painless subcutaneous mass composed of adipose tissue. Approximately 80% of benign adipocytic tumors are conventional lipomas, with around 13% occurring in the head and neck region.

Methodology: A 44-year-old male presented to East Point Medical College with a complaint of progressive scalp swelling. Clinical examination and imaging studies suggested a benign lipomatous lesion. The patient was advised to undergo further investigations, including molecular genetic testing, to evaluate for possible hereditary lipomatosis. Blood samples were collected and submitted for genomic analysis to identify mutations potentially involved in lipoma pathogenesis.

Results: The patient exhibited an atypical presentation of a large, congenital lipoma localized to the scalp. Although histopathology confirmed a benign lipomatous tumor, the unusual size and location warranted genetic evaluation. Results from molecular testing are expected to contribute to a better understanding of the underlying genetic mechanisms.

Conclusion: Despite their benign nature, lipomas can lead to aesthetic and functional concerns when they enlarge or occur in cosmetically sensitive areas. Current literature indicates no clear predilection for age or gender. Genetic insights play a critical role in differentiating normal adipose tissue from syndromic lipomatous growths and can guide diagnostic and management strategies in atypical cases.

195. Morphometric Study of RBCs in Microcytic Hypochromic Anemia using ImageJ Software

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Introduction: ImageJ is a great tool for processing images and performing analyses. It is used in many scientific peer-reviewed publications in diverse fields such as life science astronomy and physics. In life sciences, it is used to quantify medical images.

Aim and Objectives: To process and analyze the image in the slides of RBCs in a quantitative and qualitative way within a short time by using the software ImageJ.

Materials and Methods: ImageJ is a JAVA-based image processing program developed at NIH.

Specifications:
- Image Files: GIF, JPEG, DICOM, BMP, and PNG native files can be opened with a plug-in.
- Image Types: The BIT depth defines the number of grey levels for any image.
- It ranges from [0-255]
- The application has been downloaded from the website: https://imagej.nih.gov
- Histology slides of microcytic hypochromic anaemia were collected from the regional histology department of SCB MCH, Cuttack.

Observation:
The steps of ImageJ analysis are as follows:
- Duplication of the image
- Conversion of the image to 8-bit format
- Edge detection to find the edges of the image
- Conversion to binary
- Filling holes in the binary image
- Watershed transformation for separating overlapping objects
- Setting scale for accurate measurements
- Setting measurement parameter

Conclusion:
- Can display edit, analyze, process, save, and print 8bit color and grayscale.
- Can calculate area, pixel, and value statistics of defined uses and defined selections.
- Resuits of measurements can be easily exported to spreadsheets, where they can be subjected to detailed statistical analysis.

196. Perceptions of Medical Learning Environments across India: Insights from a National DREEM Survey

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Background: The educational environment significantly influences medical students' learning outcomes and professional development. This study assesses undergraduate medical students' perceptions of their

learning environment across various governance models, institute types, and curricula in India using the Dundee Ready Education Environment Measure (DREEM).

Methods: A cross-sectional, questionnaire-based survey was conducted among undergraduate medical students from government and private institutions across India. The DREEM tool, comprising 50 items across five subscales, was administered electronically. Data were analyzed using JASP software, with comparisons made via t-tests, ANOVA, and chi-squared tests.

Results: The mean DREEM score was 132, indicating a "more positive than negative" perception. Students from National Medical Commission (NMC)-governed institutes scored significantly higher than those from Institutes of National Importance (INIs). Private institutions outperformed government and public-private ownership models. Competency-Based Medical Education (CBME) students reported higher scores than those under traditional curricula. Preclinical students had the highest scores, followed by paraclinical, internship and clinical students.

Conclusion: The findings highlight the positive impact of CBME and private institutions on students' perceptions. Targeted improvements in clinical teaching, faculty-student interactions, and support systems are needed, particularly in government and INI settings, to enhance the educational environment.

197. Emotional Compass: Charting EI and Empathy in India's Future Healers – A Cross-sectional Snapshot from Central Institutes and INIs

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Background and Aim: Despite the AETCOM curriculum's emphasis on soft skills, empathy, and emotional intelligence (EI)—essential for patient-centred care and professional resilience—remain underexplored among Indian medical students. This study assessed EI and empathy levels in students from Central India's tertiary care institutes and national Institutes of Importance (INIs), while probing links to demographics and lifestyle factors to inform targeted training.

Methods: In this cross-sectional survey of 331 undergraduates (mean age 20.2 ± 2.0 years; 54.7% male) across all years, digital tools captured EI via the Schutte Self-Report Emotional Intelligence Test (SSEIT) and empathy via the Toronto Empathy Questionnaire (TEQ), alongside family ties, hobbies, and stress data. SPSS facilitated t-tests, ANOVA, and correlations ($P < 0.05$).

Results: Mean EI was 122.5 ± 13.1 (range 70-156); empathy, 45.4 ± 7.9 (23-63). Females excelled in empathy (47.3 vs. 43.7) and managing others' emotions (29.7 vs. 28.9). No year-wise decline was observed, but EI increased with frequent family visits, diverse hobbies (e.g., adventure activities that boost self-regulation), and lower stress burdens. The EI-empathy link was robust (r = 0.481).

Conclusion: Indian medical students exhibit moderate EI and empathy, shaped by modifiable elements like family bonds and hobbies—yet curriculum gaps persist. Urgent AETCOM-aligned interventions could forge more empathetic, burnout-resistant physicians, revolutionising healthcare delivery.

198. Optimizing Bone Retrieval from Embalmed Cadavers: A Scoring-based Comparative Study

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Background: Formalin-fixed cadavers are routinely used for anatomy teaching and learning during dissection. However, variability in existing bone retrieval techniques often results in inconsistent specimen quality, loss of valuable material, and suboptimal educational outcomes. To overcome these challenges, the present study compares three bone retrieval techniques—plastic-covered burial, direct mud burial, and water maceration—and introduces a novel, anatomist-validated scoring system to objectively assess bone quality.

Materials and Methods: Forty-five bones, including femur, tibia, fibula, and articulated foot, were collected from formalin-fixed cadavers. The samples were defleshed and randomly allocated into three groups (n = 15 each): Type 1 (Plastic-Covered Burial), Type 2 (Direct Mud Burial), and Type 3 (Water Maceration). Bone quality was assessed at 3, 6, and 11 months using a 5-parameter scoring system validated by experienced anatomists. Post-maceration treatments included boiling with detergent, followed by cold-water rinsing & air drying.

Results: Direct mud burial produced the best outcomes, showing complete tissue removal, no odor or grease, and intact morphology. Plastic-covered burial showed moderate results, while water maceration performed poorly.

Conclusion: Direct mud burial with standardized post-processing emerged as the most effective, economical, and reproducible technique from embalmed cadavers. The validated scoring system offers a standardized framework for quality control and inter-institutional uniformity in osteology specimen preparation.

199. Study of Morphological Variations in Placenta in Patients Who Have Delivered Normally or by C-Section in Nalanda Medical College and Hospital, Patna

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Introduction: Study of variations in placenta is of great clinical importance as placenta is the only organ by which the foetus receives nutrition from the mother.

Methodology: 500 patients who have delivered normally or by C-Section between December 2024 to August 2025.

Results: We found marked variations in the placental shape, size, location and also attachment of umbilical cord.

Statistical Analyses: Abnormal placental variations.

- Circumvallate Placenta 1.2%
- Succenturiate Placenta 1.0%
- Multilobed Placenta 0.2%
- Membranacea Placenta 0.004%.

Conclusion: Study has revealed that most Placentas are discord but variations occur in shape, size and structure. Also, there is the positive correlation between gestational age and placental thickness. Abnormal placentas are high risk factors for adverse outcomes like– Increase caesarean rate, preterm birth and Placental abruption.

200. Concomitant Lumbosacral and Coccygeal Fusion with Bilateral Sacroiliac Bridging: An Anatomical Rarity

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Introduction: Variations in lumbosacral region are frequently encountered and have significant clinical implications. Among them, sacralization of the fifth lumbar vertebra (L5) represents a common congenital anomaly. Sacralization of coccyx is also reported in some cases. Sacroiliac bridging, on the other hand, refers to abnormal bony connections across the sacroiliac joint, which may result from degenerative, congenital, or idiopathic causes.

Case Report: We report a rare case of bony pelvis in which sacralization of L5 and coccyx along with B/L sacroiliac bridging were observed during routine osteology class in the Department of Anatomy. The L5 vertebra and Coccyx demonstrated complete fusion with the sacrum. Additionally, well-formed bony bridges were noted between the sacrum and the ilium on both sides.

Conclusion: These anomalies can significantly alter biomechanics of the spine and pelvis, potentially leading to low back pain, nerve compression symptoms, and altered gait. Awareness of such variations is essential for anatomists, orthopedic surgeons, radiologists, and pain management specialists for accurate diagnosis and effective treatment planning.

201. Morphometric Study of the Greater Sciatic Notch for Sex Determination: A Radiological Study

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Introduction: The distinctive morphology of the human skeleton and its clear sexual dimorphism make it of interest from anatomical, forensic, obstetrical, radiological, and anthropological points of view. Hip bone being comparatively robust is resistant to damage and scores even in improperly preserved skeletons. It is also widely agreed that the greater sciatic notch (GSN) holds the greatest degree of sexual dimorphism.

Objective: To assess the morphometry of the greater sciatic notch already present in the abdominopelvic CT scan film of the patient in the radiology department for sex determination.

Method: To evaluate the role of Greater Sciatic Notch (GSN) parameters for sex determination in the population of the upper western region of Nepal using Three-Dimensional (3D) images reconstructed by multi-slice Computed Tomography (CT). In this study, several measurements of the greater sciatic notch, e.g. width (AB), depth (OC), and width of the posterior segment (OB) were taken and indices I and II were calculated in 138 adults (64 men and 74 women) and side (right and left).

Results: Results indicated that out of all the parameters studied, the width of the notch (right) (P, 0.000), and left (P,0.021). Posterior segment width (right) (P, 0.000), and left (P,0.021). Right index II (P 0.000) which were significantly greater in women than men by using *t*-test but left index II (P 0. 123) of notch was not found to be significantly greater in women as compared with men.

Conclusion: Geometric morphometric analysis proved to be a valuable and reliable method to verify morphological characteristics observed with more traditional methods for sex determination.

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Impact Factor® as reported in the 2025 Journal Citation Reports® (Clarivate Analytics, 2026): 0.2

Editorial Office:
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