

## Anatomical Variants of Obturator Artery in Human Cadavers among North Karnataka Subjects

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### Abstract

**Context:** Normally Obturator Artery arising from anterior division of internal iliac artery. It supplies perineum and pelvic organs. The enlightenment and proper knowledge of the obturator artery of its origin, course will provide the surgeon proper guidelines of the artery during various surgical procedure. Hence the present study was been undertaken with reference to their surgical significance. **Aims:** To study the origin and course of obturator artery in human cadaveric specimen. **Materials and Methods:** The study was conducted in the Department of Anatomy, Raichur Institute of Medical Sciences for duration of 2 year from April 2015 to April 2017. In the present study, 30 dissected hemi pelvic specimens of both male and female formalin fixed cadavers were taken. The origin and course of obturator were traced along with noting down the variations in them. **Results:** In the present study, Obturator artery arising from anterior division of internal iliac artery was noted in 14 cases, 5 cases from inferior epigastric artery, 4 cases from external iliac artery and it also arising from the common trunk of anterior division of internal iliac artery in 7 cases. **Conclusion:** Anatomical data obtained about variations in origin of obturator artery is of importance for surgeons and radiologists for procedures in reconstructive surgeries involving in the groin.

**Keywords:** Anatomical Variations; External Iliac Artery; Internal Iliac Artery; Obturator Artery.

### Introduction

Anterior division of the internal iliac artery branches into Obturator artery (OA) which courses downwards and forwards on the lateral pelvic wall to reach the upper part of the obturator foramen, and leaves the pelvic cavity by the obturator canal. Iliac, vesical and pubic branches are given off by obturator artery. Later obturator artery divides into anterior and posterior branches to supply the medial compartment of the thigh. Posterior branch gives off the acetabular branch, which enters the hip joint [1].

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The study of vascular pattern and their variations are of much importance in pelvic region as large number of organs and anatomical structures are cramped in this anatomical region. Clear awareness of the vascular anatomy of pelvis is critical in surgeries performed here, which require ligation of the arteries concerned and also because such anomalous origins may cause profuse bleeding during surgical procedures. This is particularly true with regard to the variations in the origin of the obturator artery, while performing pelvic and groin surgeries [2]. Surgeons dealing with direct or indirect inguinal, femoral or obturator hernia need to know the variations of the Obturator Artery and their close proximity to the femoral ring [3].

So, aim of this study was to know the variations in origin and course of obturator artery in North Karnataka population.

### Materials and Methods

This study was conducted on 30 adult pelvic halves

in the Department of Anatomy from Raichur Institute of Medical Sciences, Raichur for duration of 2 years from April 2015 to April 2017. Dissection method was employed for this study in each of the formalin fixed pelvis. The Internal Iliac Artery and its branches were dissected and cleaned. The variations in origin and course of obturator artery were observed and photographs were taken. It is then dehydrated with acetone. The bisected halves of the pelvis with the vessels in situ have been preserved in 10% formaldehyde solution. The percentages of anatomical variations in origin were calculated.

### Observation and Result

In the present study, Obturator artery arising from anterior division of internal iliac artery was noted in 14 pelvic specimens, 5 pelvic specimens from Inferior epigastric artery, 4 pelvic specimens from External iliac artery and it was also arising from the Common trunk of anterior division of Internal iliac artery in 7 specimens (as shown in Figure-1,2,3 and 4).

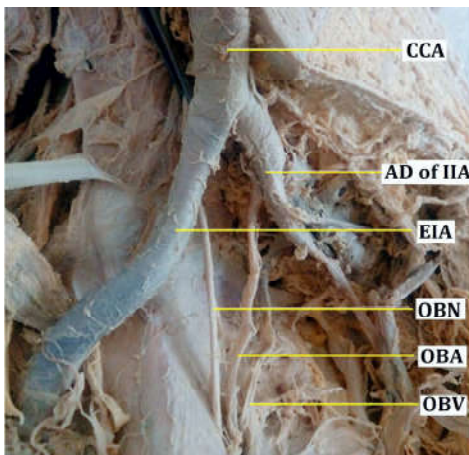


Fig. 1: Showing the origin of Obturator Artery from Anterior division of Internal Iliac Artery (AD of IIA)

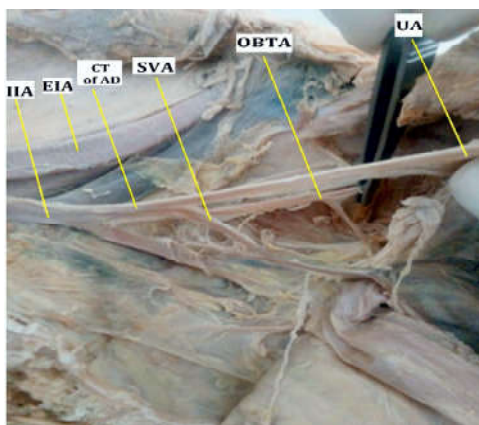


Fig. 2: Showing the origin of Obturator Artery from Common Trunk of Anterior Division of Internal Iliac Artery (CT of AD)

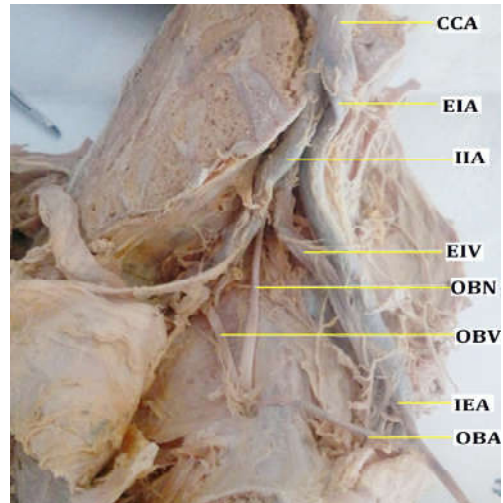


Fig. 3: Showing the origin of Obturator Artery from Inferior Epigastric Artery (IEA)

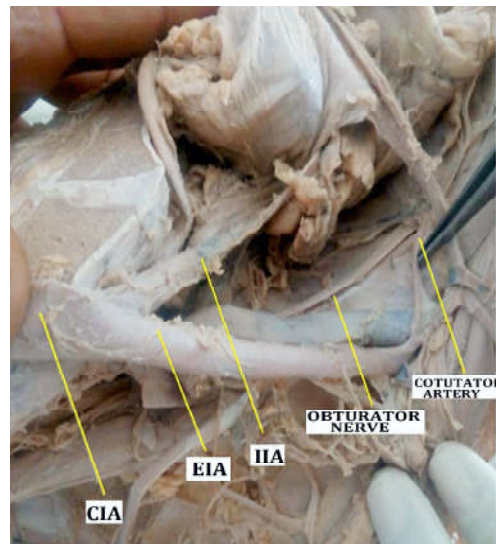


Fig. 4: Showing the origin of Obturator Artery from External Iliac Artery

### Discussion

The nutrition to pelvic wall, pelvic viscera, external genitalia, the perineum, buttocks and the medial part of the thigh is provided by internal iliac artery branches [4]. Obturator artery is normally a branch from anterior division of internal iliac artery. The obturator artery has been documented to be arising from all the possible neighbouring arteries, namely common iliac artery, external iliac artery from any branch of internal iliac artery in either sex [5]. Interesting variations in the origin of obturator artery have long since attracted the attention of anatomists and surgeons.

**Table 1:** Showing the percentage of incidence in variation of Obturator Artery

Sl. No.	Site of origin of Obturator Artery	Percentage of incidence in variation in origin of Obturator artery.
1.	Anterior division proper( normal)	47.2%.
2.	Common trunk of anterior division from Internal iliac Artery	23.33%
3.	Inferior epigastric artery	17%
4.	External iliac artery	13.33%

**Table 2:** Showing frequency of variations in origin of obturator artery reported by various Authors

Origin of Obturator artery	Frequency of origin in obturator artery reported by various Authors						In the present study (2016)
	Persons and kaith <sup>2</sup> (1897)	Pick Ashely and Anson <sup>7</sup> (1942)	Braithwaite <sup>8</sup> (1952)	Sanudo.et. al <sup>9</sup> (2011)	Tirupathirao et al., <sup>10</sup> (2013)	Akshara.e t.al <sup>2</sup> (2015)	
Direct from anterior division of internal iliac artery	39.3%	42.6%	41.4%	52.68%	35.55%	54%	47.2%.
Common trunk of anterior division from Internal iliac Artery	-	-	-	-	-	-	23.33%
Inferior epigastric artery	25%	21.3%	19.5%	29.02%	26.66%	22%	17%
Direct from external iliac artery	1.6%	0.9%	1.1%	1.79%	8.88%	4%	13.33%

In the present study, it was observed Obturator artery arising from anterior division proper in 47.2%, in 17% from inferior epigastric artery, in 23.33% from common trunk of anterior division from Internal iliac Artery with superior vesical and inferior vesical artery, in 13.33% from external iliac artery.

According to Bergman.et.al in a compendium of human anatomic variations document that the most common source source of origin of the Obturator Artery that is 41.4% of cases from common iliac or anterior division of internal iliac, in 25% from the inferior epigastric, in 10% from the superior gluteal, in 10% the interior gluteal/ internal pudendal trunk, in 4.7% the inferior gluteal, in 3.8% the internal pudendal and in 1.1% the external iliac artery respectively [6].

In 2015 Akshara Venmalassery Rajive and Minnie Pillay conducted study on 50 pelvic specimens found obturator artery was arising normal from anterior division of internal iliac artery in 54% cases, from common trunk of the internal iliac artery in 4% cases, from inferior epigastric artery in 22% cases and external iliac artery in 4% cases respectively [2]. In the present study frequency of variation in origin of obturator artery was different when compared to other study due to racial differences. (as shown in Table 2)

If the anterior division of internal iliac artery is obstructed due to any cause, the obturator artery and its branches to the head of Femur, when the obturator

artery arises from the external iliac artery [11].

The 'corona mortis' located behind the superior pubic ramus is an anatomical variant where there is an anastomosis between the obturator and the external iliac or inferior epigastric arteries or veins. 'Corona mortis' meaning crown of death, is so named due to its immense importance for its potential in causing considerable hemorrhage when cut and the difficulty in achieving subsequent haemostasis. Darmanis. et. al could find a vascular anastomosis in 83% of the cases in their cadaveric dissection study [12]. Namking.et.al in study on 204 north eastern Thai cadavers reported the presence of arteria corona mortis in 22.5%, venous corona mortis in 70.6% and both structures in 17.2% [13]. According to Akshara.et.al in 2015 corna mortis is present in 26% of the cases there was a vascular connection between obturator artery and inferior epigastric (22%) and between Obturator artery and external iliac (4%) arteries [2]. In the present study is seen in 30% cases among which 17% was between obturator artery and inferior epigastric artery and 13% in between obturator artery and external iliac artery.

The corona mortis or (CMOR) has widespread clinical implications being closely related to the superior pubic ramus, the acetabulum and the femoral ring and thus the femoral hernial sac that might enter the ring [14]. CMOR is at risk in groin or pelvic surgeries [15], could be avulsed in the fractures of superior pubic ramus leading to significant

haemorrhage [16], could be injured in laproscopic hernia repair while dissecting the preperitoneal space of Bogros and the hernial sac [17] could prove to be a hazard for orthopaedic surgeons planning an anterior approach to the acetabulum such as ilioinguinal or intrapelvic [12].

Other variations that were noted in this series included one in which the OA was seen arising from the Common trunk of anterior division of Internal iliac artery in 7 specimens.

The embryological explanations for the anomalies in the arterial patterns of the limbs are based on an unusual selection of channels from a primary capillary plexus, wherein the most appropriate channels enlarge, while others retract and disappear, thereby establishing the final arterial pattern [18,19]. The Obturator artery arises comparatively late in development as a supply to plexus, which in turn is joined by the axial artery of the lower limb that accompanies the sciatic nerve [20]. Before the Obturator artery appears as an independent blood vessel from the rete pelvicum, the blood flow destined for this territory makes an unusual choice of source channels. Instead of arising from the internal iliac artery as usual, it arises from the inferior epigastric artery, or directly from the external iliac artery [20].

The study implies the frequent occurrence of obturator artery from external iliac artery and inferior epigastric artery in North Karnataka population. Such common variations indicate the necessity of the surgeons and orthopaedicians to look for such vascularity to avoid undue haemorrhage and complications.

### Key Message

In this study obturator artery was arising from inferior epigastric artery in 17% cases and external iliac artery in 13% cases due to unusual selection of channels from primary capillaries during embryological development. This knowledge is useful for surgeons in order to avoid untoward complications during the time of pelvic surgeries.

### Conclusion

The branching pattern of obturator artery does vary very often from one side to other side in the same person and individual-to-individual. So surgeons should know the branching pattern of obturator artery while doing endoscopic repair of inguinal or femoral hernias because accessory obturator artery arising from the inferior epigastric artery. It runs close or

across the femoral ring to reach the obturator foramen. It is closely related to free margin of the lacunar ligament and to the neck of the femoral hernia. Hence the present study has been undertaken with reference to their surgical significance.

### Abbreviations

AD of IIA- Anterior division of Internal Iliac Artery.  
CCA or CIA- Common iliac Artery.  
CMOR- Corona mortis.  
CT of AD- Common Trunk of Anterior division.  
EIA- External Iliac artery.  
IEA- Inferior Epigasteric artery.  
IIA-Internal iliac artery.  
OA,OBA,OBTA- Obturator artery.  
OBN-Obturator Nerve.  
OBV-Obturator Vein.  
SVA- Superior vesical Artery.  
UA-Umbilical Artery.

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