

Rare arterial variation: a common trunk from the external iliac artery for the obturator, inferior epigastric and profunda femoris arteries

S Bilgiç and B Sahin

Department of Anatomy, Faculty of Medicine, Ondokuz Mayıs University, 55139 Samsun, Turkey

Summary: In this anomaly, observed in the right pelvic region of a female newborn cadaver among 100 studied (1%), a common arterial trunk arose from the medial side of the external iliac a. 1 cm proximal to the inguinal ligament. The trunk first divided into an ascending branch, which finally divided into the obturator and inferior epigastric arteries, and a descending branch, the profunda femoris a. from which arose the medial circumflex femoral a. The origin of the profunda femoris, obturator and inferior epigastric aa. is explained on the basis of the embryologic development and their course and variations are compared with reports in the literature.

Une variété artérielle rare : naissance par un tronc commun, issu de l'a. iliaque externe, des aa. obturatrice, épigastrique inférieure et profonde de la cuisse

Résumé : L'anomalie rapportée a été observée dans la région pelvienne droite du cadavre nouveau-né d'une petite fille sur 100 cadavres étudiés (1 %). Le tronc artériel commun naissait de la face médiale de l'a. iliaque externe, 1 cm proximale au ligament inguinal. Le tronc se divisait d'abord en une branche ascendante, qui se divisait ensuite en aa. obturatrice et épigastrique inférieure, et

une autre branche descendante, l'a. profonde de la cuisse, dont naissait l'a. circumflexe fémorale médiale. L'origine des aa. profonde de la cuisse, obturatrice et épigastrique inférieure pourrait être expliquées par le développement embryonnaire. Leur trajet et leurs variations sont étudiés à la lumière de la littérature.

Key words: Rare variation — Profunda femoris artery — Inferior epigastric artery — Obturator artery

Case report

In this anomaly, observed in the right pelvic region of a female newborn cadaver among 100 studied (1%), a common arterial trunk arose from the medial side of the external iliac a. 1 cm proximal to the inguinal ligament. The external iliac a. was crossed by the genital branch of the genitofemoral n. and the round ligament, and at this level the external iliac v. was medial to it. The common arterial trunk first divided into an ascending branch, which finally divided into the obturator and inferior epigastric aa., and a descending branch, the profunda femoris a., from which arose the medial circumflex femoral a. (Fig. 1). The inferior epigastric a. had its normal course and relationships in this case. The obturator a. initially followed a medial course, passing over the external iliac v. The obturator a. supplied the muscles of the inner wall of the pelvis

and had two pubic branches to the symphysis. It then continued inferomedially on the lateral pelvic wall to the upper part of the obturator foramen, leaving the pelvic cavity through the obturator canal with the obturator nerve (Fig. 2). After traversing the obturator canal, the obturator a. divided into an anterior branch to the adductor mm. and a posterior branch to the hip-joint.

The profunda femoris a. arose from the common trunk originating from the medial side of the external iliac a. together with an ascending branch which divided into the inferior epigastric and obturator aa. It ran downward and medially on the medial side of the external iliac a. (Fig. 1). It gave off the medial circumflex femoral a. just after passing under the inguinal ligament. The course and distribution of the profunda femoris a. were normal and the number of its perforating aa. were three, which did not include the end of the profunda femoris a. The medial circumflex femoral a. arose from the medial side of the profunda femoris a., with a normal course and distribution.

Discussion

Interesting anomalies in the origin and course of the principal aa. of the lower limbs have long received the attention of anatomists and surgeons. They usually result from embryologic abnormalities of the arterial network of the lower limb. When the embryo is 10 mm long, the

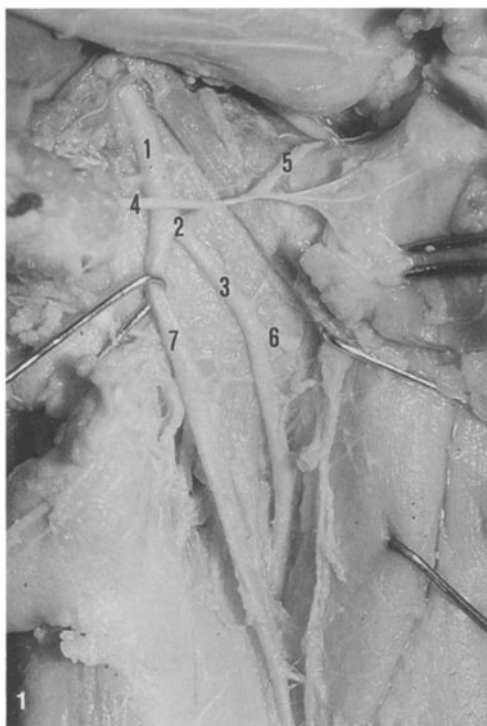


Fig. 1

Anterior view of the aa. of the right lower limb. 1, external iliac a.; 2, common arterial trunk; 3, profunda femoris a.; 5, obturator a.; 6, medial circumflex femoral a.; 7, femoral a.

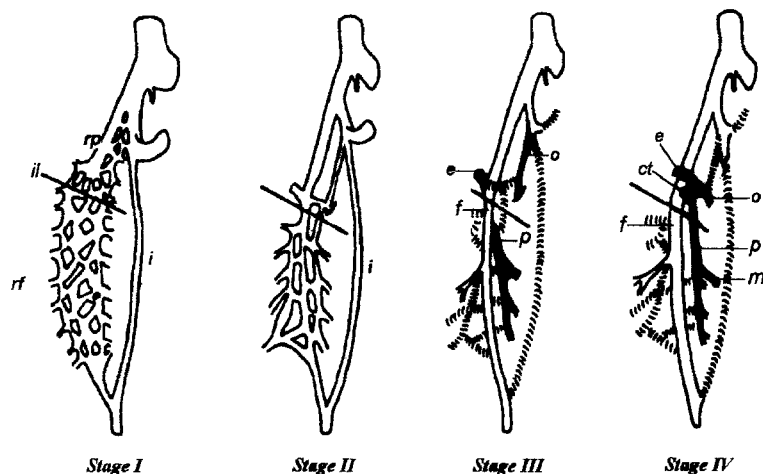


Fig. 3

Diagram of the arterial development of the lower limb (modified from Sanudo (1993)). *rp*, rete pelvica; *rf*, rete femoralis; *il*, inguinal ligament; *i*, sciatic a.; *o*, obturator a.; *e*, inferior epigastric a.; *m*, medial circumflex femoral a.; *p*, profunda femoris a.; *ct*, common arterial trunk; *f*, femoral a.

sciatic a. traverses the sciatic plexus and forms the main a. of the lower limb [7]. It persists in most vertebrates, but in mammals the femoral a., as the continuation of the external iliac a., becomes the main a. for the lower limb. Very early, anastomoses are formed between the dorsal sciatic and ventral femoral aa. When the main supply to the popliteal a.

comes from the femoral a., the sciatic a. regresses. Other parts of this anastomotic network are the precursor or the profunda femoris a. The initial part of the sciatic a. persists to supply the sciatic n. [7]. Another branch of the femoral a. is the saphenous a.; as this becomes connected to the arteries of the foot: its connections to the sciatic a. disappear. As some parts atro-

phy while others grow, the descending genicular a. and the posterior tibial a. are eventually the only remnants of the saphenous a. Whereas the peroneal a. is a remnant of the sciatic a., the anterior tibial a. is a new branch. This complicated pattern of embryologic development in the arteries of the leg explains the large number of anomalies [1, 7].

Vascular anomalies of the lower limb have been described by some authors [1-15]. A common origin for the inferior epigastric and obturator aa. is a relatively frequent anomaly, occurring in 20-30% of cases [3, 7, 9, 12]. However, the involvement of a third a., namely the medial circumflex femoral a., arising from a common origin together with these two arteries is extremely infrequent [11]. Such a variation has been described only 8 times in the literature [1, 4, 5, 10, 11, 13]. In 6 cases the trunk arose in the femoral region from the femoral a. [1, 4, 5, 10, 13], whereas in 2 cases its origin was intrapelvic, arising from the external iliac a. [11]. This triple arterial association has been described as following to three different patterns. In the most frequent, recorded in 4 cases, the inferior epigastric and obturator aa. arose as a common trunk from the medial circumflex femoral a. [1, 5, 10, 11]. The medial

circumflex femoral a. arose from the external iliac a. in one variant [11], and in three from the femoral a. [1, 5, 10]. Another pattern, reported in 3 cases, shows the three arteries arising directly from a common trunk of the femoral a. [1, 13] or the external iliac a. [11]. In 1 case, the inferior epigastric and obturator aa. arose from the medial circumflex femoral a. as independent vessels [4]. Although our case was a triple arterial variation, it does not correspond exactly to these patterns, since the arterial trunk from the external iliac a. gave off two branches, one being the profunda femoris a. and the other a common trunk for the inferior epigastric and obturator aa. Although there are some report of a triple origin for the obturator, inferior epigastric and medial circumflex femoral aa. [1, 4, 5, 10, 11, 13], the arterial trunk presented here has not been encountered in the literature. However, the profunda femoris a. has been reported as a branch of the external iliac a. in fewer than 1% of cases, sometimes together with the inferior epigastric a. [7]. Voboril [15] has also reported a high origination of the profunda femoris a. from the external iliac a. in 1 of 253 extremities (0.4 %). This is a more unusual anomaly, occurring with a frequency of 0.4-1% [7, 15], than the anomaly of a common trunk from the external iliac a. for the inferior epigastric and obturator aa., occurring in 20-30% [3, 7, 9, 12]. This anomaly may sometimes be of importance when the femoral a. is occluded in atherosclerosis. After ligation or occlusion of the femoral a. proximal to the origin of the profunda femoris a., the main anastomotic channels normally available are: 1) superior and inferior gluteal branches of the internal iliac a. with the medial and lateral circumflex femoral aa. and the first perforating branch of the profunda femoris a.; 2) the obturator branch of the internal iliac a. with the medial circumflex femoral branch of the profunda femoris a.; 3) the internal pudendal branch of the internal iliac a. with the superficial and deep external pudendal branches of the femoral a.; 4) a deep circumflex iliac branch of the external iliac a. with the lateral circumflex femoral branch of the profunda femoris a. and the superficial circumflex iliac branch of the femoral a.; 5) the inferior gluteal branch of the internal iliac a. with perfo-

rating branches of the profunda femoris a. [12]. These anastomoses may be less important in cases with a high origination of the profunda femoris a. from the external iliac a. when the femoral a. is occluded in atherosclerosis.

Vaas [14] has also reported on the importance of the profunda femoris a. as a collateral vessel in occlusion of the (superficial) femoral a. as follow. The profunda femoris a. has two groups of branches, each anastomosing with the branches of the popliteal a. If the profunda femoris a. is to function adequately as a collateral, it has to have a large caliber. An explanation for this may be found in comparative anatomy. In the phylogenetically more advanced vertebrates, all of which have very strongly developed extensors in the posterior extremities, the profunda femoris a. which supplies blood to this muscle group is a branch of the iliac a., and accordingly a pelvic a. In man, this artery originates distal to the inguinal ligament from the common femoral a. and supplies blood to less well-developed muscle groups. In this way, phylogeny explains the large caliber of the deep femoral a., which was originally a pelvic a. and it also explains the numerous anatomic variations at the site of the bifurcation of the (common) femoral a.

The embryologic development of the vascular plexus of the lower limb is based on an unusual selection of channels, some of which enlarge whilst others contract and disappear, thereby establishing the final pattern. In accordance with this and other's embryological interpretation [1, 2, 6, 11, 12], we may advance the following embryological interpretation of the anomaly; which the origin of the profunda femoris, obturator and inferior epigastric aa. were from a common trunk of the external iliac a. Before the profunda femoris a. and the obturator and inferior epigastric aa. appear as independent blood vessels from the «rete femorale» and «rete pelvicum» (Fig. 3), respectively, the blood flow destined for this territory makes an unexpected choice of source channels; instead of originating directly from the femoral, internal iliac or external iliac a. as usual, they arise from the common trunk of the external iliac a. (Fig. 1). This explanation is similar to that of Sanudo et al [11]. However there

is a difference, which is related to one member of the triple arterial trunk. Sanudo et al [11] observed the third a. namely the medial circumflex femoral a., as arising from a common origin together with the 2 other aa. In our case the third a. was the profunda femoris a. and not of the medial circumflex femoral a., but the medial circumflex femoral a. was observed to be a branch of the profunda femoris a. This anomaly, although rare, is important for the surgeon and radiologist to recognize because of its obvious implications when reconstructive surgery is being contemplated.

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