

Different Contralateral Branching Patterns of the Deep Branches of the Femoral Artery in the Femoral Triangle: A Cadaveric Case Report

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Received: February 2, 2023

Published: February 20, 2023

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Abstract

Objectives: Inguinotomy, endarterectomy and other surgical procedures that benefit from good knowledge of the anatomy of the femoral artery are common. Variation of deep branching patterns of the femoral artery with respect to sidedness, which may affect the success of pertinent procedures, was highlighted in the present case.

Methods: During routine anatomical dissection for undergraduate medical education, a cadaver with different contralateral branching patterns of the femoral artery was noted and documented.

Results: It was noted that on the left side, the lateral circumflex femoral artery emerged from the lateral aspect of the femoral artery proximal to that of the profunda femoris artery. The profunda femoris artery emerged on the lateral aspect of the femoral artery. The medial circumflex femoral artery emerged from the medial side of the femoral artery at the level the profunda femoris artery emerged. On the right side, none of the circumflex femoral arteries were apparent. The profunda femoris artery emerged from the lateral side of the femoral artery and the two were of similar size.

Conclusion: Further investigations into the prevalence and distribution of the variation in the branching patterns of the femoral artery with sidedness have the potential of refining the description and classification of the variant.

Keywords: anatomical variations, sidedness, femoral artery, femoral triangle, deep branches

Introduction

The profunda femoris artery is a branch of the femoral artery and the main supply to the thigh. The femoral artery is a continuation of the external iliac artery inferior to the inguinal ligament and is the main artery that supplies the lower free limb [12]. It enters the thigh at the mid-inguinal point anterior to the psoas major tendon in the femoral triangle. At the superior hiatus of the adductor canal, it continues as the popliteal artery [2]. Apart from the deep circumflex artery, external pudendal and superficial epigastric

arteries which mostly supply the lower anterior abdominal wall, the femoral artery gives off three thigh branches in the middle of the femoral triangle, viz: lateral circumflex femoral artery, medial circumflex femoral artery and profunda femoris. The three latter arteries are known as the deep branches and may branch off from the femoral artery independently or by a common stem or trifurcate [2].

The profunda femoris artery is normally the vessel that supplies all muscles of the thigh unless its circumflex branches

come directly from the femoral artery [12]. The femoral artery emerges about 4cm distal to the midinguinal point on the lateral side of the femoral artery passing between the pectineus and the adductor longus muscles [7]. It gives three perforating arteries and terminate as the fourth perforating artery over adductor brevis and adductor magnus. It usually gives off the medial and lateral femoral circumflex arteries [12].

The medial circumflex femoral artery arises from the medial side of the profunda femoris artery usually proximal to the point of emergence of the lateral circumflex femoral artery [12].

Variations of course and distribution of the arteries are of great surgical and radiological importance, but little has been documented in literature of the possible variation of this very important artery [10]. This article adds to existing knowledge of the variations.

Materials and Methods

An adult black Zambian male formalin-phenol-alcohol treated cadaver was dissected in line with "A new system of anatomy: A dissector's guide and Atlas." [15]. During dissection of the lower limb, variation in the branching patterns of the femoral artery was observed and photographed.

Figure 1: Right Side Branching pattern.

PFA: Profunda Femoris Artery. LFCA: Left Femoral Circumflex Artery. MFCA: Medial Femoral Circumflex Artery

Case findings

The lateral femoral circumflex artery emerged directly from the femoral artery 2 cm proximal to the point the profunda femoral artery arose. However, they both arose on the lateral aspect of the femoral artery. On the medial side, the medial circumflex femoral artery arose opposite the level of emergence of the profunda

femoris artery. The caliber of the profunda femoris artery was slightly larger than that of each of the other two branches.

Course within the femoral triangle

- **Femoral Artery (FA):** Entered the femoral triangle on the mid-inguinal point overlying the Psoas tendon and the Pectineus muscle.
- **Lateral Circumflex Femoral Artery (LFCA):** Emerged proximal to the profunda femoris and the medial circumflex arteries. It coursed laterally and deep to the Sartorius traversing a leash of branches of the femoral nerve.
- **Profunda Femoris Artery (PFA):** Runs postero-lateral to the femoral artery, and deeps between the adductor longus and the pectineus.
- **Medial Circumflex Femoral Artery (MCFA):** Arose from the medial side of the femoral artery opposite the point of origin of the PFA and dived in between the pectineus and the psoas.

Figure 2: Left Side Branching pattern.

PFA: Profunda Femoris Artery; LFCA: Left Femoral Circumflex Artery; MFCA: Medial Femoral Circumflex Artery

A common stem (CS) with a caliber similar to that of the femoral artery arose proximal to that of the profunda femoris artery on the contralateral side emerged from the femoral artery. The lateral and medial circumflex arteries did not arise directly from the femoral artery in the femoral triangle.

Course within the femoral triangle

FA entered the femoral triangle at the mid-inguinal point as was the course with that of the contralateral side. The CS emerged from

Figure 3: Left Side Branching pattern.
FA: Femoris Artery; CS: Common Stem

the lateral side of the FA and was the only branch of the femoral artery in the middle of the femoral triangle. It ran the course of the contralateral profunda femoris artery between the pectineus and adductor longus muscles. The LCFA and the MCFA did not arise from the femoral artery the femoral triangle.

Discussion

To our knowledge, this is the first published case report of a variation in contralateral deep branching patterns of the femoral artery in the femoral triangle in an adult black male Zambian. Literature reveals such anomalies have been published in Asian adults [4,9]. We did not come across any published reports on black Africans.

In the embryo, blood vessels of the limbs arise from a delicate concerted program of angiogenesis, vasculogenesis and apoptosis. The primary arterial trunk of the lower limb arises from the internal iliac artery which continues as the inferior gluteal artery. This trunk is seen in adults as a remnant accompanying the sciatic nerve (*arteria comitans nervi ischidici*) in the back of the thigh [13]. The external iliac artery, continuing as the femoral artery, buds off as a secondary arterial trunk. The primary and secondary trunks anastomose through perforating arteries of the profunda femoris artery. Most of the anastomotic part of the primary trunk is resorbed except the highest perforating artery which is retained as circumflex arteries in adult [3].

Variations are seen in absence or presence [8], larger or smaller caliber, variety of levels at which branches emerge [14] course and relations of vessels in the lower limb as well as sidedness [8].

These variations have been associated with a variation of factors that affect angiogenesis and vasculogenesis during development of the lower limbs [6].

Furthermore, there are permutations and combinations of these main forms of variations. However, there are several of them that are of no consequence, yet others present with clinical anatomical significance. The anatomist, the surgeon and the radiologist should be informed of a myriad of such variations [10].

A report suggested that origins of the medial and lateral femoral circumflex arteries directly from the femoral artery is associated with lower level of separation of the profunda femoral artery from the femoral artery [8]. In the same record, the lateral femoral circumflex artery arose from the profunda femoris in over eighty per cent of the limbs whereas in less than twenty per cent it arises directly from the femoral artery.

On the left lower limb, the medial circumflex artery, with the profunda femoris arose by a common arterial stem, coursed superficially to the femoral vein. The lateral circumflex femoral artery arose directly from the femoral artery and coursed parallel to the femoral artery on the lateral side and divided into branches [5]; [1]. The anatomy of the profunda femoris artery on the right side was normal i.e., the lateral and medial circumflex arteries arose from the profunda femoris artery [5].

Other rare variations have been documented such as medial or anterolateral origin of the profunda femoris as well as origin of superficial branches from the profunda femoris artery [10]. The medial femoral circumflex may be absent or originate from the obturator artery or from the inferior epigastric artery [4].

Conclusion

This case contributes towards a determination of the true prevalence of variations of deep branching patterns of the femoral artery with respect to laterality among Sub-Saharan Africans.

Acknowledgment

We would like to acknowledge the cadaver on which this study was based.

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