

A cadaveric study of variations in the origin of medial circumflex femoral artery

Apurva Darji¹, Paras Shrimankar², Hitesh Chauhan^{*3}, Hardik Khatri⁴ and T.C.Singel⁵

¹Tutor, ²Associate Professor, ⁵Professor and Head, Department of Anatomy, B. J. Medical College, Ahmedabad, Gujarat.

³Assistant Professor, Department of Anatomy, GMERS Medical College, Dharpur-Patan, Gujarat.

⁴Assistant Professor, Department of Anaesthesia, U.N.Mehta institute of cardiology and Research centre, Ahmedabad.

*Correspondence Info:

Dr. Hiteshkumar M. Chauhan
Assistant Professor,
Anatomy Department,
G.M.E.R.S. Medical College, Dharpur-Patan.
E-mail: drmanwish@gmail.com

Abstract

The medial circumflex femoral artery is the chief source of blood supply to head and neck of femur. So, the precise knowledge of the anatomy of the artery is essential during reconstructive surgeries of the hip joint and if it is damaged, may cause a vascular necrosis of the head of femur. We have done this study to determine the mode of origin and the distance of origin of medial circumflex femoral artery from the origin of profunda femoris artery and from mid-inguinal point when it arises from femoral artery. We dissected 130 femoral triangles in 65 human cadavers which revealed interesting variations. Medial circumflex femoral artery originated from profunda femoris artery in 116 cases and from femoral artery in 14 cases. In most of the cases, the distance of origin of medial circumflex femoral artery from the origin of profunda femoris artery was ranging from 0 to 10 mm. Variations in the arterial patterns may be due to the divergence in the mode and proximo-distal level of branching or aberrant vessels that connect with the principal vessels, arcades or plexuses during the development of the blood vessels. Thus the knowledge of these variations can be of great help to the surgeons in reducing the chances of intra-operative secondary haemorrhage and post-operative complications.

Keywords: Femoral artery, Idiopathic ischaemic necrosis, Medial circumflex femoral artery, Profunda femoris artery

1.Introduction

Medial circumflex femoral artery is a branch of profunda femoris artery. It arises from the posteromedial aspect of the profunda femoris artery in the femoral triangle.[1] The principal sources of blood flow to the femoral head are the lateral epiphyseal vessels which are the branches of the posterior superior retinacular vessels of the medial circumflex femoral artery. Medial circumflex femoral artery also gives postero-inferior arteries to the femoral head and neck and posterior arteries to the neck of femur. The medial circumflex femoral artery, therefore, is the chief source of blood supply to head and neck of femur.[2] Selective arteriography of medial circumflex femoral artery in the patients of idiopathic ischaemic necrosis of the femoral head is done to determine the arterial supply of the femoral head. The precise knowledge of the anatomy of medial circumflex femoral artery is essential when

performing both trochanteric and inter-trochanteric osteotomies and is also helpful to avoid iatrogenic vascular necrosis of the head of femur in reconstructive surgery of the hip and fixation of acetabular fractures through the posterior approach.[3]

1.2Aim

- To determine mode of origin of medial circumflex femoral artery.
- To determine the distance of origin of medial circumflex femoral artery from the origin of profunda femoris artery
- To determine the distance of origin of medial circumflex femoral artery from mid-inguinal point when it arises from femoral artery.
- To compare the obtained results with those of other studies.

2. Materials and method

In present study, total 130 femoral triangles from 65 properly embalmed and formalin fixed human cadavers, from various medical colleges of Gujarat, were dissected meticulously according to cunningham’s manual[4] during the educational dissection. The distance between the pubic symphysis and anterior superior iliac spine was measured with the help of measure tap and the midpoint of this distance was taken as mid-inguinal point. Various other distances were measured with the help of vernier calliper.

3. Observation

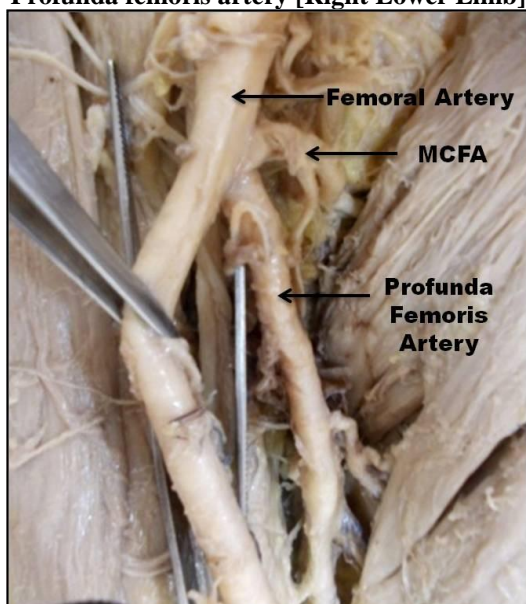
In the present study, total 130 femoral triangles from 65 embalmed human cadavers belonging to Anatomy department of various medical colleges of Gujarat state were dissected and data were collected and analysed. Various findings noted were as follows:

On the right Lower limb, Medial circumflex femoral artery originated from profunda femoris artery in 60 cases (92.31%) and from femoral artery in 5 cases (7.69%). Out of these, it originated at the level of origin of profunda femoris artery (including common stem) in 3 cases (4.62%) and from femoral artery superior to origin of profunda femoris artery in 2 cases (3.08%) [Figure-1] and none of the artery found originated from femoral artery inferior to origin of profunda femoris artery. While on the left side, medial circumflex femoral artery originated from profunda femoris artery in 56 cases (86.15%) and from femoral artery in 9 cases (13.85%). Out of these, it originated at the level of origin of profunda femoris artery (including common stem) in 7 cases (9.23%) [Figure-2], from femoral artery superior to origin of profunda femoris artery in 1 case (1.54%) and none of the artery found originated from femoral artery inferior to origin of profunda femoris artery. [Table 1]

Table 1: Mode of origin of Medial circumflex femoral artery

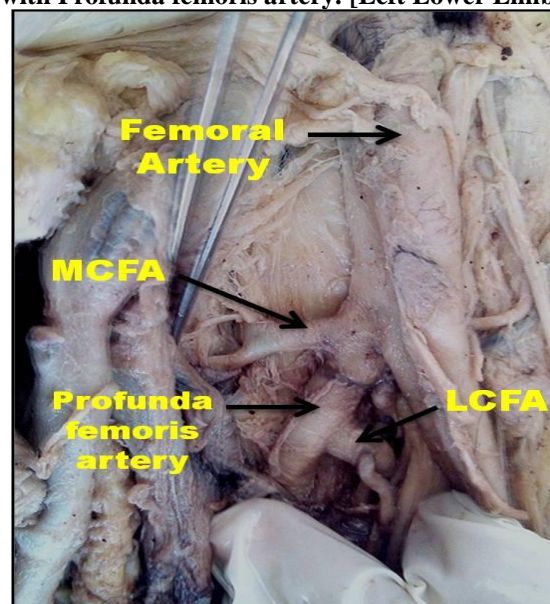
Mode of origin	Right Side		Left Side	
	No. of cases	Percentage (%)	No. of cases	Percentage (%)
From Profunda femoris artery	60	92.31	56	86.16
From Femoral artery At the level of origin of Profunda femoris artery (including common stem)	3	4.62	7	10.77
From femoral artery Superior to Profunda femoris artery	2	3.08	1	1.54
From femoral artery Inferior to Profunda femoris artery	-	-	-	-
From femoral artery As a common stem with Profunda femoris artery	-	-	1	1.54
Total	65		65	

Figure 1: Origin of Medial circumflex femoral artery from Femoral artery Superior to origin of Profunda femoris artery [Right Lower Limb]



MCFA – Medial Circumflex Femoral Artery

Figure 2: Origin of Medial circumflex femoral artery from Femoral artery as a common stem with Profunda femoris artery. [Left Lower Limb]



MCFA – Medial Circumflex Femoral Artery, LCFA – Lateral Circumflex Femoral Artery

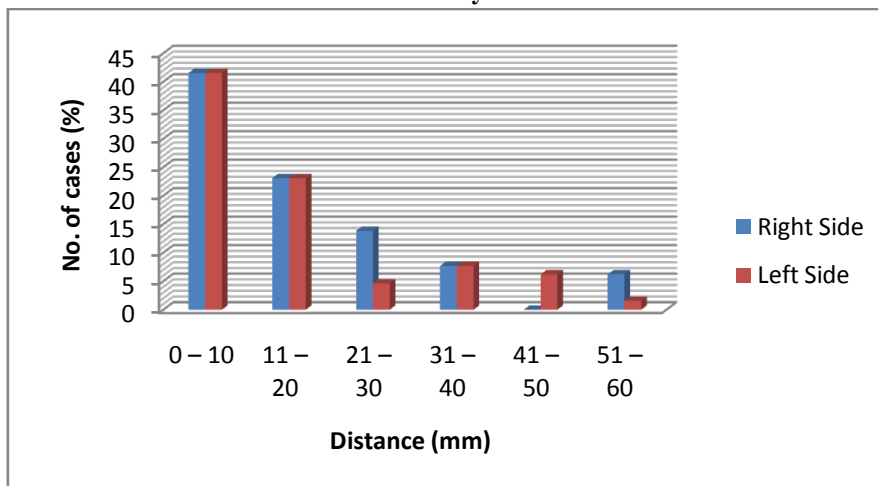
The distance of origin of medial circumflex femoral artery from the origin of profunda femoris artery was ranging from 0 to 10 mm found in 27 cases on both sides. The distance was ranging from 11 to 20 mm in 15 cases (23.08%) on both the sides. It was ranging from 21 to 30 mm in 9 cases (13.85%) on the right side and in 3 cases (4.62%) on the left

side. While it was more than 31 mm in 9 cases (13.85%) on the right side and 11 cases (16.92%) on the left side [Table 2] [Figure-3]. Mean distance of origin of medial circumflex femoral artery from the origin of profunda femoris artery when it was a branch of profunda femoris artery was 18.13 mm on the right side and 18.14 mm on the left side.

Table 2: Distance of origin of Medial circumflex femoral artery from the origin of Profunda femoris artery

Distance (mm)	Right Side		Left Side	
	No. of cases	Percentage (%)	No. of cases	Percentage (%)
0-10	27	41.54	27	41.54
11-20	15	23.08	15	23.08
21-30	9	13.85	3	4.62
31-40	5	7.69	5	7.69
41-50	0	0	4	6.15
51-60	4	6.15	2	3.08
Total	60	92.31	56	86.16

Figure3: Distance of origin of Medial circumflex femoral artery from the origin of Profunda femoris artery



Medial circumflex femoral artery was arising from femoral artery in total 14 cases; 5 cases on the right side and 9 cases on the left side. The distance of origin of medial circumflex femoral artery from the mid-inguinal point when it was a branch of femoral artery was ranging from 11 to 20 mm in 1 case, 21 to 30 mm in 1 case, 31 to 40 mm in 2 cases and 61 to 70 mm in 1 case on the right side; whereas on the left side, the distance was between 21 to 30 mm in 2 cases, between 31 to 40 mm in 2 cases, between 41 to 50 mm in 4 cases and between 61 to 70 mm in 1 case. [Table 3] Mean distance of origin of Medial circumflex femoral artery from the mid-inguinal point was 45.60 mm on the right side and 40.33 mm on the left side when it was a branch of femoral artery.

Table 3: Distance of origin of Medial circumflex femoral artery From the Mid-inguinal point, when it was a branch of Femoral artery

Distance (mm)	No. of cases	
	Right Side	Left Side
0-10	0	0
11 – 20	1	0
21 – 30	1	2
31 – 40	2	2
41 – 50	0	4
51 – 60	0	0
61 – 70	1	1
Total	5 (7.69%)	9 (13.85%)

4. Discussion

In present study, 130 femoral triangles of lower limb from sixty five properly embalmed and formalin fixed cadavers were dissected during the educational dissection.

Lipshutz et al[5], Siddharth et al[6], Clarke et al[7], Gautier et al[3], Basar et al[8], Tanayeli et al[9], Samarwickrama et al[10], Prakash et al[11] and Kulkarni et al[12] observed the origin of medial circumflex femoral artery from profunda femoris artery in 59%, 63%, 53%, 83.3%, 67.1%, 79%, 62%, 67.2% and 71.67% cases respectively. Shainy et al[13] found that the origin of medial circumflex femoral artery from femoral artery in 13 out of 120 lower limbs. Among which in 6 cases artery originated from femoral artery above the origin of profunda femoris artery and in 7 cases arise as a common stem with profunda femoris artery. Dixit et al[14] observed that origin of medial circumflex femoral artery from femoral artery in 88 out of 228 lower limbs. Out of these, the artery originated from femoral artery above the origin of profunda femoris artery in 38 cases, below the origin of profunda femoris artery in 15 cases and as a common stem with profunda femoris artery in 35 cases. Anjankar et al[15] observed the origin of medial circumflex femoral artery from femoral artery directly in 45 out of 120 lower limbs. Out of these, Medial circumflex femoral artery originated from femoral artery above the origin of profunda femoris artery in 13 cases,

below the origin of profunda femoris artery in 13 cases and as a common stem with profunda femoris artery in 19 cases. In present study, the origin of medial circumflex femoral artery from profunda femoris artery was found in 89.23% and from femoral artery in 10.77%. Out of these, Medial circumflex femoral artery originated from femoral artery above the origin of profunda femoris artery in 3 cases, as a common stem with profunda femoris artery in 10 cases. Medial circumflex femoral artery originated from femoral artery as a common stem with lateral circumflex femoral artery above the origin of profunda femoris artery in one case (1.54%) on the left side.

Various authors' observation of the distance of origin of Medial circumflex femoral artery from the origin of profunda femoris artery is noted in Table-4. In present study the distance of origin of medial circumflex femoral artery from the origin of profunda femoris artery was most commonly varied from 1 to 10 mm on both the sides. Mean distance of origin of medial circumflex femoral artery from the origin of profunda femoris artery was 18.13 mm on the right side and 18.14 mm on the left side.

Table 4: Comparison of the distance of origin of Medial circumflex femoral artery from the origin of Profunda femoris artery in different studies

Sr. No	Author	Total No.	Distance of origin of Medial circumflex femoral artery from Profunda femoris artery (mm)											
			1-10		11-20		21-30		31-40		41-50		51-60	
			R	L	R	L	R	L	R	L	R	L	R	L
1	Samarwickrama et al[10]	26	5	4	2	4	5	2	0	2	-	-	-	-
2	Dixit et al[14]	228	45	44	30	30	22	21	11	14	4	5	2	-
3	Kulkarni et al[12]	60	9	10	5	3	4	3	1	2	2	1	-	-
4	Anjankar et al[15]	120	27	29	12	12	9	7	5	6	6	4	1	2
5	Present study	130	27	27	15	15	9	3	5	5	-	4	4	2

5. Conclusion

Medial circumflex femoral artery originated from profunda femoris artery in 116 cases (89.23%) and from femoral artery in 14 cases (10.77%). The most common distance of origin of medial circumflex femoral artery from the origin of profunda femoris artery was ranging from 0 to 10 mm on both the sides, but it may varied from 5 to 65 mm. The mean of this distance was 18.13 mm on the right side and 18.14 mm on the left side. It was found that the origin of medial circumflex femoral artery directly from the femoral artery was associated with more distal separation of profunda femoris artery from the femoral artery. The results of the present study may be used as reference guide for future studies about femoral artery and its branches as well as for surgical, clinical and radiological interventions.

Reference

- [1] Standring S, Healy JC, Johnson D, Williams A, Collins P. Gray's Anatomy: The Anatomical Basis of Clinical Practice.40th ed. London: Elsevier, Churchill Livingstone 2008; p.409, 491-494,544,665-668, 1349-85.
- [2] Hollinshead WJ. Anatomy for surgeon's. The Back and Limbs, vol.3. Newyork: Medical book department of harper and brothers 1958; p.705-42.
- [3] Gautier E, Ganz K, Krugel N, Gill T, Ganz R. Anatomy of the medial femoral circumflex artery and its surgical implications. *The journal of bone and joint surgery* (Br) 2000; 82: p.679-683.

- [4] Cunningham's manual of practical anatomy. Vol.-1. Upper and lower limbs. 15th ed. London: Oxford university press 2002; p.129-44.
- [5] Lipchut BB. Studies on the blood vascular tree, A composite study of the femoral artery. *Anatomical Record* 1961; 10: p.361-70.
- [6] Siddharth P, Smith NL, Mason RA, Giron F. Variational anatomy of the deep femoral artery. *Anat Rec* 1985; 212(2): p.206-9.
- [7] Clarke SM, Colborn GL. The medial femoral artery: its clinical anatomy and nomenclature, *Clin Anat* 1993; 6: p.94- 105.
- [8] Başar R, Sargon MF, Cumhuri M, Bayramoğlu A, Demiryürek D. Distinct Intergender difference in the femoral artery ramification patterns found in the Turkish population: angiographic study, *Anat Sci Int* 2002; 77(4): p.250-253.
- [9] Tanyeli E, Uzel M, Yıldırım M, Celik HH. An anatomical study of the origins of the medial circumflex femoral artery in the Turkish population. *Folia Morphol* 2006; 65(3): p.209 - 12.
- [10] Samarawickrama MB, Nanayakkara BG, Wimalagunaratna KWR, Nishantha DG, Walawag UB. Branching pattern of the femoral artery at the femoral triangle: a cadaver study. *Galle Medical Journal* 2009; 14(1): p.31-34.
- [11] Prakash, Kumari J, Bharadwaj AK, Jose BA, Yadav KS, Sing G. Variations in the origins of the profunda femoris, medial and lateral femoral circumflex arteries: a cadaver study in the Indian population, *Romanian Journal of Morphology and embryology* 2010; 51(1): p.167-70.
- [12] Kulkarni SP, Nikade VV. A study of branching pattern of femoral artery in femoral triangle in cadavers. *International Journal of Recent Trends in Science and Technology*. 2013; 6(1): p.53-55.
- [13] Shainy V B, Suseelamma D, Shridevi N S, Gayatri N, Sangeeta M. A study of the origin of medial circumflex femoral artery. *Journal of Dental and Medical Sciences* 2013; 4(5) p.28-31.
- [14] Dixit D, Dharati M, Suresh P, Mital M, Singel TC. A study of variations in the origin of profunda femoris artery and its circumflex branches. *Int J Biol Med Res* 2011; 2(4):.1084 - 89.
- [15] Anajankar VP, Panshewdikar PN, Thakare G, Mane U, Tekale V. Morphological study on branching pattern of femoral artery: a cadaveric study. *Int J of biomed and pharm sci* 2014; 4(28): p.34-38.