

Retro-pubic vascular anomalies: a study of abnormal obturator vessels

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SUMMARY

Variations in the vascular pattern are common in the retro-pubic region. These anomalies are chiefly concerned with the origin and course of the obturator vessels; especially the venous channels. The present study is an effort to observe the incidences of abnormalities of these vessels for their significance in several clinical contexts. The study investigates the frequencies of (a) the presence of abnormal obturator vessels (vasa corona mortis), (b) the occurrence of abnormal obturator veins (venous corona mortis) and (c) the different patterns of the origin of the abnormal obturator arteries. It is important to note that although the percentages of occurrences of these anomalies found in the study are different from previous reports, they are nevertheless significant owing to their obvious clinical implications.

Key words: Obturator vessels – Vasa corona – Inferior epigastric artery

INTRODUCTION

Variations in vasculature in the retro pubic region are common. These variations are

chiefly situated behind the body and the superior ramus of the pubic bone (Standring, 2005; Bergman et al., 1988). In terms of classical anatomy (Kuran, 1983; Last, 1984; Marsman et al., 1984) and orthopedics (Crenshaw, 1998), these anomalies are considered to be associated with anomalous obturator vessels. The major anomaly at the retro-pubis is attributed to the unusual origins of the obturator artery. Several workers (de Kleuver et al., 1998; Fujimoto et al., 2001; Gosling et al., 1985; Gilroy et al., 1997) have reported these anomalous variations related to the obturator artery. The obturator artery develops late during embryogenesis (Sañudo et al., 1993). Vessels at the retro-pubis develop from a diffusely oriented plexus of vascular channels. One of these vessels from the capillary plexus is selected that attains a suitable connection with the axial artery of the lower limb accompanying the sciatic nerve. This vessel eventually persists as the main conduit for blood to the region in future life whereas the less potent channels obliterate and disappear (Fitzgerald, 1978; Moore, 1992).

Several text books and literature provide good accounts of the variations in the formation, course and distribution (Marsman et al., 1984; Jimenez and Vrahas, 1997) of the inferior epigastric artery and the obturator artery,

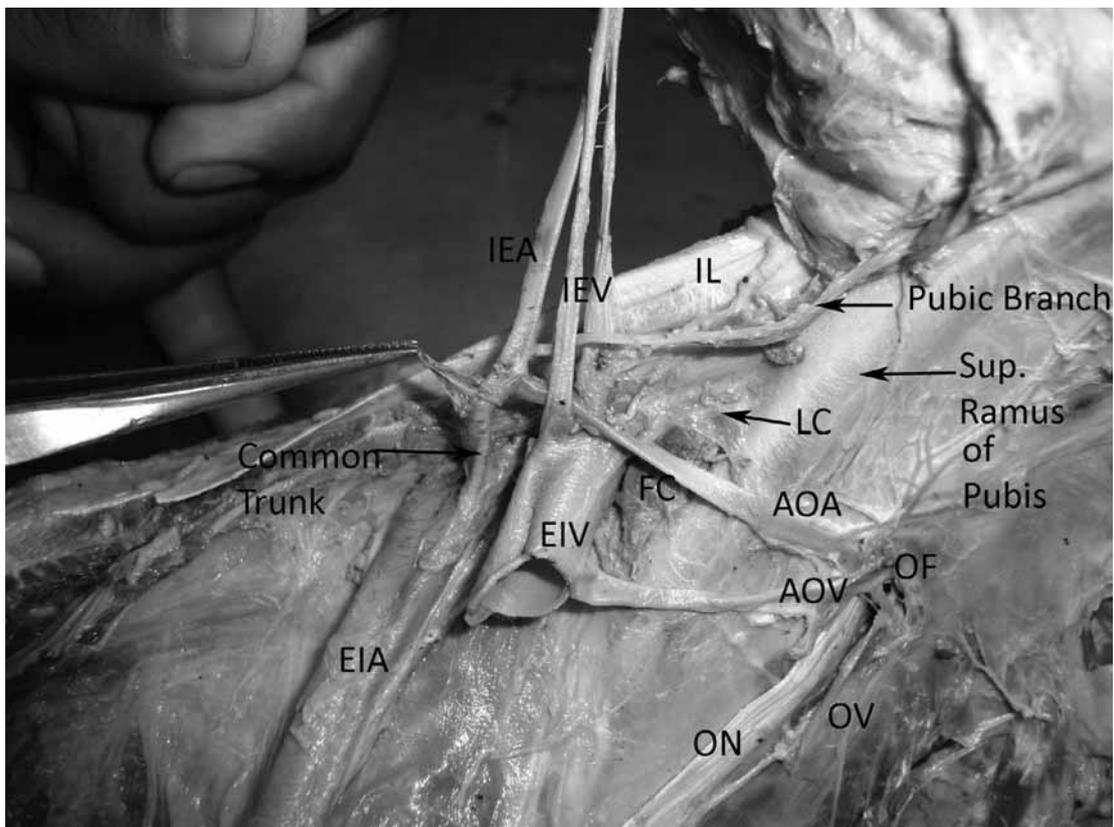


Figure 1. Left pelvic half showing a common origin of abnormal obturator artery (AOA) with the inferior epigastric artery (IEA) by a common trunk from the external iliac artery left (EIA). Note its proximity to the Femoral Canal (FC) and direction towards the obturator foramen (OF). IEV=inferior epigastric vein; AOV= abnormal obturator vein; EIV= external iliac vein; ON= Obturator nerve; OV= obturator vein; IL= inguinal ligament.

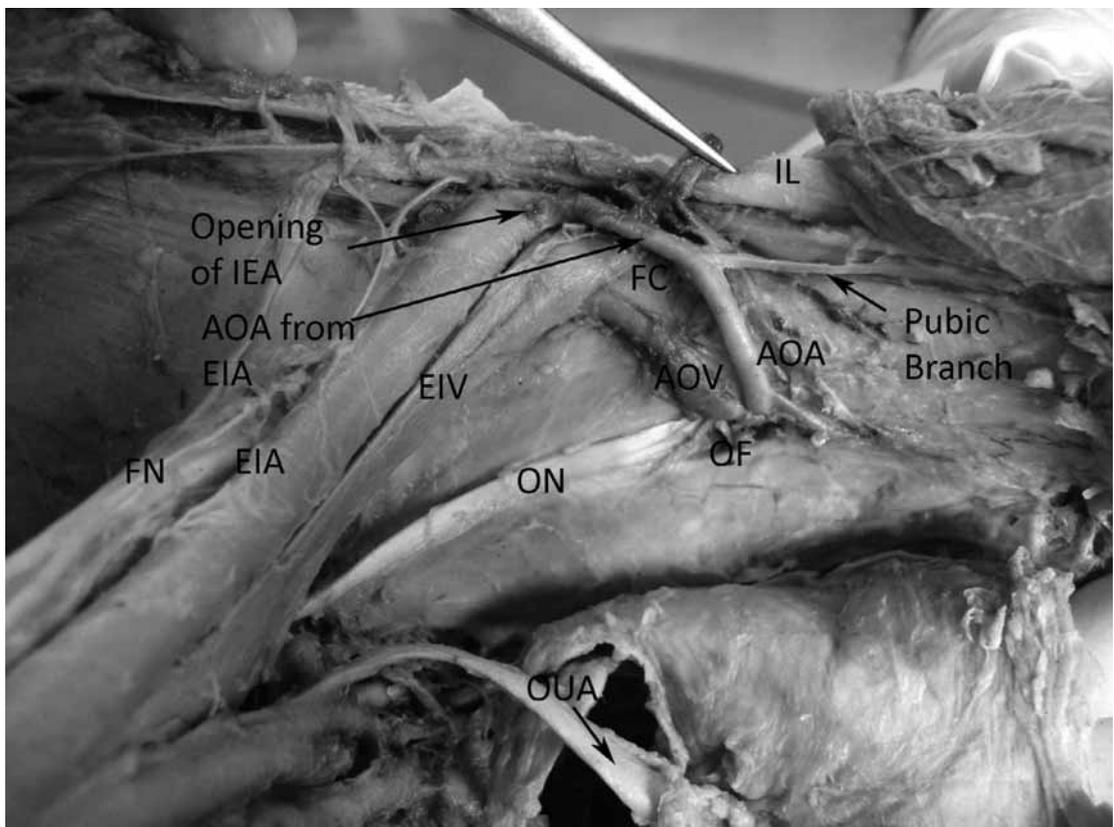


Figure 2. Left pelvic half showing a separate origin of abnormal obturator artery (AOA) from the external iliac artery left (EIA). Note the absence of normal obturator vessels. OUA= obliterated umbilical artery; FN= femoral nerve. All other abbreviations are the same as in Figure 1.

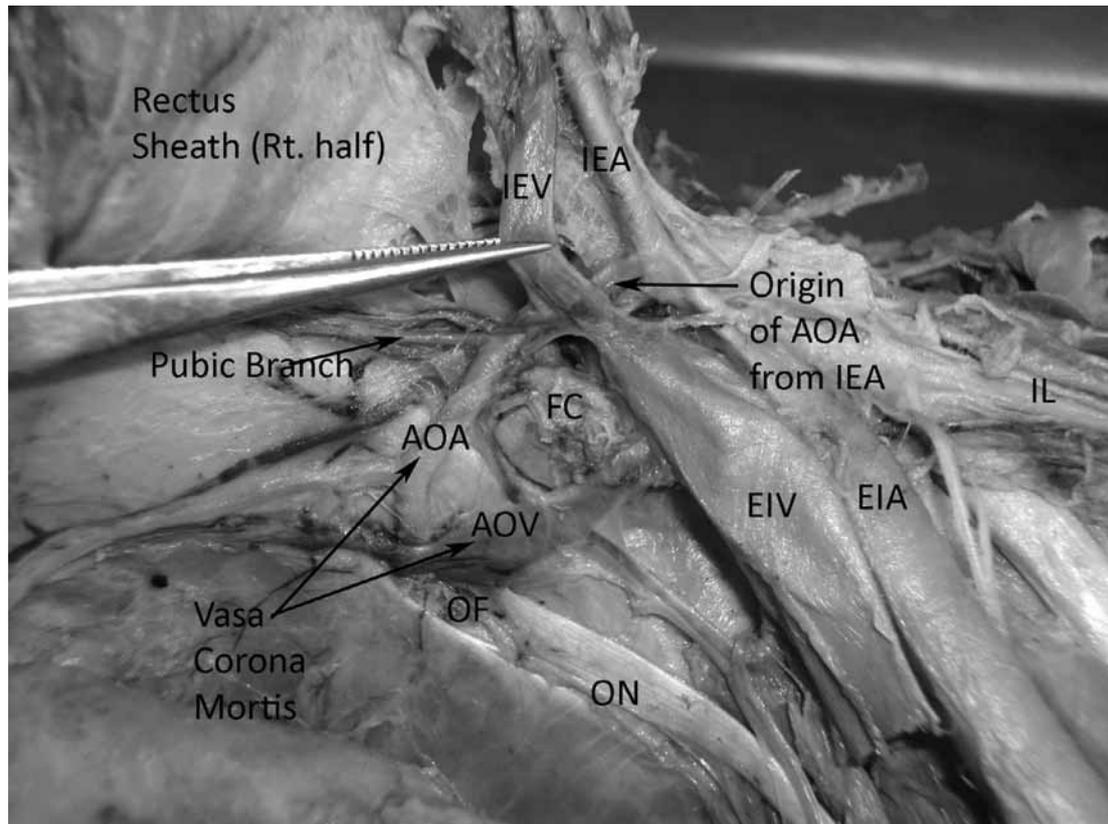


Figure 3. Right pelvic half presenting an origin of the abnormal obturator artery (AOA) from the inferior epigastric artery (IEA). Note the presence of abundant venous communications near the AOA. All abbreviations are the same as in Figure 1.

with descriptions of communications between these two arteries. Abnormal communication between the pubic branches of the two aforesaid arteries may lead to the formation of an abnormal origin of the obturator artery from the external iliac or the inferior epigastric artery (Kuran, 1983; Last, 1984; Marsman et al., 1984). The normal origin (Standring, 2005) of the obturator artery from the terminal part of the anterior division of the internal iliac artery is thus lost. The resulting obturator artery, with its unusual origin from the inferior epigastric artery or the external iliac artery, has been variously termed as accessory obturator artery (Gilroy et al., 1997; Routt Jr et al., 1997) or an aberrant obturator artery (Gosling et al., 1985; Jimenez and Vrahas, 1997). The close proximity of the abnormal obturator artery to the pubis and the lacunar ligament at the medial edge of the femoral canal poses important considerations in several clinical contexts. Fracture of the pubic bone, intra-pelvic maneuvers behind the pubis, release of the lacunar ligament during the reduction and repair of femoral hernias at the femoral ring, surgical management of acetabular fractures are certain procedures

where care must be exercised as regards the presence of such an artery in the vicinity (de Kleuver et al., 1998; Routt Jr et al., 1997; Skandalakis et al., 2000) because bleeding caused by inadvertent injury to these vessels is hard to control. Even very tiny vessels can be hazardous if injured during surgery (Odar, 1984; Yildirim et al., 1996).

Although a good volume of literature is available related to the anomalous origins and courses of the two arteries as mentioned above, documentation about aberrant yet clinically significant venous communications at the retro-pubis is sparse (Sarikcioglu and Sindel, 2002; Sarikcioglu et al., 2003). Obturator veins may exist in a greater number than the usual single artery and single vein pattern (Bergman et al., 1988) and are quite varied in their courses and terminations. The presence of a variable venous network has been described (Bendavid, 1992) at the retro-pubis formed by communications between the inferior epigastric, iliopubic, rectus, retro-pubic, and communicating rectusopubic veins. Although several of the classical text books on anatomy have described the abnormal position of the obturator vessels, very few of them

(Kuran, 1983; Last, 1984) and few studies (Marsman et al., 1984; Sarikcioglu et al., 2003; Berberoglu et al., 2001; Tornetta et al., 1996) have given them the name 'vasa corona mortis', literally meaning 'the crown of death'. The corona mortis is quite consistent in lying at the medial edge of the femoral canal (free margin of the lacunar ligament) and usually drains into the external iliac vein. Corona mortis refers to the presence of an abnormal obturator artery (arising from the external iliac / inferior epigastric artery) along with the corresponding vein (draining into the external iliac / inferior epigastric vein). It has been reported that incidences of corona mortis represented only by an abnormal obturator vein (venous corona) are more common and frequent (Sarikcioglu et al., 2003; Bendavid, 1992; Berberoglu et al., 2001; Tornetta et al., 1996; Missankov et al., 1996) than a purely arterial anomaly or a combination of both the vessels.

The objective of the current study was to detect the frequency of occurrence of (a) corona mortis with both an anomalous obturator artery and vein, (b) corona mortis only represented by an anomalous obturator vein, and frequency of anomalous origin of the obturator artery (c) from the external iliac artery, (d) from the inferior epigastric artery or (e) from a common trunk with the inferior epigastric artery from the external iliac artery (Jakubowicz and Czarniawska-Grzesinska, 1996). All the observations were assessed retrospectively for their orientation in the two sexes.

MATERIAL AND METHODS

Twenty-five human cadaveric pelvises were included in this study. These specimens were recruited from the routine dissection specimens provided to the First Professional MBBS students at Sri Aurobindo Institute of Medical Sciences (SAIMS), Indore, India. The pelvises

belonged to the 40-65 year age group. Three of the bodies were female. Each of the pelvises was dissected as per Cunningham's manual of dissection (Romanes, 1996) with a mid-sagittal separation of the two pelvic halves. All the branches from the Internal Iliac artery were dissected out and identified. The inferior epigastric artery was isolated and its entire course was uncovered till it entered the rectus sheath. Anomalous origins and courses of the obturator artery along with smaller vessels in the retro-pubic region were dissected. The femoral sheath, femoral ring and the lacunar ligaments were exposed from the abdominal aspect.

Observations were made in each of the male and female pelvic halves for (a) the presence of abnormal obturator vessels (both artery and vein) at the retro-pubis and their positions with relation to the abdominal aspect of the femoral canal and the symphysis pubis and (b) the presence of abnormal obturator vein at the same locations. The origin of the abnormal obturator artery, if detected, was traced to find whether it sourced from (c) the external iliac artery, (d) the inferior epigastric artery or (e) a common origin with (d) from the external iliac artery.

RESULTS

The results of the study are shown in Table 1. Observations were made as stated in Material and Methods. A significant percentage (40%) of the pelvic halves presented with an abnormal obturator vein (venous corona mortis). The percentage for abnormal obturator vessels (both artery and vein; vasa corona mortis) stood at 22%. The origins of the abnormal obturator arteries could be traced to the external iliac artery (in 10%), to the inferior epigastric artery (in 8%), and to a common trunk for the obturator artery and inferior epigastric artery (in 2%) of the pelvic halves in descend-

Table 1. Number and percentages of incidences of abnormal obturator vessels. (n=50; Males: 44; Females: 6). OA = Obturator Artery; OV= Obturator Vein; EIA= External Iliac Artery; IEA= Inferior Epigastric Artery.

	Male (44)		Female(6)		Total
	Right	Left	Right	Left	
Vasa Corona (Both abnormal OA & OV)	(5/22)	(4/22)	—	(2/6)	(11/50) 22%
Venous Corona (Only abnormal OV)	(8/22)	(11/22)	—	(1/6)	(20/50) 40%
Origin of abnormal OA from EIA	(3/22)	(1/22)	—	(1/6)	(5/50) 10%
Origin of abnormal OA from IEA	(1/22)	(2/22)	—	(1/6)	(4/50) 8%
Origin of abnormal OA & IEA by common trunk at EIA	(1/22)	—	—	—	(1/50) 2%

ing order of frequencies of occurrence (Figs. 1, 2 and 3).

DISCUSSION

The incidence of an anomalous origin and course of the obturator vessels (vasa corona mortis) in the general population is about thirty percent (Bergman et al., 1988). The present study observed this in 22% of the dissected specimen (11 of the 50 pelvic halves). Nine anomalous obturator arteries were observed in males (9/44; 5 on the right and 4 on the left halves). In contrast to a previous study (Sarikcioglu et al., 2003) where vasa corona mortis was not detected in any of the female pelvises, the present study found this anomaly in two of the six female pelvic halves (2/6; both on the left side). Similar to the study reporting presence of a venous network at the retro-pubic region (Bendavid, 1992), a diffuse system of venous channels was found in almost all the dissected retro-pubis in the present study. The incidence of pure venous corona mortis in this study (prominent venous connection between the obturator and the external iliac vein) was found in 40 % of the pelvises (1/6 in female halves; one on the left and 19/ 44 of the male halves; 8 on the right and 11 on the left), in comparison to Berberoglu et al. (2001) who reported the presence of venous corona in all his samples. Torretta et al. (1996) and Missankov et al. (1996) placed the incidence at 70% and 26% respectively. The wide variations observed in all studies, including this one, point to the unpredictability of the occurrence of venous anomalies around the inner pubis and hence their importance in surgical intervention in the region. Anomalous obturator veins can occur in the presence of 'normal' obturator vessels that are related to the Internal Iliac system of blood vessels. The present study revealed that the abnormal obturator arteries of the vasa corona mortis originated from the external iliac artery in 10% (5/50) of the pelvic halves (4/44 in males, 3 occurring on the right halves and 1 on the left; 1/6 in the female halves on the left). Jakubowicz and Czarniawska-Grzesinska, (1996) recorded the frequency of the origin of this artery from the external iliac artery at 1.3 %. Missankov et al. (1996) observed the incidence to be 25%. Berberoglu et al. (2001) placed this incidence at 7.1%. Only 8% (4/50) of the abnormal

obturator arteries were found to be originating from the inferior epigastric artery (3/44 in males, 1 in the right and 2 in the left halves; 1/6 in the female pelvis, situated on the left half). According to Jakubowicz and Czarniawska-Grzesinska (1996), this particular mode of origin is seen in 2% of the study population. Missankov et al. (1996) found this mode of origin in 44% of the arteries whereas Berberoglu et al. (2001) detected it in 4% and Sarikcioglu et al. (2003) in 14.81%. In the present study, the abnormal obturator artery had a common trunk of origin with the inferior epigastric artery (2%) in only one instance (1/50; male; on the right pelvic half). This particular occurrence has been observed in 4% of cases by Jakubowicz and Czarniawska-Grzesinska (1996).

The outcome of this study is thus in agreement with the others done so far that the variations in the pattern of vasculature at the retro-pubic region are quite variable across the general population. Surgical access to this region has to be done with meticulous planning given the variability and inaccessibility of the vasculature. Venous anomalies are more common than their arterial counterparts and are just as important in their clinical implications. It can be noted from the present study that the left halves of the pelvis are predisposed to the anomalies more than the right. Whether it this is of embryological and statistical significance is a matter for further debate. Nevertheless, the clinical significance of such variations, as discussed in the introduction, cannot be excluded, irrespective of discrepancies in the results of all studies, including this one.

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