VIA MEDICA

ORIGINAL ARTICLE

Folia Morphol.
Vol. 65, No. 3, pp. 209–212

ISSN 0015–5659
www.fm.viamedica.pl

An anatomical study of the origins of the medial circumflex femoral artery in the Turkish population

E. Tanyeli[1], M. Üzel[2], M. Yildirim[1], H.H. Çelik[3]

[1]*Department of Anatomy, Cerrahpaşa Medical Faculty, Istanbul University, Istanbul, Turkey*
[2]*Vocational School of Health Services, Istanbul University, Istanbul, Turkey*
[3]*Department of Anatomy, Faculty of Medicine, Hacettepe University, Ankara, Turkey*

[Received 21 March 2006; Revised 5 May 2006; Accepted 5 May 2006]

The medial circumflex femoral artery (MCFA) usually branches from the deep femoral artery (DFA). It may also branch from the femoral artery (FA). In this study 100 inguinal regions of 50 cadavers were investigated. In 79 extremities (79%) MCFA branched from DFA, while in 15 (15%) it branched from FA. In four extremities (4%) MCFA was found to be double; in each case one of MCFAs branched from FA and the other from DFA. In one of these four cases the lateral circumflex femoral artery (LCFA) was also double. In one case we found a common trunk of DFA and MCFA and in another case a common trunk of MCFA, DFA and LCFA. Clinicians must be familiar with the variations of this clinically important artery to improve their success in the diagnosis and treatment of pathologies in the region.

Key words: anatomy, variation, deep femoral artery

INTRODUCTION

The medial circumflex femoral artery (MCFA) has an important role in supplying blood to the femoral head and neck, to fatty tissue in the acetabular fossa and to the adductor muscles [12, 19]. It usually originates from the deep femoral artery (DFA) [12, 18, 19]. It can be used in flaps in reconstructive surgery [2, 6–8, 16, 17]. It can be injured during femoral neck fracture or the hip dislocation [12] and it is also important to avoid injuring it during surgery of the hip joint to prevent necrosis of the femoral head [12]. It is used in selective arteriography in idiopathic ischaemic necrosis of the femoral head to determine its arterial supply [14].

The aim of this study was to determine the origins of MCFA, which is clinically important and widely used. We discuss our results in relation to the literature.

MATERIAL AND METHODS

In this study we investigated during the period 1997 to 2005 the inguinal regions of 50 cadavers, of which 40 were male and 10 were female. The ages of the individuals were between 24 and 78 years. The cadavers were fixed by using 10% formalin injected from the femoral artery. After the inguinal region had been dissected, the femoral artery (FA) and its branches were exposed. We also measured the distance between the midpoint of the inguinal ligament (IL) and the origin of MCFA.

RESULTS

We investigated 100 inguinal regions of 50 cadavers. In 79 extremities (79%) MCFA was found to branch from DFA. In 15 extremities (15%) MCFA was found to branch from FA.

Address for correspondence: E. Tanyeli, Assoc. Prof., MD, Department of Anatomy, Cerrahpa°a Medical Faculty, Istanbul University, 34098, Kocamustafapa°a, Istanbul, Turkey, tel: +90 212 414 30 57, fax: +90 212 414 30 59, e-mail: tanyeli@istanbul.edu.tr

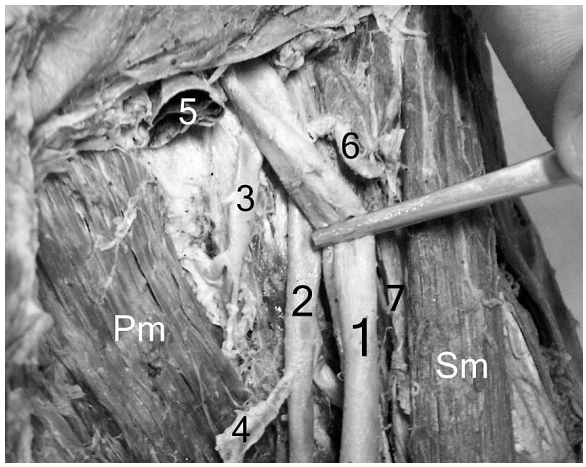

Figure 1. Photograph of the case with double medial and double lateral circumflex femoral arteries: 1 — femoral artery, 2 — deep femoral artery, 3 — superior medial circumflex femoral artery branching from the femoral artery, 4 — inferior medial circumflex femoral artery branching from the deep femoral artery, 5 — femoral vein (cut), 6 — superior lateral circumflex femoral artery branching from the femoral artery, 7 — inferior lateral circumflex femoral artery branching from the deep femoral artery, Sm — sartorius muscle, Pm — pectineus muscle.

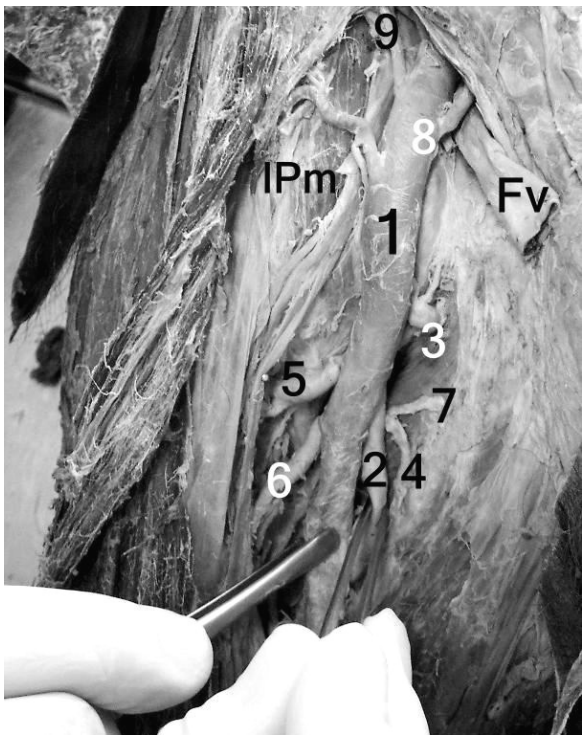

Figure 2. Photograph of the case with double medial and double lateral circumflex femoral arteries together with deep circumflex iliac and inferior epigastric arteries branching from the femoral artery: 1 — femoral artery, 2 — deep femoral artery, 3 — superior medial circumflex femoral artery branching from the femoral artery, 4 — inferior medial circumflex femoral artery branching from the deep femoral artery, 5 — superior lateral circumflex femoral artery branching from the femoral artery, 6 — inferior lateral circumflex femoral artery branching from the deep femoral artery, 7 — external pudendal artery, 8 — inferior epigastric artery, 9 — deep circumflex iliac artery, Fv — femoral vein, IPm — iliopsoas muscle.

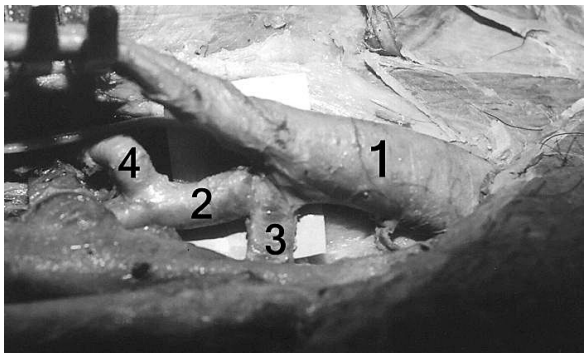

Figure 3. Common trunk formation between the medial circumflex femoral and the deep femoral arteries: 1 — femoral artery, 2 — deep femoral artery, 3 — medial circumflex femoral artery, 4 — lateral circumflex femoral artery.

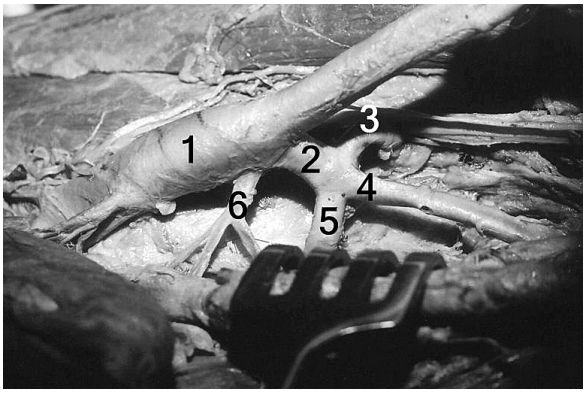

Figure 4. The case with trifurcation: 1 — femoral artery, 2 — trifurcation, 3 — lateral circumflex femoral artery, 4 — deep femoral artery, 5 — medial circumflex femoral artery, 6 — external pudendal artery.

In 4 extremities (4%) MCFA was found to be double; in each case one of MCFAs branched from FA and the other from DFA. In one of these four extremities the LCFA was also double (Fig. 1) while in the other three it was single. In one of the extremities with a double MCFA there were additional variations, as the inferior epigastric and deep circumflex iliac arteries branched from FA (Fig. 2).

In 1 extremity (1%) MCFA had a common trunk with DFA and branched from FA (Fig. 3). In one other extremity (1%) MCFA, DFA and LCFA had a common trunk which branched from FA as a trifurcation (Fig. 4).

Apart from the branching patterns we measured the distance of the branching point of MCFA from the midpoint of IL. In the cases which showed a normal branching pattern the mean distance between the midpoint of IL and the branching point of MCFA from DFA was 5.9 ± 1.5 cm (3.4–8.1 cm). In the cases in which MCFA branched directly from FA the mean distance between the midpoint of IL and the branching point of MCFA from FA was 2.5 ± 1.4 cm (0.8–4.2 cm).

DISCUSSION

MCFA, which shows different branching patterns, is an important artery in supplying blood to the head and neck of the femur, to the adductor muscles and to fatty tissue in the acetabular fossa [12, 19]. Because of its close relationship with this area there is a high risk of severing the artery after trauma or during operations such as total hip arthroplasty [3, 9, 13, 15]. It also has great importance in plastic surgery operations as the vascular pedicle of grafts such as the transverse upper gracilis (TUG) flap, the supermedial thigh flap and the medial circumflex femoral (gracilis) perforator free flap [2, 6, 8]. It is used in selective arteriography in idiopathic ischaemic necrosis of the femoral head to determine the arterial supply of the femoral head [14].

The normal origin of MCFA is from DFA. When we compared our data with the literature we found different results. In our study a normal pattern was observed in 79% of the cases. Lippert and Pabst found it in 58% [10], Adachi in 63.2% [1], Siddharth et al. in 63% [18], Massoud and Fletcher in 81% [11] and Emura et al. in 61.7% [5]. In their angiographic study Başar et al. found the normal pattern in 40.9% of cases [4]. Our results are therefore closest to those of Massoud and Fletcher [11].

MCFA may also branch from FA. We found this pattern in 15% of our cases. Lippert and Pabst found it in 18% [10], Adachi in 14% [1], Siddharth in 26% [18], Massoud and Fletcher in 6.4% [11] and Emura et al. in 11.6% [5].

Cases with a double MCFA are rare. We found this pattern in 4% of our cases. In the literature we were unable to find much evidence of double MCFAs. Apart from our findings this pattern was found only in the study of Siddharth et al. [18] in 1% of cases.

In one case (1%) we also found a common origin of DFA and MCFA. In the literature we found the same pattern only in Adachi's [1] study, where this variation is reported in 4% of cases. Emura et al. [5] also described a similar case in their study with ascending and descending branches of LCFA arising from FA as additional variations.

In one case (1%) we found a trifurcation of DFA, MCFA and LCFA from a common trunk from FA (Fig. 4). We were unable to find any comparable case in the literature. The most similar case that we could find was the common origin of these three arteries from FA in the study by Siddharth et al. [18], in which it was reported as occurring in 5% of cases.

In the literature it is possible to find cadaveric and angiographic studies concerning MCFA. The angiographic studies are valuable but their results may be inconsistent with the results of the cadaveric studies. The literature includes an angiographic study of MCFA in the Turkish population [4] but we were unable to find any cadaveric studies on the same population. Our intention in the present study was to fill this gap. Our result for the normal origin of MCFA from DFA is fairly consistent with the results of other cadaveric studies in different populations [1, 5, 10, 11, 18]. The percentage of cases in our study with a normal origin of MCFA (79%) is higher than in the angiographic study in the same population (40.9%) [4].

In our study the distance between the branching point of MCFA and the midpoint of IL was also measured. We were unable to find any information about this distance in other studies [1, 5, 10, 11, 18]. In the cases with MCFA branching directly from FA the mean distance (2.5 ± 1.4 cm) was smaller than in the cases in which MCFA branched from DFA (5.9 ± 1.5 cm). These distances may be useful for clinicians dealing with this artery.

MCFA can be used in flaps in reconstructive surgery [2, 6–8, 16, 17] or in selective arteriography in idiopathic ischaemic necrosis of the femoral head to determine its arterial supply [14]. It can be injured during femoral neck fracture or hip dislocation or in surgery of the hip joint [12]. To prevent necrosis of the femoral head it is important to take care that the artery is not severed. Because of its importance its normal and variational anatomy should be borne in mind if undesirable outcomes are to be avoided.

In our study we both investigated the patterns and measured the distance of branching of MCFA in the Turkish population. We compared our results with other studies and found some patterns which not previously reported and for this reason consider it useful to publish these findings and share them with our colleagues.

REFERENCES

1. Adachi B (1928) Das Arteriensystem der Japaner, Band II. Verlag der Kaiserlich, Kyoto, p. 145.
2. Arnež ZM, Pogorelec D, Planinšek F, Ahčan U (2004) Breast reconstruction by the free transverse gracilis (TUG) flap. Br J Plast Surg, 57: 20–26.
3. Aust JC, Bredenberg CE, Murray DG (1981) Mechanisms of arterial injuries associated with total hip replacement. Arch Surg, 116: 345–349.
4. Başar R, Sargon MF, Cumhur M, Bayramoglu A, Demiryürek D (2002) Distinct intergender difference in the femoral artery ramification patterns found in the Turkish population: angiographic study. Anat Sci Int, 77: 250–253.

5. Emura S, Shoumura S, Ishizaki N, Yamahira T, Ito M, Chen HY, Isono H (1989) The anatomical study on the branches of the femoral artery (II). Comparison with the findings of Adachi's classification. Kaibogaku Zasshi, 64: 196–205.
6. Hallock GG (2003) The medial circumflex femoral (gracilis) local perforator flap — a local medial groin perforator flap. Ann Plast Surg, 51: 460–464.
7. Hallock GG (2004) Further experience with the medial circumflex femoral (gracilis) perforator free flap. J Reconstr Microsurg, 20: 115–122.
8. Har-Shai Y, Hirshowitz B, Marcovich A, Eliachar I, Peretz BA (1984) Blood supply and innervation of the superomedial thigh flap employed in one-stage reconstruction of the scrotum and vulva — an anatomical study. Ann Plas Surg, 13: 504–510.
9. Langer R, Langer M, Scholz A, Astinet F, Schwetlick G, Felix R (1993) Femoral head perfusion in patients with femoral neck fracture and femoral head necrosis. J Belge Rad, 76: 145–149.
10. Lippert H, Pabst R (1985) Arterial variations in man: classification and frequency. JF Bergman Verlag, München, p. 61.
11. Massoud TF, Fletcher EWL (1997) Anatomical variants of the profunda femoris artery: an angiographic study. Surg Radiol Anat, 19: 99–103.
12. Moore KL (1999) Clinically oriented anatomy. 3rd ed. Williams and Wilkins, Baltimore, pp. 188, 545.
13. Nachbur B, Meyer RP, Verkkala K, Zurcher R (1979) The mechanisms of severe arterial injury in surgery of the hip joint. Clin Orthop Relat Res, 141: 122–133.
14. Oide T (1979) Selective medial circumflex femoral arteriography in idiopathic ischemic necrosis of the femoral head in adults. Nippon Seikeigeka Gakkai Zasshi, 53: 293–305.
15. Pai VS (1996) Compartment syndrome of the buttock following a total hip arthroplasty. J Artroplast, 11: 609–610.
16. Rab M, Mader N, Kamolz LP, Hausner T, Gruber H, Girsch W (1997) Basic anatomical investigation of semitendinosus and the long head of biceps femoris muscle for their possible use in electrically stimulated neosphincter formation. Surg Radiol Anat, 19: 287–291.
17. Ramasastry SS, Liang MD, Hurwitz DJ (1989) Surgical management of difficult wounds of the groin. Surg Gynecol Obstet, 169: 418–422.
18. Siddharth P, Smith NL, Mason RA, Giron F (1985) Variational anatomy of the deep femoral artery. Anat Rec, 212: 206–209.
19. Williams PL, Warwick R, Dyson M, Bannister LH (1989) Gray's anatomy. 37th ed. Churchill & Livingston, London, pp. 781–783.