Original Article

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Anatomy Section

Cadaveric Study of Lateral Circumflex Femoral Artery

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ABSTRACT

Introduction: Lateral circumflex femoral artery is typically arising from Profunda femoris artery (PFA) and supplied blood to head, neck, greater trochanter of femur, the vastus lateralis muscle and knee. Hence, knowledge of variations of lateral circumflex femoral artery is very important for the surgeons and anaesthetist.

Aim: To note the site and distance of origin of Lateral circumflex femoral artery (LCFA) and also to note any other variations related to branching pattern of LCFA.

Materials and Methods: Thirty three properly embalmed cadavers (17 males and 16 females) were selected for the study. Lateral circumflex femoral artery was exposed, its site and distance of origin as well as any variations in branching pattern was noted.

Results: In present study, lateral circumflex femoral artery (LCFA) took origin from profunda femoris artery in 75.75% of cases and from femoral artery in 22.72% cases. Absent or short LCFA noted in 4.54% cases of each. High origin of LCFA 6(9.09%) also noted by us. In one cadaver we noted bilateral double LCFA. In two limbs (3.03%) superficial branches of thigh took origin from LCFA. Such findings are rare and important.

Conclusion: Present study showed very high rate of variations (33.33%) in LCFA, which is very useful for the surgeons working in this area. Knowledge of these variations will help clinicians to improve their success in diagnosis and treatment.

Keywords: Descending branch, High origin, Variations

INTRODUCTION

Lateral circumflex femoral artery (LCFA) is an artery typically arising from the lateral side of the upper end of the profunda femoris artery (PFA). It passes between the division of femoral nerve and divides into ascending, transverse and descending branches [1]. All three branches supply greater trochanter, hip joint and anterolateral thigh flaps respectively [2]. Variations of the femoral artery (FA), PFA and LCFA are important in vascular reconstruction surgeries while raising myocutaneous grafts with pedicle and peripheral nerve blockade offers many advantages for patients undergoing orthopedic surgery of the lower extremity. Therefore, the knowledge of variation of this artery is important for anaesthetists during femoral nerve blockade and also during procedures in the femoral region and hip joint replacements [3]. LCFA is very important while undertaking clinical procedure in the femoral region and in hip joint replacement [4]. LCFA and its branches are used in various bypass surgeries in iliofemoral region as well as in cranial cavity [5]. Therefore, the present study was conducted to note the site and distance of origin of LCFA and also to note any other variations related to branching pattern of LCFA.

MATERIALS AND METHODS

This was an observational study carried out in Medical College Baroda from January 2013-January 2015. All the bodies which didn't have any visible external abnormalities in their lower limb were included. Thirty three properly embalmed and formalin fixed adult cadavers (17 males and 16 females) were selected for the present study. Observations were made after dissecting the cadavers. Sixty six femoral triangles were dissected. FA, PFA and its branches exposed. Origin of lateral circumflex femoral artery (either from FA or PFA) was noted. Distance of origin of LCFA measured with the help of vernier caliper in millimeters (mm). For the same we considered origin point of PFA to origin site of LCFA (if the artery is taking origin from PFA) or from midpoint of inguinal ligament to origin of LCFA (if artery is taking origin from FA). If the distance was < 10 mm then considered as high origin.

RESULTS

In the present study total 66 limbs were dissected. LCFA in 75.75% cases took origin from PFA while in 15 cases (22.72%) it took origin from FA and its relation with PFA was noted [Table/Fig-1]. In one limb we found origin of LCFA higher than

PFA and in two cadavers bilateral common origin with PFA was noted while in five cadavers LCF arteries took origin from FA. In 3 limbs (4.54%) LCFA was absent and in two limbs double LCFA was noted.

Common range of distance of origin of LCFA was noted between 11-30 mm. In six limbs (9.09%) we found high origin of LCFA while in Three limbs (4.54%) very low origin of LCFA (distance >50mm) was notes [Table/Fig-2]. All six high origin limbs show different branching pattern. In one limb all three branches of LCFA arose from different level [Table/Fig-3] while in another limb short LCFA with multiple branching patterns was noted. In one limb superficial branches of thigh took origin from LCFA and in one cadaver bilateral high origin of LCFA was noted [Table/Fig-4]. Very high incidence (33.33%) of variation in LCFA and its branching pattern was noted [Table/Fig-5]. In low origin of LCFA cases origin of PFA and MCFA was compared. In the first limb high origin of PFA**(refer [Table/Fig-4]) was noted while in the second limb LCFA took common origin with PFA and in third limb high origin of MCFA was noted. In limbs with no LCFA direct branches arose from PFA, pattern of origin of branches was different in each limb. In 1st limb, transverse and descending branches arose directly

Pattern of origin of LCFA		No of cases	Total	Percentage %
Originating from PF		50		75.75
Originating from FA	Above PFA origin	05	15	22.72
	Below PFA origin	02		
	As a common origin with PFA	08		
Absent LCFA with direct branches from PFA		03		4.54

[Table/Fig-1]: Pattern of origin of LCFA
* In 3 limbs (4.54%) LCFA was absent and in two limbs double LCFA was noted hence, we have 68 readings in total.

Distance in mm	Origin from PFA	Origin from FA	Total	Remark
0-10	03	03	06	High origin
11-20	18	03	21	Commonest range of origin from PFA in 50% & from FA in 10.29%.
21-30	16	04	20	
31-40	06	00	06	----------
41-50	05	04	09	----------
51-60	02	00	02	Very low origin 4.41%
61-70	00	01	01	----------
Total / percentage	50/75.75	15/22.72	63/95.45	----------
Nil	Nil	Nil	3/ 4.54	Absent LCFA
Grand total /Percentage (%)			66/100%	----------

[Table/Fig-2]: Distance of origin of LCFA.

[Table/Fig-3]: High origin of LCFA with separate origins of three branches
*A (ascending branch), T (transverse branch), D (descending branch)

LCFA No./ Sex /Side of cadaver	Distance of origin	Origin from	Special features
1st /M/ Lt	2 mm	FA	All branches of LCFA arose at different level (27 mm, 54 mm & continue as descending) [Table/Fig-5]
2nd /F/Lt	06 mm	PFA	Short LCFA with multiple branches
3rd / M/Rt	9 mm	FA	Bilateral common origin with PFA and tourtous LCFA noted
4th/M/Lt	10 mm	FA	
5th/F/ Rt	8 mm	PFA	Superficial branches arose from LCFA [Table/Fig-8a]
6th/F/Rt	7 mm	PFA	Typical course, very low origin noted on left side of same cadaver**

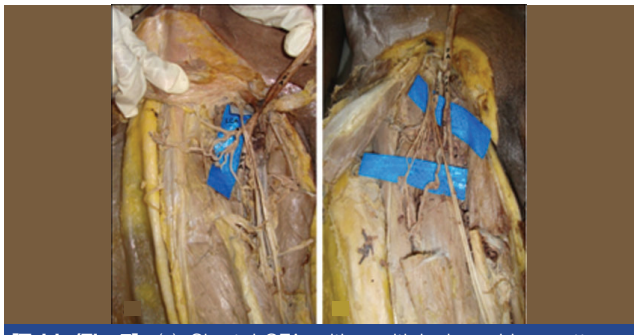
[Table/Fig-4]: Regarding high origin of LCFA.
**High origin of LCFA on right side and very low origin on left side.

Pattern of LCFA	Pattern of LCFA branches	No of cases	Percentage %	Total No. (%)
High origin of LCFA	With Superficial branches	01*	1.51	6 (9.09)
	Without Superficial branches	05	7.57	
Absent LCFA	Direct branches from PFA	03	4.54	3(4.54)
	Direct branches from FA	00	00	
Short LCFA	Multiple branches	03	4.54	3(4.54)
Separate descending branch of LCFA	From FA	02	3.03	6 (9.09)
	From PFA	04	6.06	
Normal site of origin	Superficial branches from LCFA	01*	1.51	1(1.51)
Double LCFA	2 sets of branches	03	4.41	3(4.54)
Total		22	33.33	22(33.33)

[Table/Fig-5]: Branching pattern of LCFA.
* Total two limbs show superficial branches taking origin from LCFA.

from PFA [Table/Fig-6(a)], in 2nd limb, three separate branches arising from PFA at a different distance [Table/Fig-6(b)] while in 3rd limb, PFA gives ascending branch and common trunk for

[Table/Fig-6]: Absent LCFA (a)Transverse and descending branches arising from PFA as a common stem (b) All three branches of LCFA are arising from PFA at a different level (c) Direct Ascending branch and common trunk for transverse and descending branches.



[Table/Fig-7]: (a) Short LCFA with multiple branching patterns (b) Separate descending branch from PFA.

transverse and descending branches [Table/Fig-6(c)]. In short LCFA, branching pattern was same in all three limbs. In which LCFA first divides into upper and lower trunks and then each trunk further divides into multiple branches [Table/Fig-7(a)]. We also noted separate descending branch either arising from PFA (4 limbs) or from FA (2 limbs) [Table/Fig-7(b)]. Bilateral double LCFA was noted in one cadaver. First LCFA took origin from FA (considered 1st) and second from PFA (considered 2nd). On right side 1st LCFA gives superficial branches near its origin and 2nd LCFA after short course divides into ascending, transverse branches and separate descending branch [Table/Fig-8(a)]. While on left side, course and branching pattern was same as right side except the superficial branches did not take origin from LCFA [Table/Fig-8(b)].

DISCUSSION

LCFA is an important branch of the PFA. Knowledge of variations of the circumflex femoral arteries is important when undertaking clinical procedures in the femoral region and in hip joint replacement. Variation of this artery is very important for plastic surgeons [6]. LCFA flap is used for reconstruction of large defects in the face, secondary to gunshot wounds [4,5]. As LCFA is big and it may carry significant amount of blood to the femoral neck, muscles and skin over the thigh. Since, the blood supply is more there will be less chances of flap necrosis [7].

[Table/Fig-8]: Bilateral double LCFA (a) R- superficial branches of thigh arising from LCFA; (b) L- no superficial branches from LCFA
*Black arrow shows superficial branches. Red arrow shows LCF Arteries

The arteries of the lower limb develop from the axis artery, which is derived from the fifth lumbar artery. In the developmental process, some of the channels regress and some of them enlarge and form a definitive arterial pattern. The persistence of the channels that are supposed to disappear, leads to various vascular anomalies which may complicate arteriectomies, embolectomies and thromboendatherectomies which are most commonly seen in the lower limb vessels [6,7]. Comparative study of site of origin of LCFA is given in [Table/Fig-9].

The descending branch of the lateral circumflex femoral artery has been used successfully as a high flow conduit for extra cranial intracranial bypass surgery [3]. We noted separate descending branch either originating from FA or PFA in 6 limbs, which is also very high in incidence (9.09%). We have not come across any literature with such high incidence. At the same time we also found high incidence of high origin of LCFA which is an unusual finding. Superficial branches of

Authors of various studies	Origin from PFA (%)	Variation pattern					
		Origin from FA (%)			Total	Origin from EIA (%)	Absent LCFA (%)
		Above PF	Below PF	As a common stem			
Our study	75.75	7.57	3.03	12.12	22.72	-	4.54
Brijesh et al., [8]	80.39	2.94	10.78	4.9	18.62	0.97	-
Dixit et al., [9]	72.8 R/77.2L	25.3 Rt /22.7 Lt				0.8(Rt)	0.87 (Rt)
Uzel M et al.,[10]	77.3	22.7			-	-	-
Fukuda H et al., [11]	78.6	21.4			-	-	-
Shridevi et al., [5]	85	10			-	-	-

[Table/Fig-9]: Comparative studies of various literatures regarding origin sites of LCFA.
EIA-external Iliac artery

thigh took origin from LCFA in two limbs (3.03%). LCFA was absent in 3 limbs, the study by Dixit et al., LCFA was absent in Down syndrome female cadaver [9]. We noted short LCFA with multiple branches in 4.54% cases. This observation is close to the study done by Shridevi et al., [5] they reported such variation in 5% of the cases and also mentioned that double LCFA was reported by Bergman. We have found double LCFA in one cadaver which is again a rare finding.

All above variations of LCFA and its branches are useful for the surgeons, anaesthetist and interventional radiologist working in this area.

CONCLUSION

Knowledge of LCFA variations is very important for vascular surgeons, orthopaedic surgeon and anaesthetists.

According to present study the most common site of origin of LCFA was from PFA (75.75%). Other relevant observations were number of variations like absent LCFA (4.54%), double LCFA (4.54%), separate descending branch of LCFA (9.09%), short LCA with multiple branching patterns (4.54%) and high origin of LCFA (9.09%). It was also noted that superficial branches of thigh took origin from LCFA instead of FA in 3.03% of the cases. Knowledge of these variations will help clinicians to improve their success in diagnosis and treatment.

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