

A study of variations of origin of obturator artery: Review in south Indian population



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ABSTRACT

Introduction: Obturator artery is usually derived from the anterior division of internal iliac artery. It is the most variable vessel among the branches of the internal iliac artery. This variable course of obturator artery is responsible for vascular injury during laparoscopic herniorrhaphy.

Material and methods: The present prospective study was conducted on 30 pelvic halves from formaldehyde preserved cadavers and was dissected in the Department of Anatomy, MIMS, Mandya, and origin of the obturator artery was noted.

Result: Out of 30 specimens, obturator artery has following origin: 66.6% of anterior division, 20% of posterior division, 10% from the external iliac artery and 3.3% from both external iliac and internal iliac arteries.

Discussion: Obviously the variation in the origin of obturator artery had always been a curious topic not only throughout history of anatomic literature but also among surgeons and radiologists. Most of the time it originates from the anterior division of internal iliac artery. But it originated from the posterior division in significant numbers as in our study.

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1. Introduction

Obturator artery has usually arisen from the anterior division of internal iliac artery (Fig. 1) and runs anteroinferiorly on the lateral pelvic wall with the obturator nerve to the upper part of the obturator foramen and leaves the pelvis via the obturator canal and divides into anterior and posterior branches. There are iliac, vesical and pubic branches in the pelvis.¹

A number of review literature and articles are available in a vascular variation of the obturator artery origin and course. Furthermore, in about 13–30%, the obturator artery has an anomalous origin. The origin may be either from external iliac or inferior epigastric artery. In 20–30%, obturator artery is replaced by a pubic branch of the inferior epigastric and descends up to the obturator foramen. Sometimes, it partly encircles the neck of a hernia sac and may be inadvertently cut during surgery for femoral hernia.²

Therefore, understanding of the variation of obturator artery in pelvic surgeries and interpreting angiograms is important.

2. Materials and methods

The present study was conducted on thirty adult pelvic halves belonging to fifteen embalmed cadavers of known sex in the Department of Anatomy, Mandya Institute of Medical Sciences, Mandya. The pelvis was divided into two equal halves by cutting through the pubic symphysis and posteriorly through the sacrum and coccyx. Further, the dissection was carried out to delineate the origin of obturator artery from different sources. Any anomalous origin was noted down and photographs were taken and labeled.

3. Results

Observations regarding the mode of origin of obturator artery are given in Table 1. In 20 sides (66.6%), it originated from the anterior trunk of internal iliac artery while variation in its origin was observed in 10 sides (33.3%). In two specimens, obturator artery gave origin to the inferior vesical artery; usually, it is direct branch of the anterior division of internal iliac artery (Fig. 3). In four specimens (13.3%), obturator artery originated from posterior division. In one specimen (3.3%) originated from a superior gluteal artery, one specimen (3.3%) arose from inferior gluteal artery and

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Origin of Obturator Artery

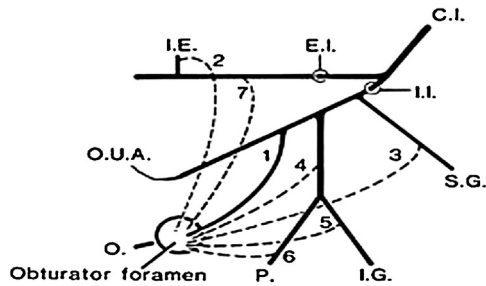


Fig. 1. Possible origins from different branches. C.I., common iliac artery, E.I., external iliac artery; I.E., inferior epigastric artery; I.G., inferior gluteal artery; I.I., internal iliac artery; O., obturator artery; O.U.A., obliterated umbilical artery; P., pudendal artery; S.G., superior gluteal artery.

Source: <http://www.anatomyatlases.org/AnatomicVariants>, Redrawn from Braithwaite, J.L., 1952.

Table 1
Percentage distribution of the origins of obturator artery from various sources.

Origin of obturator artery	Male		Female		Total	%
	Left	Right	Left	Right		
Anterior division of internal iliac artery	4	2	8	6	20	66.6
Posterior division of internal iliac artery	1	1	0	2	4	13.3
Superior gluteal artery	1				1	3.3
Inferior gluteal artery			1	1	2	6.6
External iliac artery			1	1	2	6.6
Inferior epigastric artery	1				1	3.3
By double origin			1		1	3.3

Table 2
Overall percentage distribution from anterior division and posterior division of internal iliac artery and external iliac artery as well as of dual origin.

Source of origin	No of specimens	%
Anterior division	20	66.6
Posterior division	6	20
External iliac artery	3	10
Dual	1	3.3

one specimen (3.3%) originated from an inferior epigastric artery. In two specimens (6.6%), arose from the external iliac artery.

Therefore, broadly, 20% of cases it originated from posterior division, 10% of the external iliac artery and in 3.3% of cases there was a dual origin (Table 2 and Fig. 2).

4. Discussion

The obturator artery has been documented to be arising from all possible neighboring arteries, i.e. common iliac, external iliac or from any branch of the internal iliac in either sex (Fig. 1).

Table 3
Comparison of percentage distribution of the origin of obturator artery as described by various authors.

Origin of obturator artery	Braithwaite ⁵ (1952)	Pai et al. ⁶ (2009)	Biswas et al. ⁴ (2010)	Thirupathi Rao et al. ⁷ (2013)	Present study (in %)
Anterior division of internal iliac artery	41.4	60	44.6	35.55	66
Posterior division of internal iliac artery	0	7	12.5	0	13.3
Superior gluteal artery	10	1	16	4.4	3.3
Inferior gluteal artery	4.7	0	0	4.7	3.3
External iliac artery	1.1	5.1	3.5	8.8	6.6
Inferior epigastric artery	19.5	14	23.2	26.66	3.3
By double origin	6.5	2	0	0	3.3
Common trunk of inferior gluteal and internal pudendal	10	0	0	13.33	0
Internal pudendal	3.8	0	0	4.4	0

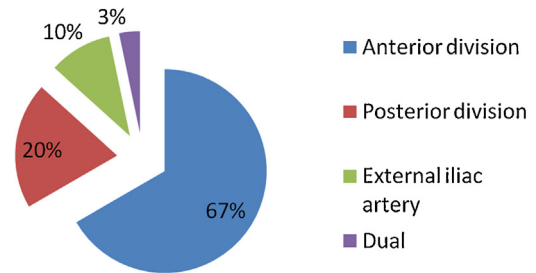


Fig. 2. Pie diagram showing percentage distribution of origin of obturator artery.

According to Bergman, obturator artery is varied in origin. It may arise from common iliac, anterior division of the internal iliac (41.4%), inferior epigastric (25%), superior gluteal (10%), inferior gluteal-internal pudendal common trunk (10%), inferior gluteal (4.7%), internal pudendal (3.8%) and external iliac (3.8%). The artery may be absent and its distribution replaced by branches from profunda femoris.³

The result of four previous studies is shown the prevalence of various source's origin of obturator artery in Table 3. From these studies anterior division is the most common source of origin of obturator artery, which is in accordance with the present study (Fig. 3) and seen in 66%.

The second highest number of variations is from the posterior division (Fig. 4). In the present study it originated from the posterior division (13.3%), which corresponds with study by Biswas et al.⁴ (2010) 12.5%.

The superior gluteal artery has given origin (Fig. 4) in one specimen (3.3%). The present study has comparatively lesser incidence than Braithwaite⁵ (10%) and Biswas et al.⁴ (16%).

The anomalous origin of obturator artery from the external iliac artery observed in (6%) (Figs. 5 and 6). This is little higher than study done by Pai et al.⁶ (2009) 5.25% and lower than (8.8%) Thirupathi Rao et al.⁷ (2013). Relatively older literature before 2000 such as Parsons and Keith (1897), Pick, Ashley and Anson (1942) and Braithwaite⁵ (1952) show origin in less than 5%. Higher incidence has clinical implication for careful surgery for femoral hernia to avoid unnecessary bleeding.

It originated from an inferior epigastric artery (Fig. 7) in only one (3.3%). However, other studies in Table 3 have a higher incidence of variation.

One of specimens showiest originated from inferior gluteal artery as in Fig. 8. The percentage distribution is in accordance with the studies done by Brainwaite⁵ (1952) and Thirupathi Rao et al.⁷ (2013).

In the present study, none has an originated from the internal pudendal artery or common trunk of inferior gluteal & the internal pudendal artery.

Embryologically, the anomaly may be explained by genetic and environmental factors. As per description by previous studies,

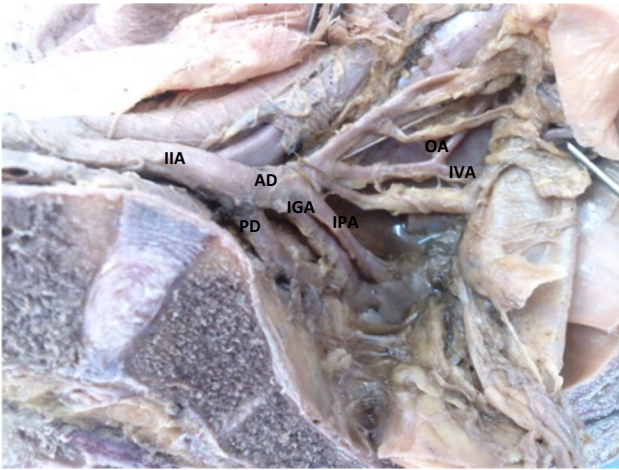


Fig. 3. AD, anterior division; IIA, internal iliac artery; EIA, external iliac artery; IGA, inferior gluteal artery; IPA, internal pudendal artery; IVA, inferior vesical artery; PD, posterior division; OA, obturator artery.

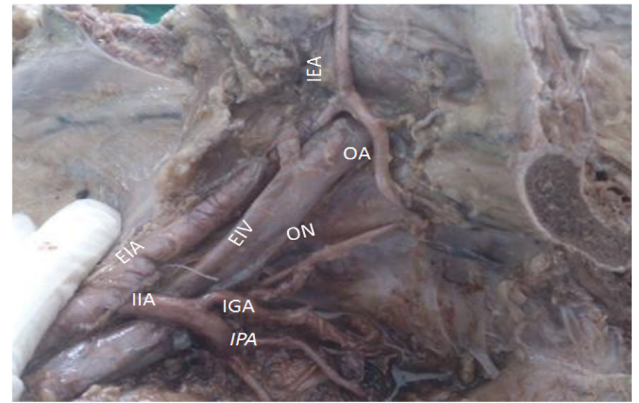


Fig. 7. Obturator origin from inferior epigastric artery, Abbreviations: AD, anterior division; EIA, external iliac artery; EIV, external iliac vein; IIA, internal iliac artery; IGA, inferior gluteal artery; IPA, internal pudendal artery; IVA, inferior vesical artery; OA, obturator artery; ON, obturator nerve; PD, posterior division.

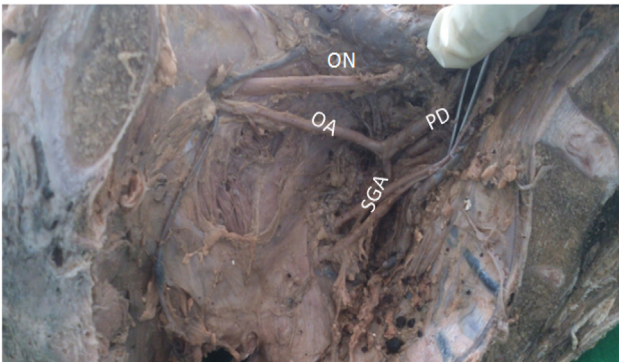


Fig. 4. Obturator artery from posterior division and superior gluteal artery.

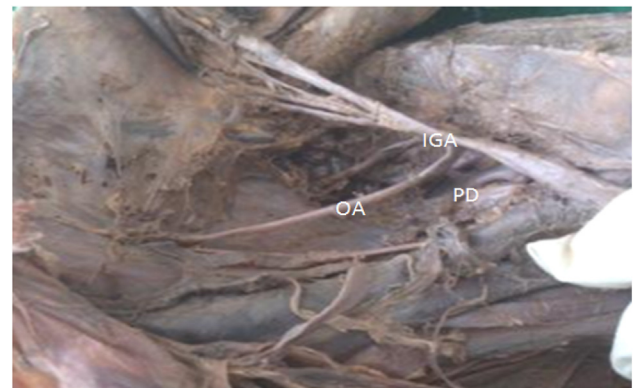


Fig. 8. Obturator artery from inferior gluteal artery.

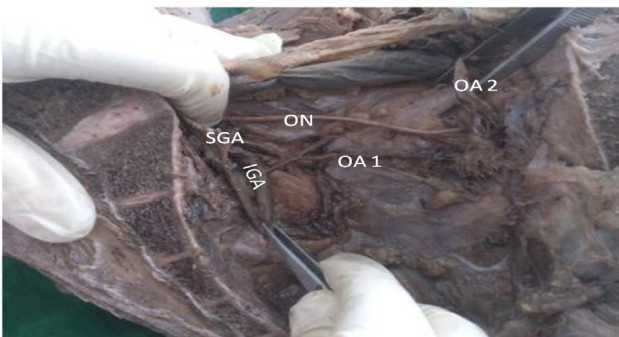


Fig. 5. Obturator origin from inferior gluteal and external iliac artery.

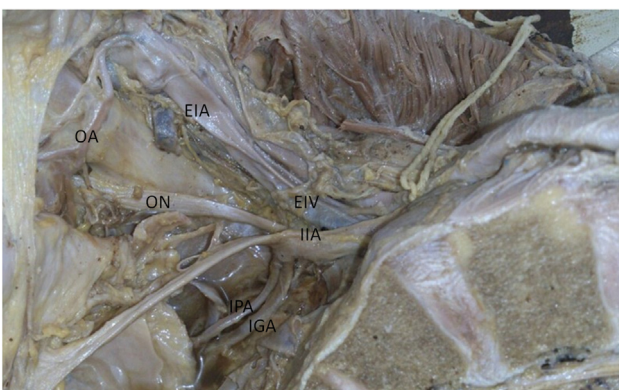


Fig. 6. Obturator origin from external iliac artery.

obturator artery has been reported to arise late in the development. Unusual selection of channels from the primary capillaries is thought to account for the anomalies affecting the arterial patterns in the lower limb.⁸ A simple view is that the most appropriate channels enlarge while the others retract or disappearing, which may result in the final arterial pattern.⁹

4.1. Conclusion

The variations in the origin of obturator artery have been a curious topic not only throughout history of anatomic literature but also among surgeons and radiologists. Most of the time it originates from the anterior division of internal iliac artery. But it originated from the posterior division in significant numbers as in the present study.

Conflicts of interest

The authors have none to declare.

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