

Anomalous Branching Pattern of the Profunda Femoris Artery with Incomplete Transposition of the Femoral Vein in the Femoral Triangle

Abstract

During routine dissection of a female cadaver, we observed variation in vascular structures in the right femoral triangle. The profunda femoris artery was taking a high origin from the femoral artery (FA) just deep to the inguinal ligament, and the lateral femoral circumflex artery was arising from the FA. We also observed differences in the drainage pattern of great saphenous vein, wherein it was superficially crossing the FA to drain into the femoral vein which was located posterior to the FA. This type of rare vascular variation is informative to clinicians, cardiologists, and operating surgeons.

Keywords: Arterial catheterization, femoral artery, femoral vein, peripheral, saphenous veins, varicose veins

Introduction

The lower limb is supplied by the femoral artery (FA), which is the continuation of the external iliac artery below the mid-inguinal point. Normally, in the femoral triangle, the FA from its lateral aspect gives a large branch named as the profunda femoris artery (PFA) also known as deep FA. Lateral and medial circumflex femoral arteries and perforating arteries are the branches of PFA. The initial part of FA is covered by the femoral sheath (FS), which is derived from the fascia transversalis and fascia iliaca. Within the FS, the FA lies in the lateral compartment, whereas the femoral vein (FV) lies in the intermediate compartment. The superficial branches of FA and superficial tributaries of the great saphenous vein (GSV) pierce the FS. The GSV is the largest superficial vein, pierces the saphenous opening to drain into the FV.^[1] The branching pattern of FA, course of tributaries of FV, and the relation between above-mentioned structures within the FS contain great clinical significance since a number of interventional, diagnostic, and surgical procedures involving these vessels are done in this location. Hence, here, we report an unusual branching pattern of PFA and circumflex femoral arteries associated with unusual draining pattern of GSV along

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with transposition of FA and FV within the FS. Variation in origin and course of vessels are common due to their multiple and plexiform sources of origin. Although these variations may not affect the normal functioning of the body, the knowledge of variations helps clinicians plan surgeries and avoid complications due to inadvertent injuries.

Case Report

During a routine dissection of a female cadaver, we observed a rare variation in the origin and branching pattern of PFA in the right lower limb [Figure 1]. We observed a high origin of PFA at the level of the inguinal ligament from the lateral aspect of FA. The PFA then gave the medial circumflex FA from its medial aspect, which passed deep to FA [Figure 2]. Lateral circumflex FA (LCFA) branched from FA, 5.8 cm distal to the mid-inguinal point and coursed laterally, as usual between the branches of anterior and posterior divisions of the femoral nerve. The rest of the course and branching pattern of the LCFA were as described in the standard anatomy textbooks. GSV arched across the FA superficially from medial-to-lateral side, 4 cm distal to the mid-inguinal point, to drain into the FV which was located posterior to the FA [Figures 1 and 2]. Hence, FA was in front of FV instead of

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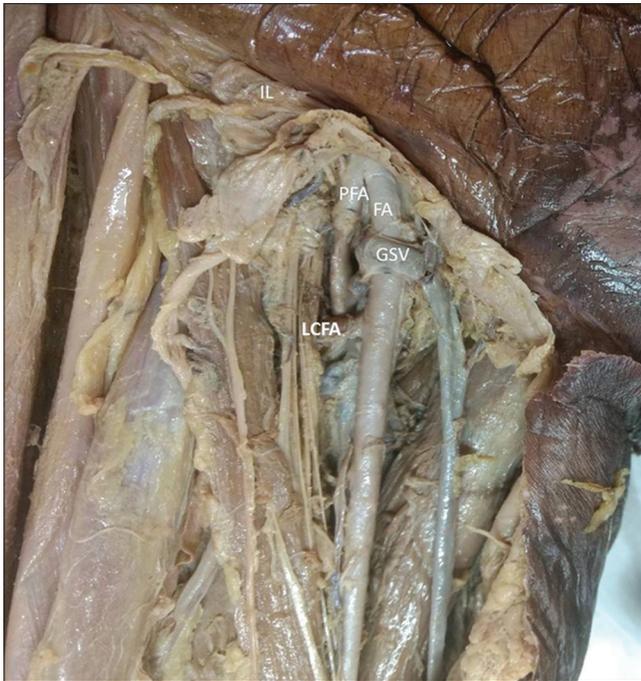


Figure 1: Right lower limb of a female cadaver showing high origin of profunda femoris artery, great saphenous vein crossing the femoral artery to open into femoral vein. FA: Femoral artery, FV: Femoral vein, PFA: Profunda femoris artery, IL: Inguinal ligament, LCFA: Lateral circumflex femoral artery, GSV: Great saphenous vein

being placed lateral in the lateral compartment of FS. These variations were unilateral; the vascular structures in the left lower extremity showed normal origin and course.

Discussion

During 14-mm embryo stage, FA develops from the external iliac artery. The proximal segment of the axial artery persists as the inferior gluteal artery, and middle segment disappears after giving FA. Any anomaly during this stage of the development may lead to variation in FA and related vessels.^[2]

Variations in the origin of PFA have been reported earlier, but in this case, PFA was arising from the FA deep to the inguinal ligament that is from the junction of the external iliac artery and FA. Hence, this is a high origin of PFA. According to Mergu and VS Prasad^[3], this type of origin is seen in only 1.6%. Such a high origin of PFA could be beneficial that it can be used for catheterization.^[4] However, this high origin of PFA may hinder the inguinal approach to the acetabulum during surgeries for the acetabulum fracture. Hence, preoperative vascular imaging is advisable. According to Bozanic *et al.*,^[5] the high origin of PFA will influence in the distribution of its lateral branches. It is interesting point to note that, in our case, LCFA was originating from the lateral side of FA instead of taking origin from PFA which is supporting Bozanic *et al.*'s opinion. The knowledge of origin, course, and caliber of the lateral branches is important for surgeons since they play an important role in the vascularization of musculocutaneous flaps they supply.^[6]

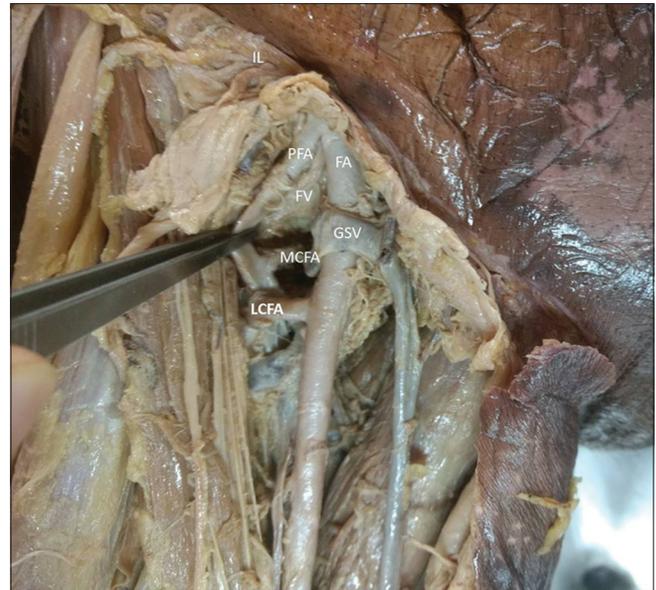


Figure 2: Right lower limb of a female cadaver after retracting the profunda femoris artery showing incomplete transposition of the femoral vein and origin of MAF and lateral circumflex femoral artery. FA: Femoral artery, FV: Femoral vein, PFA: Profunda femoris artery, IL: Inguinal ligament, LCFA: Lateral circumflex femoral artery, MCFA: Medial circumflex femoral artery, GSV: Great saphenous vein

In the present case, we have also found a variation in the saphenofemoral junction (SFJ). The GSV arched anterolaterally over the FA to drain into the FV that was positioned posterior to FA. This pattern of arrangement of femoral vessels in the femoral triangle is called as incomplete transposition of FV, whereas in complete transposition, SFJ will be lateral to the FA.^[2,7] Variation in SFJ is very rare when compared to saphenopopliteal junction.^[8] Varicosity of the GSV is very common and stripping or SFJ ligation is the procedure of choice to treat this condition and hence locating the SFJ becomes essential. Radiological preoperative recognition of SFJ in transverse view is usually employed. The normal image is referred to as a Mickey Mouse sign.^[9] Any abnormal image will indicate the transposition of the vessels. Lieto *et al.*^[10] reported a case of incomplete transposition of the femoral vessels where the FV and SFJ were completely overlapped by the FA. In our case, FA was overlapping the FV; however, the GSV was arching anteriorly over the FA from medial to lateral side. It is possible that in such cases, the venous drainage from GSV could be hampered leading to varicosity. Moreover, since FA is lying between the FV and arched GSV, like a nut in the nutcracker, varicosities of these veins may lead to compression of FA. Also during femoral catheterization or SFJ ligation, bleeding complications may take place, but this could be prevented by preoperative identification and proper retraction of the vessels during surgery.

Due to transposition of the FV within the FS, the medial compartment of the FS which is referred to as femoral canal gets widened and may increase the possibility of femoral hernia. Since this anomaly was found in a female

cadaver, special attention to this aspect as in female's femoral canal is normally wider, increasing the incidence of femoral hernia.

Conclusion

Incomplete transposition of FV is a very rare variation which should be identified before any surgical procedure in the femoral triangle. The combination of transposition of FV with variation in the branching pattern of FA could be really an unexpected finding for surgeon and radiologist. Knowledge of such rare variation is essential during any clinical procedures to prevent and minimize the complications such as bleeding. Awareness of such anatomical variations is informative for the radiologists to avoid the misinterpretations during the preoperative vascular assessment.

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Conflicts of interest

There are no conflicts of interest.

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