

# A deep femoral artery passing in front of the femoral vein

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*It is known that a different ramification pattern can occur as a function of the development of the arteries of the lower limb. During a routine dissection, a variation of the deep femoral artery was found passing in front of the femoral vein in the left lower limb of a 43-year-old male cadaver. This case is reported because of its rare occurrence in the literature. The variation is discussed on the basis of the possible embryological development of the lower limb arteries.*

**key words:** deep femoral artery, anatomical variation, lower limb

## INTRODUCTION

The course and the ramification of the vessels of the lower limbs have long received attention from anatomists and surgeons. It has been reported that arteriovenous fistulas can occur in the groin region as a complication of the percutaneous angioplasty or cardiac catheterisation of the femoral vessels [2, 7]. Thus, a complete understanding of the anatomy of the femoral triangle is necessary in order to avoid this and other complications [3, 11]. In addition, the existence of embryological variations of the arteries of the lower limb often results from unexpected developmental defects of the embryological arterial network.

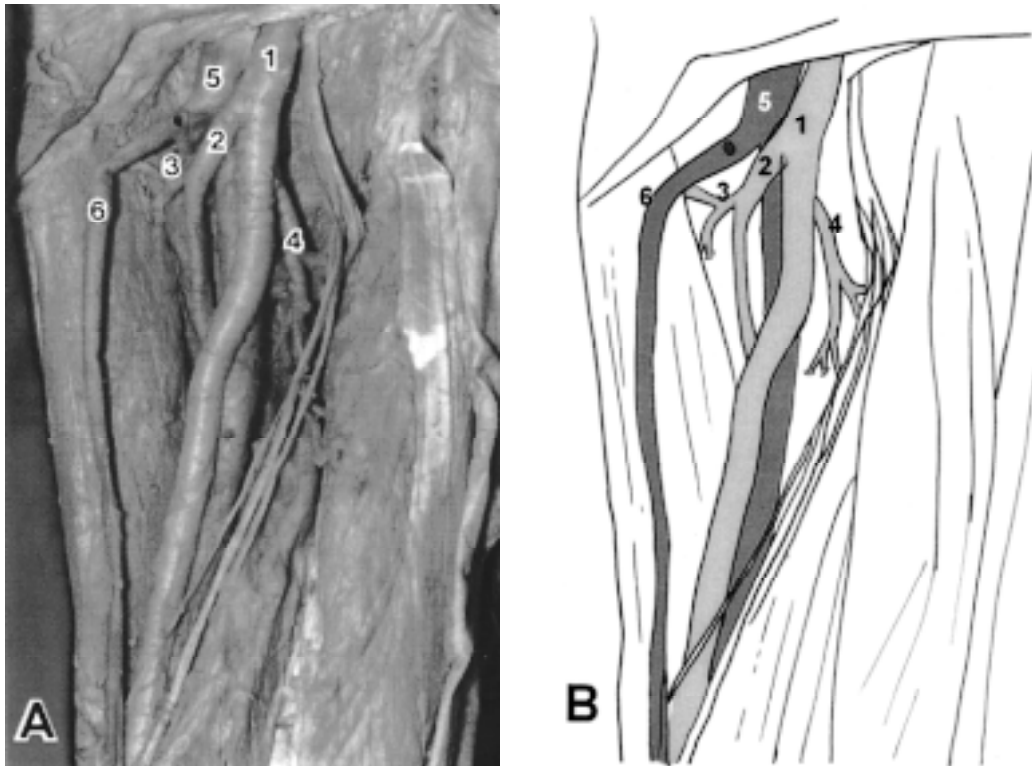
During embryological development, the channels of the primary capillary plexuses and primitive sciatic artery regress and the appropriate vascular channels enlarge. Thus the sciatic artery disappears and the main blood flow begins to come from the femoral artery. Consequently, the final arterial pattern establishes in the front of the thigh [8, 11, 12, 16, 17]. Several case reports on the ramification pattern and variations of both femoral and deep femoral arteries have been reported [1, 6, 17, 19–23]. How-

ever, a variation where the deep femoral artery actually passes in front of the femoral vein is rare in the literature [4, 5, 9, 13, 14].

## CASE REPORT

A variation of the deep femoral artery was found in the left lower limb of a 43-year-old adult male cadaver during dissection of the lower limbs of 18 adult cadavers at the Department of Anatomy in Ondokuz Mayıs University, School of Medicine. The deep femoral artery arose from the medial surface of the femoral artery, 3.7 cm distal to the inguinal ligament. The artery then ran inferomedially and crossed the anterior surface of the femoral vein just below the insertion point of the great saphenous vein to the femoral vein, as shown in Figure 1.

The deep femoral artery reached the medial border of the femoral vein, descended on the medial surface of the vein and turned laterally to eventually cross posterior to the vein before entering the deep part of the thigh. On reaching the medial border of the femoral vein, the deep femoral artery gave off the medial circumflex femoral artery. The lateral circumflex femoral artery originated from the posteri-



**Figure 1A, B.** The deep femoral artery passing in front of the femoral vein A and its diagram B in the left lower limb of a male adult cadaver; 1 — femoral artery, 2 — deep femoral artery, 3 — medial circumflex femoral artery, 4 — lateral circumflex femoral artery, 5 — femoral vein, 6 — great saphenous vein.

or surface of the femoral artery, 4.9 cm below the inguinal ligament and distal to the origin of the deep femoral artery.

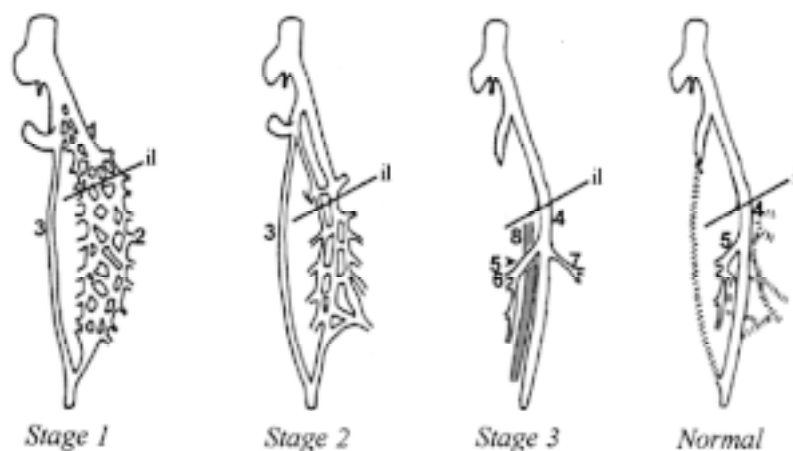
### DISCUSSION

The existence of variations of the vessels of the lower limb can most often be explained as an abnormal development of the arterial network of the lower limb in the embryo [8, 16]. The primary sciatic artery traverses the sciatic nerve and forms the main blood supply of the lower limb when the embryo is 10 mm long [11, 18]. The sciatic artery then persists in most vertebrates; however, the femoral artery, as the continuation of the external iliac artery, becomes the main artery of the lower limb in mammals, with regression of the sciatic artery. This process may be the main reason for the differences of the ramification of the arteries between other vertebrates and humans [9].

Very early in the developmental process, anastomoses can be found between the dorsal sciatic artery and ventral femoral artery [8, 12]. Later, capillaries in front of the pelvis and thigh form complex vascular networks, named the rete pelvicum and rete femorale. It is generally accepted that an increase of blood-flow in these capillaries determines the final

mature arterial pattern. Thus, the most appropriate channels enlarge while others contract and disappear, thereby establishing the final arterial ramification [16, 18]. Concurrently, the sciatic artery regresses as the main blood flow and the popliteal artery begins to come from the femoral artery. Other parts of this anastomotic network are the precursors to the final deep femoral artery [8]. The initial part of the sciatic artery remains as the inferior gluteal artery and ramus concomitans to the sciatic nerve to supply the gluteal region and the sciatic nerve (Fig. 2). Formation of the arteries of the lower limbs is completed during the third month of gestation with a pattern that corresponds to the adult [10].

Although we can only speculate, one possible reason for the observed variation of the deep femoral artery in this case could be increased blood flow in the rete femorale vessels located in front of the femoral vein, thus forming a variation of the deep femoral artery. Additionally, the femoral vein's entrance into the rete femorale could effect the arterial plexus and produce the unusual selection of the capillaries to form a final deep femoral artery passing in front of the femoral vein. In most other vertebrates, the inferior epigastric, superior epigastric and



**Figure 2.** Diagram of the development of the arteries of the lower limb [modified from Sanudo et al. (1993)]; il — inguinal ligament, 1 — rete femorale, 2 — rete pelvicum, 3 — sciatic artery, 4 — femoral artery, 5 — deep femoral artery, 6 — medial circumflex femoral artery, 7 — lateral circumflex femoral artery, 8 — femoral vein.

deep femoral arteries arise by a common trunk that lies anterior to the femoral vein; however, the condition is rather different for primates [9].

In our case, only one out of 18 cadavers exhibited a deep femoral artery passing in front of the femoral vein, and this was found only in the left lower limb. In two of the previously reported cases, the anomalous deep femoral arteries were also found in the left lower limb of the cadavers [9, 14]. However, the reports and the ratios on the existence of reported variation are not enough to obtain a satisfying prediction on the incidence or side preference of the variation in population.

The importance of knowing the normal anatomy and the anomalies of the femoral artery, femoral vein and the other vessels in the region has been emphasised by many clinicians [2, 7]. Before the catheterisation of femoral vessels and operations in the femoral triangle, high-resolution ultrasonic imaging can provide anatomic and functional information about the femoral vessels and would be of assistance in planning catheterisation [15]. A crossing deep femoral artery in front of the femoral vein may also cause obstruction to the femoral vein [14], or it may produce an arteriovenous fistula during femoral vein catheterisation. This reported variation must also be regarded as a possibility during the surgical repair of femoral hernias [9].

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