

A Study of Variations in the Origin of Lateral Circumflex Femoral Artery

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Abstract.

Background: Knowledge of arterial variations is extremely important as these may be the source of intraoperative iatrogenic haemorrhage or post operative complications. Arterial variations of the lower extremity are important because of their close association with repair of femoral hernias. Anomalous route of the lateral circumflex femoral artery is of utmost importance to surgeons while raising free rectus femoris muscle flaps with a branch of posterior division of the femoral nerve, for one stage reconstruction of facial paralysis.

Materials and methods- Adult thigh specimens were obtained from 25 adult cadavers allotted for dissection to the I MBBS students in the Institute of Anatomy, Madras Medical College, Chennai. The method of study was direct dissection method.

Results-[i] in the present study, the origin of the lateral circumflex femoral artery were from profunda femoris artery in 42 out of 50 specimens [84%] and its from femoral artery in 8 out of 50 specimens [16%]

[ii] in the present study the mean distance between the origin of lateral circumflex femoral artery was 24.5 mm.

[iii] in the present study double lateral circumflex femoral artery was not found.

[iv] in the present study absence of lateral circumflex femoral artery was also not present.

Conclusion –With the advent of novel harvesting and reconstructive techniques, precise anatomical knowledge of lateral circumflex femoral artery becomes more important. This study will be useful to the surgeons , anaesthetists , interventional radiologists and other clinicians to enlighten their knowledge about the origin of the lateral circumflex femoral artery which will inturn help in better patient management.

Keywords: origin; lateral circumflex femoral artery; distance.

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I. Introduction

Developmental arrests at different stages may lead to anatomical variations related to the branches of femoral artery. Vascular development in the lower limb is preceded by morphological and molecular changes that occur in the limb mesenchyme, therefore variations in the vascular pattern are often recorded. Knowledge of arterial variations is extremely important as these may be the source of intraoperative iatrogenic haemorrhage or post operative complications. Arterial variations of the lower extremity are important because of their close association with femoral hernias. Anatomical knowledge of branches of lateral circumflex femoral artery is also important while using sharp ended version guidewires during hip fracture surgery. Anomalous route of lateral circumflex femoral artery is of utmost importance to surgeons while raising free rectus femoris muscle flaps with a branch of posterior division of the femoral nerve, for one stage reconstruction of facial paralysis.

Lateral circumflex femoral artery is an artery typically arising from the lateral side of the upper end of the profunda femoris artery. The lateral circumflex femoral artery supply the greater trochanter, hip joint and anterolateral thigh flaps. Variations of the lateral circumflex femoral artery are important in vascular reconstruction surgeries while raising myocutaneous grafts with pedicle and peripheral nerve blockade offers many advantages for patients undergoing orthopaedic surgery of the lower extremity. Knowledge of the variations of this artery is important for anaesthetists during femoral nerve blockade and also during procedures in the femoral region and in hip joint replacement. The lateral circumflex femoral artery and its branches are used in various bypass surgeries in iliofemoral region. Therefore the present study was conducted to note the variations in the origin of lateral circumflex femoral artery.

II. Aims And Objectives

The main objective of this study is

- [i] to find out whether the origin of the lateral circumflex femoral artery were from profunda femoris artery or from the femoral artery.
- [ii] to find out the distance between the origin of lateral circumflex femoral artery and the origin of profunda femoris artery.
- [iii] to look for the double lateral circumflex femoral artery.
- [iv] to look for the absence of lateral circumflex femoral artery.

III. Material And Methods

This study was done on 50 adult thigh specimens obtained from 25 adult cadavers allotted for dissection to the I MBBS students in the Institute of Anatomy, Madras Medical College, Chennai.

The dissection was carried out as follows:

A horizontal incision was made along the inguinal ligament from the anterior superior iliac spine to the pubic tubercle and the incision was carried down along the external genitalia and carried down vertically along the medial border of the thigh, medial part of the knee, down to the legs up to the level of the tibial tuberosity. Horizontal incision was made from this point laterally. The skin flap was reflected from medial to lateral side. Then the femoral artery, profunda femoral artery and the lateral circumflex femoral artery were traced. The pattern of origin of lateral circumflex femoral artery whether lateral circumflex femoral artery originates from profunda femoral artery or the femoral artery was noted. Then the distance between the origin of the lateral circumflex femoral artery and the origin of profunda femoral artery was measured with the vernier callipers. The mean distance was calculated using Microsoft office excel 2007 computer program. Any duplication and absence of lateral circumflex femoral artery was also noted.

IV. Observation

- [i] In the present study the origin of the lateral circumflex femoral artery was from profunda femoral artery in 42 out of 50 specimens [84%] and it is from femoral artery in 8 out of 50 specimens [16%].
- [ii] In the present study the mean distance between the origin of lateral circumflex femoral artery and the origin of profunda femoral artery was 24.5mm. The findings are tabulated in Table.no.1
- [iii] In the present study double lateral circumflex femoral artery was not found.
- [iv] In the present study absence of lateral circumflex femoral artery was not found.

Table.no.1. Distance between the origin of lateral circumflex femoral artery and the origin of profunda femoral artery in the present study

Distance in mm	Actual no. on right side	Percentage on right side	Actual no. on left side	Percentage on left side
0-10mm	2/25	8	1/25	4
11-20 mm	3/25	12	2/25	8
21- 30 mm	11/25	44	12/25	48
31-40 mm	4/25	16	5/25	20
41-50 mm	4/25	16	4/25	16
51-60 mm	1/25	4	1/25	4

Figure No.1. Origin Of Lateral Circumflex Femoral Artery From Profunda Femoris Artery.



Figure No.2. Origin Of Lateral Circumflex Femoral Artery From Femoral Artery.



V. Discussion

[i] Origin of lateral circumflex femoral artery from profunda femoral artery

According to Tansalit.T[1]; Sinkeet SR [2]; Sangeetha J. Ranjini[3] ; Uzel [4]; Fukuda [5] ; Ho Suck Hang [6]; Brijesh [7] ; Prakash[8]; Dixit [9]; Sridevi [10] and Choi [11] the origin of the lateral femoral artery from profunda femoral artery was seen in 56.67%; 65.5% 75.75%; 77.3% ; 78.6% ; 78.9% ; 80.39% ; 81.25% ; 83.34% ; 85% and 86.8% respectively. In the present study the origin of lateral circumflex femoral artery from the profunda femoral artery was seen in 84% of specimens. Therefore the present study coincides with the study of Dixit DP ; Sridevi and Choi et al. , but is greater than that found by Tansalit.T; Sinkeet; Sangeetha J .Ranjini; Uzel ; Fukuda ; Ho Suck Hang ; Brijesh and Prakash et al and is lesser than that found by Choi et al. [Table.no.2].

[ii] Origin of lateral circumflex femoral artery from femoral artery.

According to Shri devi et al[11] ; Choi et al [10]; Dixit DP et al[9]; Brijesh et al[7]; Prakash et al[8]; Fukuda et al [5]; Uzel M et al[4] ; Sangeetha J Ranjini et al [3]; Ho Suck Hang et al[6] ; Sinkeet SR et al[2] and Tansalit T et al [1] in 10%; 13.2%; 16.66%; 18.62%; 18.75%; 21.1%; 21.4%; 22.7%; 22.72%; 35%; and 43.33% the origin of lateral circumflex femoral artery was from femoral artery . In the present study the origin of lateral circumflex femoral artery from the femoral artery was seen in 16 % of specimens. Therefore the present study coincides with the study of Dixit DP et al and nearly equal to the study of Brijesh et al and Prakash et al. The finding in the present study is lesser than that of Ho suck hang; Fukuda; Uzel; Sangeetha; Sinkeet and Tansalit but is greater than that found by Sridevi et al. [Table.no.2]

[iii] Distance between the origin of lateral circumflex femoral artery and the origin of profunda femoral artery

According to Lakshmi et al [12] and Vaibhav et al [13] in maximum no of specimens the distance between the origin of lateral circumflex femoral artery and the origin of profunda femoral artery was between 21-30mm and in minimum no of specimens the distance between the origin of lateral circumflex femoral artery and the origin of profunda femoral artery was between 51-60 mm . In the present study in maximum no of specimens the distance is between 21-30 mm and in minimum no of specimens the distance is between 51-60 mm, Therefore the present study coincides with the finding of Lakshmi et al and Vaibhav et al. [Table .no.3]

According to Daksha dixit et al [14] and Samarawickrama et al [15] in maximum no of specimens the distance between the origin of lateral circumflex femoral artery and the origin of profunda femoral artery is between 21-30mm and in minimum no of specimens the distance between the origin of lateral circumflex femoral artery and the origin of profunda femoral artery is between 51-60 mm . In the present study in maximum no of specimens the distance is between 21-30 mm and in minimum no of specimens the distance is between 51-60 mm. Therefore the present study coincides with the finding of Daksha dixit et al and Samarawickrama et al.[Table.no.4]

According to Tapur kumar et al [16] the distance between the origin of lateral circumflex femoral artery and the origin of profunda femoral artery <2 cm- in 18/66 specimens; 2-3 cm in 31/66 specimens and < 3 cm in 17/66 specimens. In the present study < 2 cm in 8/50; 2-3 cm in 23/50; > 3cm in 9/50

specimens. In both the studies in maximum no of specimens the distance is between 2-3 cm . Therefore the present study coincides with the finding of Tapur kumar.

Table. No. 2. Pattern of origin of lateral circumflex femoral artery.

s.no	Author	Origin from profunda femoris artery	Origin from femoral artery
1	Tansalit.T	56.67	43.33
2.	Sinkeet SR	65.5	35
3.	Sangeetha J.Ranjini	75.75	22.72
4.	Uzel m et al	77.3	22.7
5.	Fukuda	78.6	21.4
6.	Ho suck hang	78.9	21.1
7.	Brijesh et al	80.39	18.62
8.	Prakash et al	81.25	18.75
9.	Dixit DP	83.34	16.66
10.	Sridevi et al	85	10
11.	Choi S.W	86.8	13.3
12	Present study	84	16

Table .no.3 .Comparison of the distance between the origin of lateral circumflex femoral artery and the origin of profunda femoral artery by various authors in percentage

s. no	Authors	0-10		11-20		21-30		31-40		41-50		51-60	
		Right	left	Right	Left	Right	Left	Right	left	right	left	Right	Left
1	Lakshmi et al	8%	4%	14%	16%	42%	40%	16%	18%	16%	18%	4%	4%
2.	Vaibhav et al	13.3%	11.6 7%	28.33 %	20%	36.67 %	43.33 %	15%	18.33 %	5%	5%	1.67%	1.67%
3	Present study	8%	4%	12%	8%	44%	48%	16%	20%	16%	16%	4%	4%

Table .no.4 .Comparison of the distance between the origin of lateral circumflex femoral artery and the origin of profunda femoral artery by various authors in numbers.

s.no	Authors	0-10		11-20		21-30		31-40		41-50		51-60	
		Right	left	Right	Left	Right	Left	right	Left	Right	Left	right	Left
1	Daksha dixit etl	11/114	10/114	32/114	25/114	45/114	42/114	14/114	21/114	7/114	12/114	4/114	4/114
2.	Samarawickrama et al	3/13	2/13	3/13	2/13	5/13	4/13	1/13	1/13	0/13	2/13	0/13	1/13
3	Present study	2/25	1/25	3/25	2/25	11/25	12/25	4/25	5/25	4/25	4/25	1/25	1/25

According to Pradip[17] the mean distance between the origin of lateral circumflex femoral artery and the origin of profunda femoral artery is 18.44 mm. In the present study the mean distance is 24.5 mm which is greater than that found by Pradip.

According to Nasr [18] it is 20+/- 2.2 in right males and 22.5 +/- 2.3 in left males and 21 +/- 2.6 mm in right females and 21.7 +/- 2.6 mm in left females. In the present study the mean distance is 24.5 mm greater than the finding of Nasr.

[iv] Double Lateral Circumflex Femoral Artery.

Sangeetha et al [3]; Hema et al [19] ; Balachandra et al [20] and Rajani singh et al [21] reported a case report where they found double lateral circumflex femoral artery. In the present study we did not find any double lateral circumflex femoral artery. Therefore the present study differs with the finding of Sangeetha et al; Hema et al al; Balachandra et al and Ranjini singh et al.

[v] Absent Lateral Circumflex Femoral Artery.

Daksha dixit et al [14] ; Sabnis et al [22] and Sangeetha et al [3] reported that absence of lateral circumflex femoral artery was absent in 0.8%; 3.3% and 4.54% respectively. In the present study we did not find any absence of lateral circumflex femoral artery. So the present study differs with the findings of Daksha dixit; Sabnis and Sangeetha et al.

VI. Conclusion

With increasing challenges in the feild of surgery and occurrence of uncommon anatomic variations, it becomes imperative for the present day surgeons , interventional radiologists and anatomists to be aware of anatomical variations of lateral circumflex femoral artery. Ignorance of such variations can not only lead to fatal intra operative haemorrhage but also injury to the branches of the femoral nerve which are in close relations to these vessels. Such avoidable femoral nerve lesions can lead to incapacitating sensory and motor deficit. Anatomical knowledge of the lateral circumflex femoral artery including its variations has gained significant importance with the involvement of lateral circumflex femoral artery in antero lateral thigh flaps, aorto popliteal

bypass and extra cranial and intracranial bypass surgery. With the advent of novel harvesting and reconstructive techniques , precise anatomical knowledge of lateral circumflex femoral artery becomes further important. This study will be useful to the surgeons, anaesthetists, interventional radiologists and to enlighten their knowledge about the origin of lateral circumflex femoral artery which will inturn help in better patient management.

Abbreviations

FA-Femoral artery

PFA- Profunda femoris artery

LCFA-Lateral circumflex femoral artery

MCFA-Medial circumflex femoral artery.

Conflict of interest : none.

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