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Original Article

VARIABILITY IN THE ORIGIN OF LATERAL AND MEDIAL CIRCUMFLEX FEMORAL ARTERIES: AN ANATOMICAL STUDY IN SOUTH INDIANS

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ABSTRACT

Aim: The objectives were to study the anatomical variations in the origin of lateral and medial circumflex femoral arteries in cadaveric lower limbs of South Indian population.

Material and method: The present study included 48 embalmed cadaveric lower limbs from the southern part of India. The branching patterns of femoral artery and deep femoral artery were observed in all the specimens. The branching pattern was categorized into different types as per Vazquez et al. The type 1a, the lateral circumflex femoral artery branched distal to the medial circumflex femoral artery and type 1b, the medial circumflex femoral artery branched distal to the lateral circumflex femoral artery. They are grouped under the type 1c, if both the circumflex femoral arteries, were found branching at the same level. Subtype 2a, if the lateral circumflex femoral artery is branching from the deep femoral artery and the medial circumflex femoral artery is branching from the femoral artery. Type 2b, if the medial circumflex femoral artery is branching from the deep femoral artery and the lateral circumflex femoral artery is branching from the femoral artery. In type 3, both the lateral and medial circumflex femoral arteries were branching from the femoral artery.

Results: In the present study, the type 1a was observed in 43.7% of specimens, type 1c in 12.5% of cases, type 2a was found in 33.3% specimens, type 2b was observed in 6.2% cases and type 3 in 4.2% of cases. The type 1b was not observed in the present study.

Conclusion: The present study has provided additional knowledge about the variability in the origins of lateral and medial circumflex femoral arteries in the cadaveric lower limbs of South Indian population. The morphological knowledge will enlighten the surgeons to avoid complications like catastrophic bleeding and diagnostic misinterpretations.

KEY WORDS: Artery, Branching, Circumflex, Femoral, Variation.

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INTRODUCTION

The deep femoral artery (DFA) is a branch of femoral artery (FA) and DFA is also called as the profunda femoris artery. DFA provides a couple of branches known as lateral circumflex femoral artery (LCFA) and the medial circumflex femoral artery (MCFA). However there may be variation in the origin of MCFA and LCFA because of the developmental reason. The arterial variations can occur in any artery of the human body

and the same is to the femoral arterial tree. Prakash et al. [1] opined that, MCFA and LCFA can branch directly from the FA. It is further suggested that the origins of the MCFA and LCFA directly from the FA is observed in case of low level branching of DFA from the FA [1, 2]. It is obvious that the morphological knowledge of the branching pattern of the arteries of the thigh is important to the operating surgeon. The knowledge will prevent the unexpected catastrophic bleeding. The knowledge of the anatomy of the MCFA is important to the orthopaedic surgeon during the hip reconstructive surgery and the internal fixation of acetabular fractures [3]. The anatomical knowledge of the branching pattern may prevent the iatrogenic rupture of the MCFA and subsequent ischemia which may cause femoral head avascular necrosis. The head of femur is supplied by a deep branch which comes from the MCFA [3]. The branches of the LCFA are used in the coronary artery bypass surgery, anterolateral thigh flap surgeries, aortico popliteal bypass surgery and intracranial-extracranial bypass grafting [4].

The morphological knowledge of the branching pattern of FA is essential to the surgeons and radiologists, as this particular arterial system is often assessed in procedures like coronary angioplasty. The knowledge about anatomical variations in this arterial system including the MCFA and LCFA may prevent the intraoperative complications like catastrophic bleeding and haemorrhagic shock. Due to all this clinical implications, the present study was performed. The objectives were to study the variability in the origin of LCFA and MCFA in human cadaveric lower limbs of South Indian population.

MATERIALS AND METHODS

The present study included 48 (24 right sided & 24 left sided) embalmed cadaveric lower limbs which were available in the dissection hall at our institution. These cadavers were procured from the southern part of India. The macerated specimens were excluded from the present study. After reflecting the skin, the superficial fascia and deep fascia, the inguinal ligament was exposed. The FA was identified after tracing down from the midinguinal point to expose the DFA and their branches. There were different branching patterns of FA and DFA observed in different specimens. We categorized our observations into different branching patterns as per the classification given by Vazquez et al. [5]

The type 1 has both LCFA and MCFA branching from the DFA and type 2, one among the circumflex femoral arteries is branching from the FA and the other one from the DFA. In type 3, both LCFA and MCFA were branching from the FA. The types 1 and 2 were again subcategorized. Type 1a, the LCFA branched distal to the MCFA and type 1b, the MCFA branched distal to the LCFA. Type 1c, both circumflex arteries were branching at the same level. Subtype 2a, the LCFA was branching from the DFA and the MCFA was branching from the FA. Type 2b, the MCFA was branching from the DFA and the LCFA was branching from the FA [5].

OBSERVATIONS

The types 1, 2 and 3 [5] observed in the present study and their frequency are represented in Figure 1. The type 1, type 2 and type 3 patterns were observed in 56%, 40%, and 4% cases respectively. The subtypes among the types 1, 2 and 3, which were observed among our specimens, are represented in table 1. Type 1a (Figure 2) was observed in 43.7% of specimens, type 1c (Figure 2) in 12.5% of cases, type 2a (Figure 3) was found in 33.3% specimens, type 2b (Figure 3) was observed in 6.2% cases and type 3 (Figure 4) in 4.2% of cases. The type 1b was not observed in any of our specimens in the present study.

Fig. 1: showing the frequency of different types of origin of MCFA and LCFA observed in the present study [5]. (type 1-56%; type 2-40%; type 3-4%).

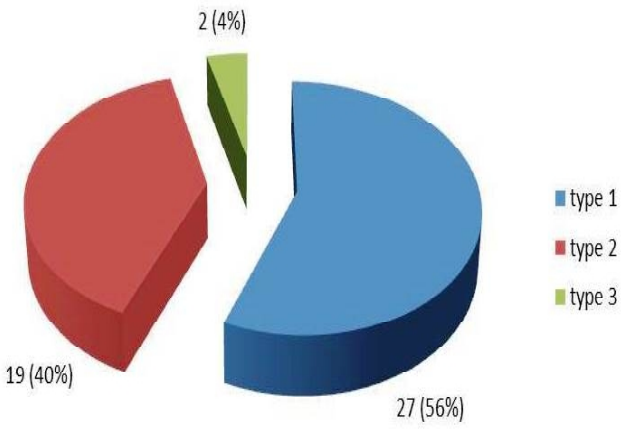
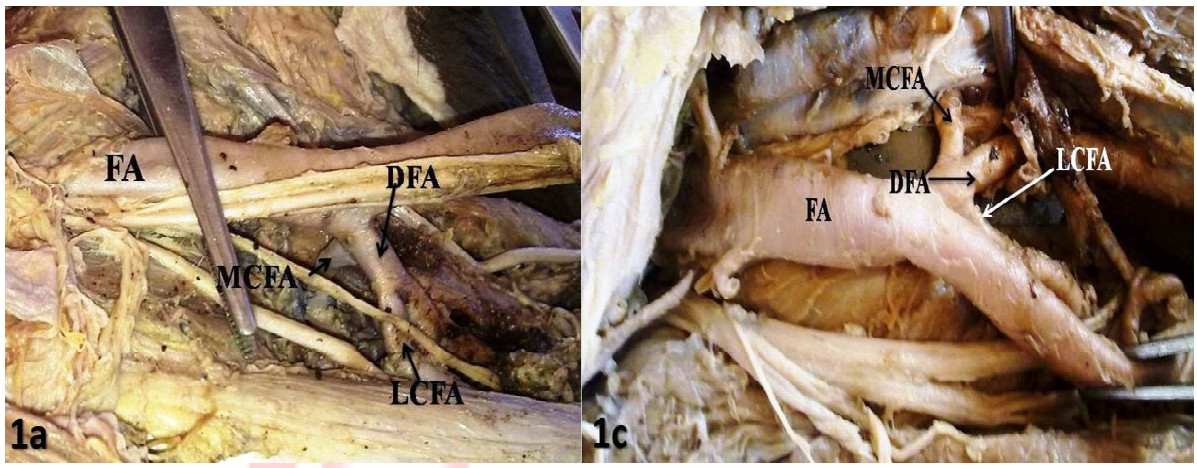
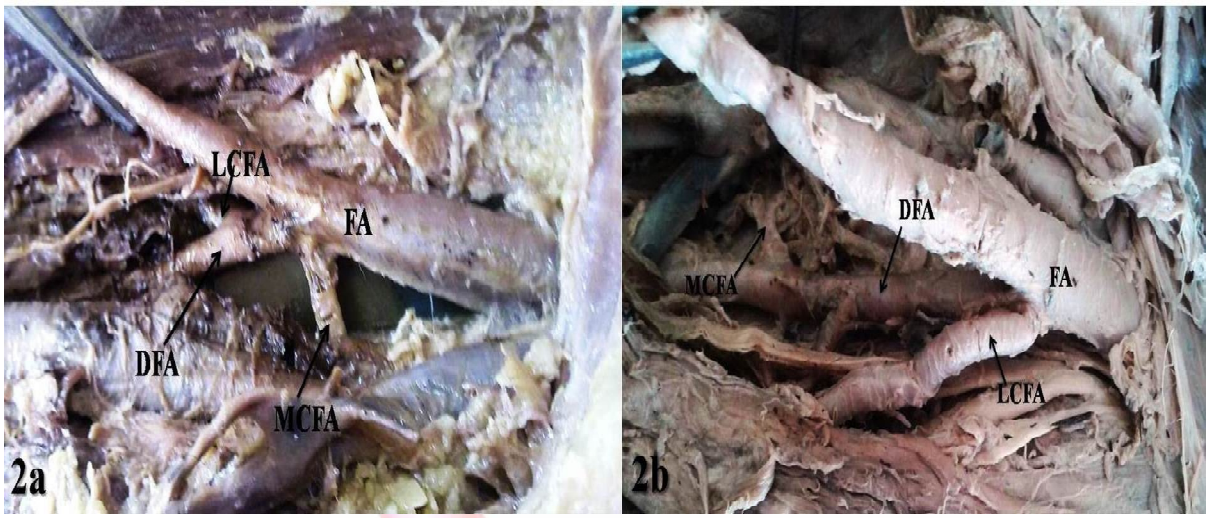


Fig. 2: showing the origins of MCFA and LCFA from the DFA (type 1, 56%); The type 1a, if the LCFA branches distal to the MCFA (43.7%) and Type 1c, both MCFA and LCFA arose at the same level (12.5%).



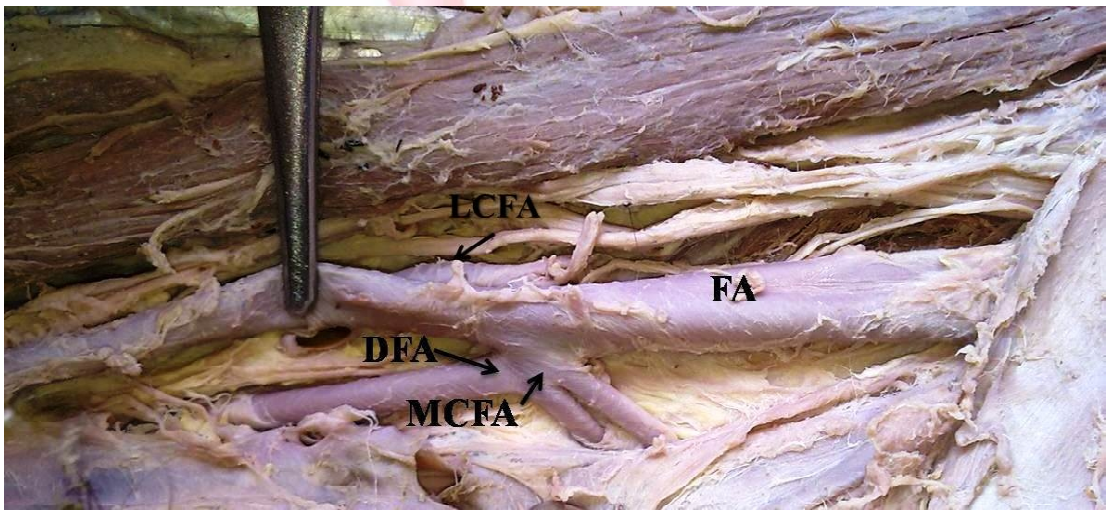
MCFA-medial circumflex femoral artery; LCFA-lateral circumflex femoral artery; DFA-deep femoral artery

Fig. 3: showing the origins of MCFA and LCFA in which one among the circumflex femoral arteries is branching from the FA and the other one from the DFA (type 2, 40%). The type 2a, if the LCFA is branching from the DFA and the MCFA is branching from the FA (33.3%). The type 2b, if the MCFA is branching from the DFA and the LCFA is branching from the FA (6.2%).



MCFA-medial circumflex femoral artery; LCFA-lateral circumflex femoral artery; DFA-deep femoral artery; FA-femoral artery

Fig. 4: showing the origins of MCFA and LCFA, both of them branched from the FA (type 3, 4%).



MCFA-medial circumflex femoral artery; LCFA-lateral circumflex femoral artery; DFA-deep femoral artery; FA-femoral artery

Table 1: Showing the number and frequency of different subtypes [5] of the origins of MCFA and LCFA observed in the present study (n=48).

type	right side (n=24)	left side (n=24)	total (n=48)
type 1a	11 (45.8%)	10 (41.7%)	21 (43.7%)
type 1b	nil	nil	nil
type 1c	3 (12.5%)	3 (12.5%)	6 (12.5%)
type 2a	8 (33.3%)	8 (33.3%)	16 (33.3%)
type 2b	1 (4.2%)	2 (8.3%)	3 (6.2%)
type 3	1 (4.2%)	1 (4.2%)	2 (4.2%)

DISCUSSION

It has been reported that several embryological and phylogenetic observations revealed that the variations of the branching patterns of DFA are due to the embryological variation in the selection of capillary channels during the development of arteries of the lower limb. The fetal studies have shown that both LCFA and MCFA arise equally from the FA and DFA [5]. The various types of branching patterns of the DFA have been studied by anatomists and surgeons. The LCFA and MCFA are the collateral branches arising from the DFA; however they may arise from FA too. The morphological variable branching pattern of arterial pattern was studied by few authors [5]. The oldest classification described in 1860, has described the branching pattern into 4 types. Vazquez et al. [5] modified the older classifications of the branching pattern of DFA and reported the simplest version of classification which describes the branching pattern into 6 types.

It has been reported that the branching pattern type 1 ranges from 40-83.3%, type 2 ranges from 14-51% and type 3 ranges from 0.5-20%. The average frequencies for type 1, 2, 3 are 64.4%, 30% and 14.2% respectively [5]. In the present study, the type 1 was observed in 56.2% cases, type 2 was in 39.6% cases and type 3 in 4.2% cases. The racial variations have to be taken into consideration in comparing this aspect.

The variations of the vessels of lower limb have been described as abnormal development of the arteries of the lower limb in the embryo [6]. It has been reported that, in the lower animals, the DFA originates from the internal iliac artery (IIA). During the human evolution, this origin has moved distally and the DFA branches from the FA. This is because of the concept that 'ontogeny repeats phylogeny' [1]. Hence, the developmental arrest during the various stages perhaps lead to the arterial variations related to the femoral artery branching [1]. Vaas [7] opined that the DFA is an important vessel for the collateral circulation during the situation of FA occlusion and for this function; DFA should have a larger caliber, which could be related to the comparative anatomical basis. The morphological idea of the branching of the arteries of femoral triangle is important in avoiding the iatrogenic injury to the vessels. The knowledge helps in preventing the femoral arterio-venous fistula while performing the FA puncture and it will enable the operating surgeon in identifying the correct artery for the surgical exposure.

The DFA is clinically used for the procedures like angiogram, vascular ultrasound, color doppler studies and magnetic resonance imaging [8]. It is also advised that before performing the catheterization of the femoral vessels and surgical procedures in the upper thigh region, an ultrasound examination of the upper thigh can be advised. This will provide structural information about the femoral vessels and will be of help in planning the catheterization [9]. The morphological knowledge of the arteries of the femoral triangle is also essential in the surgical repair of the femoral hernias [10].

CONCLUSION

The FA and its branches play major role in the vascular supply of the lower limb. If the FA is occluded due to the vascular pathology, the circulation of the lower limb is maintained by the collateral anastomoses. Therefore, the knowledge of the branching pattern of variations of these arteries is of paramount importance from the clinical and surgical point of view. In this context, it is believed that the present study has provided important information to the general and vascular surgeons about the branching pattern of arteries in the femoral triangle. The present study has provided additional knowledge about the variability in the origin of LCFA and MCFA in the cadaveric lower limbs of

South Indian population. The morphological knowledge is essential to avoid the complications like catastrophic bleeding. The present study is also enlightening to the morphologists and clinical anatomists.

Conflicts of Interests: **None**

Sources of support: **Nil**

REFERENCES

[1]. Prakash, Kumari J, Bhardwaj AK, Jose BA, Yadav SK, Singh G. Variations in the origins of the profunda femoris, medial and lateral femoral circumflex arteries: a cadaver study in the Indian population. Rom J Morphol Embryol 2010; 51:167-70.

[2]. Vuksanovic-Bozaric A, Stefanivic N, Pavlovic S, Duraskosvic R, Randelovic J. Analysis of deep femoral artery origin variances on fetal material. Facta Universitatis: Medicine and Biology 2007; 14:112-6.

[3]. Gautier E, Ganz K, Krugel N, Gill T, Ganz R. Anatomy of the medial femoral circumflex artery and its surgical implications. J Bone Joint Surg Br 2000; 82:679-83.

[4]. Uzel M, Tanyeli E, Yildirim M. An anatomical study of the origins of the lateral circumflex femoral artery in the Turkish population. Folia Morphol (Warsz) 2008; 67:226-30.

[5]. Vazquez MT, Murillo J, Maranillo E, Parkin I, Sanudo J. Patterns of the circumflex femoral arteries revisited. Clin Anat 2007; 20:180-5.

[6]. Kumar V, Kumar VV, Murlimanju BV, Naveen NS. High origin of the deep femoral artery: a case report and literature review. J Vasc Bras 2011; 10:243-5.

[7]. Vaas F. Some considerations concerning the deep femoral artery. Arch Chir Neerl 1975; 27:25-34.

[8]. Chitra R. A rare variational anatomy of the profunda femoris artery. Folia Morphol 2008; 67:157-8.

[9]. Canale JM, Lange L, Friedman MJ. A new technique for noninvasive evaluation of femoral arterial and venous anatomy before and after percutaneous cardiac catheterization in children and infants. Am J Cardiol 1982; 49:349-55.

[10]. Johnston TB. A rare anomaly of the arteria profunda femoris. Anat Anz 1912; 42: 269-72.

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