

# VARIATION OF ORIGIN OF OBTURATOR ARTERY IN EASTERN INDIAN POPULATION - A STUDY

Sharmishta Biswas\*, Manimay Bandopadhyay\*\*, Anjan Adhikari\*\*\*, Panchanan Kundu\*, Rita Roy\*\*,

\*\*Deptt.of anatomy, BSMC, Bankura

\*\* CNMC, Kolkata

\*\*\*R.G. Kar MC Kolkata

## ABSTRACT

Obturator artery is a medium-calibre parietal branch of internal iliac artery having wide variations in its origin. Since there was no previous investigation of variations of origin of obturator artery in a large series of eastern Indian subjects, it was decided to undertake this study. 56 pelvic halves from formaldehyde preserved cadavers were dissected in Calcutta National Medical College, Kolkata and B.S.Medical College, Bankura over a period of 3 years. Obturator artery originated in maximum number (44.6%) of cases from the anterior division of the internal iliac artery, the next common site (23.2%) being the inferior epigastric artery. Relatively late appearance of the obturator artery amongst the branches of internal iliac artery is most likely to be the cause of such a wide variation.

**Keywords:** obturator artery, variations, internal iliac artery, inferior epigastric artery

## INTRODUCTION

Obturator artery is a parietal branch of internal iliac artery, usually arising from its anterior division in the pelvis. The artery traverses along the lateral pelvic wall, being crossed by ureter medially. The vas deferens in the male and ovary in the female lie in its medial side respectively. Within the pelvis it gives iliac, vesical and pubic branches. It divides into an anterior and posterior division in the obturator canal and enters inferior extremity (Pick et al, 1942)<sup>1</sup>. Posterior branch of it gives an acetabular branch, which enters the hip joint.

Variation of origin of the obturator artery had been reported by Adachi (1928)<sup>2</sup>, Braithwaite (1952)<sup>3</sup> and Pick et al (1942)<sup>1</sup>. An extensive study of branching pattern of internal iliac artery in Polish subjects was done by Jastschinski(1891)<sup>4</sup>, who classified the branches in 3 categories according to caliber. He considered obturator artery as medium-caliber artery, which showed many variations in its origin. Adachi (1928)<sup>2</sup> also studied the branching pattern of internal iliac artery in a large number of Japanese subjects and classified them into types and subtypes. Similar study was carried out by Ashley & Anson (1941)<sup>5</sup> on American subjects, they used obturator artery as a factor for subtyping internal iliac artery variations. Like them, Braithwaite(1952)<sup>3</sup> also studied internal iliac artery variations in a large series of British subjects

,and he used obturator artery as a factor for subtyping.

Similar study on the variations of origin of obturator artery in a large series of Eastern Indian subjects is undertaken in the present study.

## MATERIALS AND METHODS

A total of 56 pelvic halves were studied, all of which were examined completely, i.e. both halves of the same pelvis. Of these, 18 pelvises were of adult female cadavers and 38 were of adult males. All the specimens were obtained from formaldehyde preserved cadavers dissected routinely for undergraduate teaching in Calcutta National Medical College, Kolkata, and B.S.Medical College, Bankura, West Bengal over a period of three years. Photographs were taken after displaying the origins of obturator arteries and careful recording of the data was done.

## RESULTS

It was observed that in 25 out of 56 pelvic halves examined, obturator artery was a direct branch of the anterior division of the internal iliac artery (Figure 1). It arose from the superior gluteal artery (Figure 2) in 9 pelvic halves. Obturator artery was seen to arise from the inferior epigastric artery in 13 cases and directly from the external iliac artery in 2 cases. Posterior division of the internal iliac artery gave origin to the obturator artery (Figure 3) in 7 cases. Obturator artery originating from the inferior gluteal or internal pudendal artery or by dual root from both internal and external iliac sources was not encountered in the study (Table 1).

Correspondence

**Dr. Sharmishta Biswas**

B.J. 145, Sector II, Salt Lake,  
Kolkata - 700091

Ph. : 9133-23216586, (91)9903408977

Email : drsharmisthabiswas@rediffmail.com

| <i>Origin</i>                                      | <i>Male<br/>n=38</i> | <i>Female<br/>n=18</i> | <i>Total<br/>n=56</i> |
|--|----------------------|------------------------|-----------------------|
| <i>Anterior division of Internal iliac artery</i>  | 19                   | 6                      | 25                    |
| <i>Superior gluteal artery</i>                     | 5                    | 4                      | 9                     |
| <i>Posterior division of internal iliac artery</i> | 5                    | 2                      | 7                     |
| <i>Inferior epigastric artery</i>                  | 8                    | 5                      | 13                    |
| <i>Directly from External iliac artery</i>         | 1                    | 1                      | 2                     |

TABLE 1: ORIGINS OF OBTURATOR ARTERY

| <i>Origin</i>   | <i>% in the present study</i> | <i>% in the study by Pick et al(1942)</i> | <i>% in the study by Braithwaite(1952)</i> |
|---|-------------------------------|---|--|
| <i>Anterior division of Internal iliac artery</i>                     | 44.6                          | 21  | 41.4                                       |
| <i>Superior gluteal artery</i>  | 16                            | 11  | 10   |
| <i>Posterior division of internal iliac artery</i>                    | 12.5                          | 3   | 0  |
| <i>Inferior epigastric artery</i>                                     | 23.2                          | 27  | 19.5                                       |
| <i>Directly from External iliac artery</i>                            | 3.5                           | Negligible                                | 1.1  |
| <i>Inferior gluteal artery</i>  | 0                             | 9   | 4.7  |
| <i>Common trunk for Inferior gluteal and Internal pudendal artery</i> | 0                             | Negligible                                | 10   |
| <i>Internal pudendal artery</i>                                       | 0                             | Negligible                                | 3.8  |
| <i>By double origin from int. &amp; ext iliac</i>                     | 0                             | 1   | 6.5  |

TABLE 2: COMPARISON BETWEEN PERCENTAGES OF ORIGINS OF OBTURATOR ARTERIES AS RECORDED BY DIFFERENT OBSERVERS

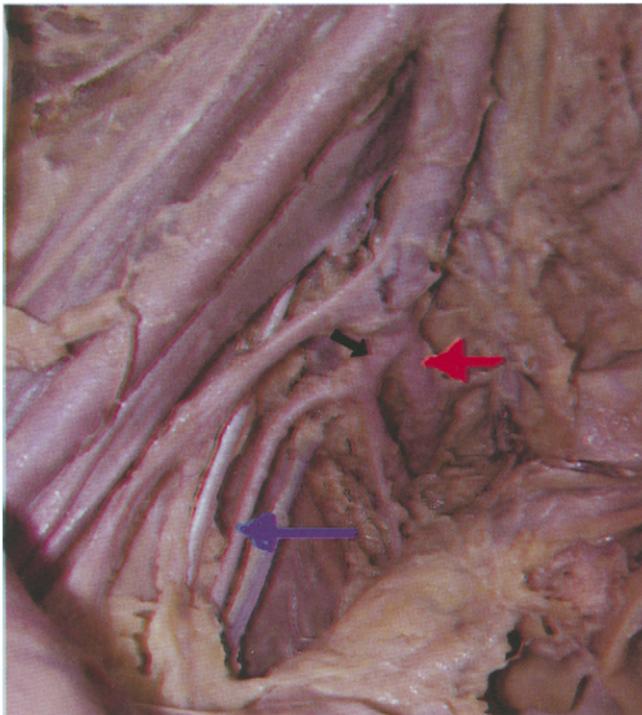


Figure 1 Red arrow indicates Posterior division of internal iliac artery.  
Blue arrow indicates obturator artery arising from the trunk of anterior division of internal iliac artery indicated by black arrow

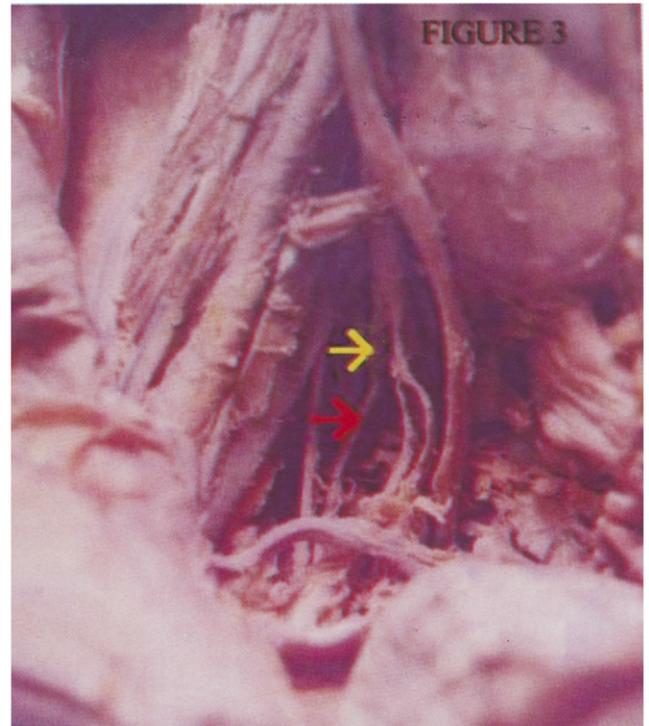


Figure 3 Red arrow indicates obturator artery. Yellow arrow indicates posterior division of the internal iliac artery

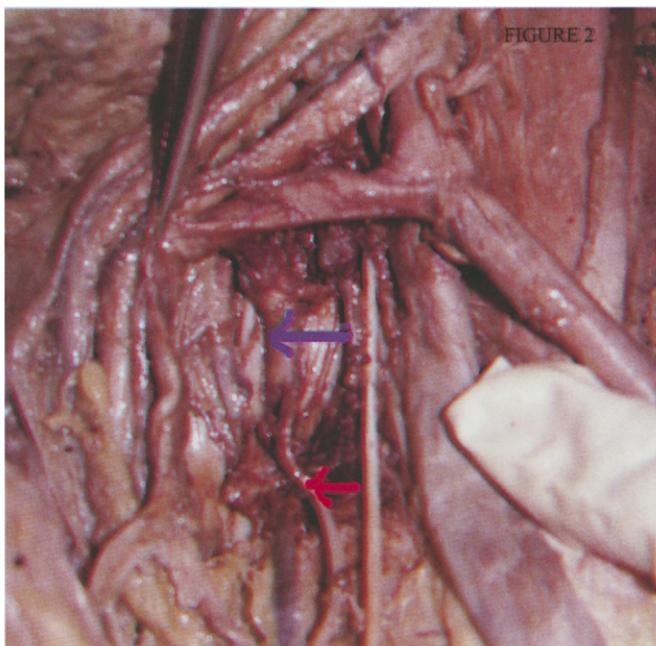
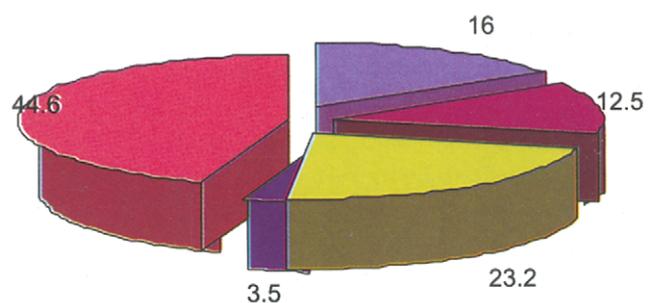


Figure 2 Red arrow indicates obturator artery. Blue arrow indicates superior gluteal artery. Anterior division of the internal iliac artery is being held with a forceps.



Graph 1 :  
PERCENTAGES OF VARIOUS ORIGINS OF  
OBTURATOR ARTERY

Percentages of various origins of obturator aitery

In 8 cadavers or 16 pelvic halves, obturator arteries of both the sides had similar origins.

## DISCUSSION

One may expect unusual origin of obturator artery in 48% of individuals but in only 23% of cases is a similar origin found on both sides of the body (Bergman et al, 2008)<sup>6</sup>. In the present study, bilaterally symmetrical origin of obturator artery was found in only 28.5% of the cases. Origin of obturator artery from internal iliac is three times more frequent than those arising from epigastric and external iliac artery <sup>6</sup>. In the present study, the incidence of origin of obturator artery directly from the anterior division of the internal iliac artery is 44.6% of the total cases. In the series studied by Pick et al (1942)<sup>1</sup>, it was 21, and those cases studied by Braithwaite (1952)<sup>3</sup> it was 41.4. Obturator artery most frequently was a direct branch of the anterior division of the internal iliac artery in all the studies.

The present study showed that in 16.0% of the specimens, obturator artery arose from superior gluteal artery. This finding is similar to that of Pick et al (1942)<sup>1</sup> and Braithwaite (1952)<sup>3</sup> who found 11% and 10% respectively. In our series, 12.5% of the obturator arteries originated from posterior division of internal iliac artery. This finding is similar to that of Parsons et al (1897)<sup>7</sup>, who reported 14.5% of cases arising from the posterior division, though Pick et al (1942)<sup>1</sup> found such origin in only 3% of the specimens, Kumar and Rath (2007)<sup>8</sup> observed such origin in 0.5% and Braithwaite (1952)<sup>3</sup> found none.

It was observed that in 23.2% specimens, inferior epigastric artery was the source of obturator artery, whereas it arose directly from external iliac artery in 3.5% cases. In most series the incidence of origin of obturator artery from inferior epigastric artery varied from 20-30%<sup>(9, 1, 3)</sup>.

In none of the specimens studied by us obturator artery originated from inferior gluteal artery, internal pudendal artery, common trunk for inferior gluteal and internal pudendal arteries, or the iliolumbar artery, though previous studies have shown number of such incidences.(Table 2). We did not come across any double roots of origin of the obturator from both internal iliac and external iliac artery arteries. Such variation is maximally reported by Braithwaite (1952)<sup>3</sup>, who found 6.5% incidence of double roots of origin. Adachi (1928)<sup>2</sup> pointed out that an obturator artery with two roots probably occurred more frequently than reported, because one of the roots might be too small to recognize readily. That

may be the cause in our case also. Probably we could not follow the fine vessels accurately in the uninjected dissection room specimens, therefore could not get such variation.

Percentages of various origins of obturator artery in our study are depicted in Graph 1.

Knowledge of variation in the origin of the obturator artery is important while doing pelvic and groin surgeries requiring appropriate ligation. Such aberrant origins may be a significant source for persistent bleeding in the setting of acute trauma. Itokazu (1997)<sup>10</sup> had emphasized importance of obturator artery for successful rotational acetabular osteotomy (ROA) because of its supply of the acetabulum .

## DEVELOPMENTAL EXPLANATION

The right and left dorsal aortae fuse caudal to the tenth dorsal intersegmental artery during fourth week of foetal life to form the descending aorta. The umbilical artery is the specialized paired ventral segmental branch passing through the connecting stalk, on each side. The proximal part of each umbilical artery anastomoses with fifth dorsal lumbar intersegmental artery, thus forming a new stem. This stem forms the dorsal root of umbilical artery, while the original ventral root degenerates. This new stem persists as the common iliac artery and gives off branches that become the external and internal iliac arteries<sup>11</sup>. Definitive obturator artery forms as a result of uneven growth of anastomosis of external and internal iliac arteries that is connected with peculiarities of regional organogenesis (Petrenko, 2000)<sup>12</sup>. The obturator artery arises comparatively late to supply the medial side of the thigh. This may be the cause of such wide variation in its origin.

## REFERENCES

1. Pick J W, Anson B J, Ashley FL. The origin of obturator artery- a study of 640 body halves. *Am J Anat* 1942; 70: 317- 344.
2. Adachi B. *Das Arteriensystem der Japaner*, Bd II. Kyoto. Supp. to *Acta Scholae Medicinalis Universitatis Imperialis in Kyoto*, 1928; 9: 1926-1927.
3. Braithwaite J L Variations in origin of parietal branches of internal iliac artery. *J Anat.* 1952; 86: 423-430.
4. Jastschinski S. *Die Typischen Verzweigungsformen der arteria Hypogastrica.*

- Int. Mschr. Anat. Physiol, 1891(a); 8: 111-127.
5. Ashley F L, Anson B J. The hypogastric artery in American whites and Negroes. Amer J. Phys. Anthropol 1941; 28: 381-391.
  6. Bergman RA, Afifi AK, Miyauchi R. Illustrated Encyclopedia of Human Anatomic Variation: Opus II: Cardiovascular system: Arteries: Pelvis. 2008.
  7. Parsons FG and Keith A. Sixth annual report of the Committee of Collective Investigation of Anatomical Society of Great Britain and Ireland, 1895-96. J. Anat. Physiol, 1897; 31: 31-44.
  8. Kumar D & Rath, G. Anomalous origin of obturator artery from the internal iliac artery. Int. J. Morphol. 2007; 25(3):639-641.
  9. Jastschinski S. Die Abweichungen der arteriaobturatoria. Int. Mschr. Anat. Physiol. (1891(b)); 366-379.
  10. Itokazu M, Takahashi K, Matsunaga T, Hayakawa D, Emura S, Isono H, Shoumura S. A study of arterial supply of the human acetabulum using a corrosion casting method. Clin. Anat. 1997; 10: 77-81.
  11. Standring SM. Gray's Anatomy. In : Development of the cardiovascular and lymphatic system. 39th Edition. Elsevier Churchill Livingstone, London, pp- 1044.
  12. Petrenko VM. Development of the obturator artery in human prenatal ontogenesis. Morfologia. 2000; 118(4): 51-3.