A Complex Variation of the Deep Femoral, Lateral and Medial Circumflex Femoral Arteries: Case Report

Bir Olguda Arteria Profunda Femoris, Arteria Circumflexa Femoris Lateralis ve Medialis'in Karmaşık Bir Varyasyonu

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Geliş Tarihi/*Received:* 24.03.2009
Kabul Tarihi/*Accepted:* 13.07.2009

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ÖZET 2007-2008 öğretim yılı rutin öğrenci disseksiyonları sırasında 65 yaşında erkek bir kadavranın sol femoral bölgesinde karmaşık bir damar varyasyonuna rastladık. Olgunun arteria circumflexa femoris lateralis'inin (ACFL), arteria profunda femoris'ten (APF) ayrıldığı yerden çıkan ikinci bir inen dalı olduğu ve arteria circumflexa femoris medialis'in (ACFM) inen dalının ACFL'nin ikinci inen dalından çıktığı görüldü, ACFM'nin çıkan dalı APF'den çıkmaktaydı. APF, ACFL ve ACFM miyokutanöz flep cerrahisi, damar rekonstrüksiyonu cerrahisi, aortopopliteal bypass, koroner arter bypass greftleme, koroner ve periferik anjiografi gibi klinik uygulamalarda yaygın olarak kullanılmakta olup ayrıca travmalara da maruz kalabilmektedirler. Olgumuzdakilere benzer varyasyonların akılda bulundurulmasının, cerrahi ve radyolojik girişimlerin başarısı bakımından önemli olduğu düşüncesindeyiz.

Anahtar Kelimeler: Arteria femoralis; anatomi

ABSTRACT During our routine dissections in 2007-2008 term, we encountered a complex variation at the left femoral region of a 65-year-old male cadaver. There was an additional descending branch of the lateral circumflex femoral artery (LCFA) and this additional branch was originating from the point where LCFA branched from the deep femoral artery (DFA); the descending branch of the medial circumflex femoral artery (MCFA) branched from the additional descending branch of the LCFA. The ascending branch of the MCFA was originating from the DFA. The deep femoral artery, LCFA and MCFA are widely used in myocutaneous flap surgery, aorto-popliteal bypass, coronary artery bypass grafting, coronary and peripheric angiographies and can expose to traumas. Keeping these kinds of variations in mind may be of importance in surgical and radiological interventions.

Key Words: Femoral artery; anatomy

Turkiye Klinikleri J Cardiovasc Sci 2010;22(1):171-4

The deep femoral artery (DFA) is the largest branch which usually emerges between the posterior and lateral aspects of the femoral artery (FA). It is the main blood supplier of adductor, extensor and flexor muscles. It arises from the FA, approximately 3-4 cm below the midpoint of the inguinal ligament (IL). The DFA spirals behind the FA and the femoral vein to reach the medial side of the femur. It passes between the pectineus and the adductor longus, and then latter and the adductor brevis muscles. It pierces the adductor magnus muscle and anastomoses with the upper branches of the popliteal artery. It gives rise to lateral circumflex femoral artery (LCFA),

medial circumflex femoral artery (MCFA) and perforating arteries.[1] The LCFA divides into its ascending, transverse and descending branches and supplies blood to the head and neck of the femur, greater trochanter, the vastus lateralis and knee.[1] The MCFA divides into transvers and ascending branches. It has an important role in supplying blood to the femoral head and neck, fat tissue in the acetabular fossa and adductor muscles.[1]

All of these arteries have many clinical implications. The DFA is an access point for angiographic procedures, such as percutaneous transluminal coronary angioplasty (PTCA), and also used in plastic surgery for myocutaneous flaps and necessary in vascular reconstructive procedures.[2] The branches of the LCFA are used in anterolateral thigh flap,[3] aorto-popliteal bypass,[4] and coronary artery bypass grafting (CABG).[5] MCFA can be used in flaps in reconstructive surgery.[6] It is used in the selective arteriography in idiopathic ischemic necrosis of the femoral head to determine its arterial supply.[7] The variations of these arteries can be important for surgeons and radiologists who are dealing with this region. These kinds of variations may change the decisions about flap design in plastic and reconstructive surgery. They may create problems in performing angiographies at, and reading angiograms of, the region.

CASE REPORT

During routine dissections, a complex variation at the left FA in a 65-year-old male cadaver was found (Figures 1, 2). The region was carefully dissected, the femoral vein was cut, deflected proximally, and the FA and its branches were exposed. It was observed that there was an additional descending branch of the LCFA (the first variation); this branch originated from the point where the LCFA left the DFA. In addition, the descending branch of the MCFA originated from the additional descending branch of the LCFA (the second variation). During its course, this branch passed in front of the DFA, and behind the FA. There was no other descending branch of the MCFA. The ascending branch of the MCFA originated from the DFA as usual. Both ascending and descending branches

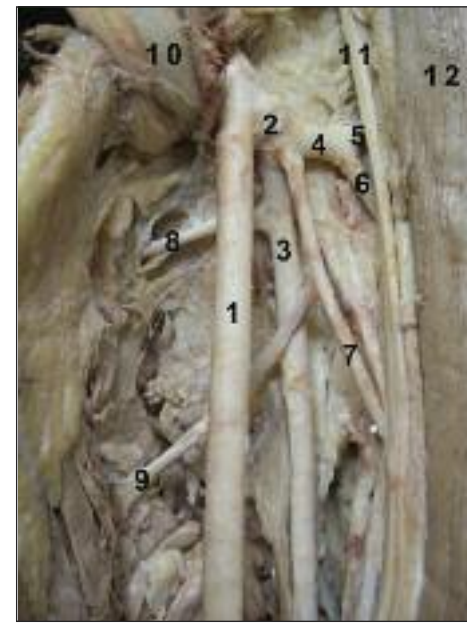

FIGURE 1: 1, FA; 2, common trunk of DFA and LCFA; 3, DFA; 4, LCFA; 5, ascending branch of the LCFA; 6, descending branch of the LCFA; 7, additional descending branch of the LCFA; 8, ascending branch of the MCFA; 9, descending branch of the MCFA originating from the LCFA; 10, femoral vein (cut and turned upwards); 11, saphenous nerve; 12, sartorius muscle.

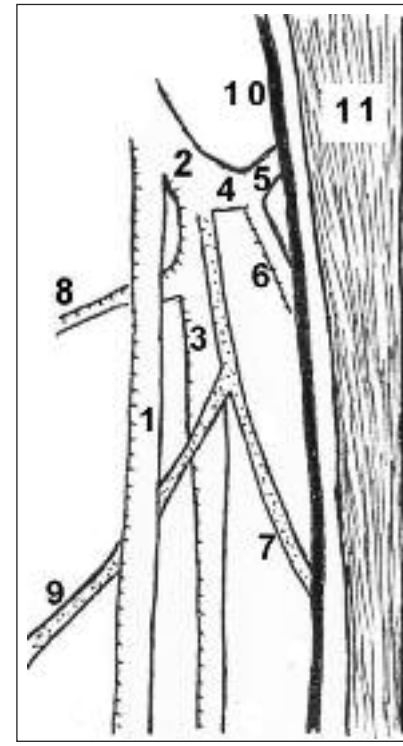

FIGURE 2: 1, FA; 2, common trunk of DFA and LCFA; 3, DFA; 4, LCFA; 5, ascending branch of the LCFA; 6, descending branch of the LCFA; 7, additional descending branch of the LCFA; 8, ascending branch of the MCFA; 9, descending branch of the MCFA originating from the LCFA; 10, saphenous nerve; 11, sartorius muscle.

of the MCFA coursed to the areas that they supposed to supply blood.

DISCUSSION

The arteries of the lower limb derive from the 5th lumbar artery. The sciatic artery is one of many branches of the 5th lumbar artery and forms the main artery of the lower limbs at the first stages of the development. Then another artery (i.e. the femoral artery) which is the continuation of another branch (i.e. the external iliac artery) of the 5th lumbar artery becomes the main artery of the lower limb and the sciatic artery regresses to become the inferior gluteal artery. At early stages an anastomotic network is formed between the femoral artery and the sciatic artery; the deep femoral artery is one the branches of this network.[2]

The peculiarity of the present case is having all these above mentioned variations together. In the literature, studies reporting branches of the LCFA originated separately from the same or different arteries can be found.[5,8-11] In those cases the number of each branch of the LCFA is one, but in the present case the LCFA had two descending and one ascending branches. In Adachi's study,[8] the most resembling pattern to the present case was type V (2.2%). In that type, the descending branch of the LCFA originated from the FA proximal to the DFA, the ascending branch of the LCFA from the DFA, and MCFA from the DFA.

The descending branch of the MCFA originating from the additional descending branch of the LCFA of the case wasn't reported in the literature before, as well. In the literature there are studies reporting the MCFA branching from the LCFA as 0.8%.[8] It's also possible to find studies reporting the ascending and descending branches of the MCFA originated separately from DFA or FA, but not from the LCFA.[5,8-11]

The DFA, LCFA, MCFA and their branches have many implications in clinical practice. In aorto-popliteal bypass,[4] anterolateral thigh flap,[3] and coronary artery bypass grafting,[5] LCFA branches are used. In addition to its role as collateral in case of occlusion in the femoral arterial system, the descending branch of the LCFA started to be utilized as an alternative vascular graft for extracranial–intracranial bypass surgery and it appears that it's good alternative to the other vessels like radial and superficial temporal arteries.[12]

The MCFA can be used in flaps in reconstructive surgery[6] or in the selective arteriography in idiopathic ischemic necrosis of the femoral head to determine its arterial supply.[7] MCFA can be injured during the fracture of the femoral neck, hip dislocation, or the hip joint surgery.

Such kind of variations may necessitate redesigning the flaps in plastic and reconstructive surgery. Besides their importance in surgical interventions, these kinds of variations can cause difficulties in interpreting the radiological images of, and applying interventions to the femoral artery and its branches. It's necessary to perform a femoral angiography prior to a CABG procedure;[5] in angiography, finding vessels like the variation in the present case can help the surgeon to use these vessels as unique source of graft. Because of such implications in clinical practice, its normal and variational anatomy should be kept in mind by clinicians to avoid any unpleasant outcome.

REFERENCES

1. Mahadevan V. Pelvic girdle and lower limb. In: Standring S, ed. Gray's Anatomy. In: Standring S, ed. 40thed. Elsevier Churchill Livingston: 2008. p. 1379-80.
2. Lamar R, Berg R, Rama K. Femoral arteriovenous fistula as a complication of percutaneous transluminal coronary angioplasty. A report of five cases. Am Surg 1990;56(11): 702-6.
3. Valdatta L, Tuinder S, Buoro M, Thione A, Faga A, Putz R. Lateral circumflex femoral arterial system and perforators of the anterolateral thigh flap: an anatomic study. Ann Plast Surg 2002;49(2):145-50.
4. Sugawara Y, Sato O, Miyata T, Kimura H, Namba T, Makuuchi M. Utilization of the lateral circumflex femoral artery as a midway outflow for aorto-popliteal grafting: report of a case. Surg Today 1998;28(9):967-70.
5. Fukuda H, Ashida M, Ishii R, Abe S, Ibukuro K. Anatomical variants of the lateral femoral circumflex artery: an angiographic study. Surg Radiol Anat 2005;27(3):260-4.
6. Hallock GG. Further experience with the medial circumflex femoral(GRACILIS) perforator free flap. J Reconstr Microsurg 2004;20(2): 115-22.

7. Oide T. [Selective medical circumflex femoral arteriography in idiopathic ischemic necrosis of the femoral head in adults (author's transl)]. [Article in Japanese] Nippon Seikeigeka Gakkai Zasshi 1979;53(3):293-305.
8. Adachi B. Das arterien system der Japaner, Band II. 1st ed. Kyoto: Verlag der Kaiserlich; 1928. p. 151.
9. Lippert H, Pabst R. Arterial Variations in Man. 1st ed. Classification and Frequency. München: JF Bergman Verlag; 1985. p 61.
10. Siddharth P, Smith NL, Mason RA, Giron F. Variational anatomy of the deep fe-moral artery. Anat Rec 1985;212(2):206-9.
11. Vazquez MT, Murillo J, Maranillo E, Parkin I, Sanudo J. Patterns of the circumflex femoral arteries revisited. Clin Anat 2007;20(2):180-5.
12. Başkaya MK, Kiehn MW, Ahmed AS, Ateş O, Niemann DB. Alternative vascular graft for extracranial-intracranial bypass surgery: descending branch of the lateral circumflex femoral artery. Neurosurg Focus 2008;24(2): E8.