IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 18, Issue 8 Ser. 4 (August. 2019), PP 59-64
www.iosrjournals.org

Anatomical Study on Variations in Branching of Profunda Femoris Artery and its Circumflex arteries

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Abstract :
Background : *Knowledge regarding the several variations of origin ,course ,branching pattern of profunda femoris artery and its branches is very useful to several clinicians ,where the various types of surgeries & diagnostic procedures are performed.*
Materials & Methods*: The present study was conducted in 50 lowerlimbs (25 right & 25 left) in our department..Origin ,course ,branching pattern of profunda femoris artery on both sides is observed.Pattern of branching is classified according to Vasquez et al study (5).They are Type 1a ,type 1b ,type 1c **;**Type 2a ,type 2b **;**Type 3.In our study all these patterns are observed.*
Results : *In the present study , Profunda femoris artery is arising from Posterolateral aspect of femoral artery in all lower limbs .Mean DMP observed in our study is 3.74 cm. In the present study type1a pattern is observed in 68% of cases ,type1b in 6% ,type 1c in 2% of cases. Where as type 2a pattern is seen in 14% ,type 2b in 6% of cases.type 3 pattern is observed in 4% of cases.*
Conclusion *: The complete information about the origin ,course , branching pattern of profunda femoris artery and its branches MCFA ,LCFA is having a lot of importance to cardiologist,radiologists,general surgeons ,vascular surgeons where these people are perfoming several investigative procedures ,surgical procedures.*
Key words: *Femoral artery , Profunda femoris artery , Medial circumflex femoral artery (MCFA) , Lateral circumflex femoral artery (LCFA)*
Abbreviations *: FA- femoral Artery ,PFA –Profunda Femoris Artery ,MCFA –Medial Circumflex Femoral Artery ,LCFA –Lateral Circumflex Femoral Artery*

Date of Submission: 22-07-2019 Date of Acceptance: 07-08-2019

I. Introduction

Profunda femoris artery is usually arising from Posterolateral aspect of femoral artery nearly 3.5 cm distal to inguinal ligament .After origin this artery is runs on the surface of Pectineus ,Adductor brevis muscles.Later It lies behind to the tendon of Adductor longus tendon and Pass directly over the adductor magnus .At this level the artery gives Lateral circumflex femoral artery (LCFA) ,Medial circumflex femoral artery (MCFA) ,Muscular branches ,Perforators .LCFA is normally arising from lateral side of Profunda femoris artery.It passes laterally infront of psoas major muscle and in between the branches of femoral nerve.This artery is divided into anterior ,transverse ,descending branches these are supplied to greater trochanter,anterolateral aspect of thigh and hip joint. MCFA is usually arising from posteromedial aspect of Profunda femoris artery.Sometimes it also arises from femoral artery.This artery is mainly supplying to head &neck of femur ,acetabular fat and adductor muscles.This artery gives rise to 2 muscular branches ,trochanteric branch & terminal branches ,they are ascending and descending branches. The knowlege regarding the branching variations of profunda femoris artery & femoral artery is very crucial to cardiologists & radiologists because these arteries are utilized for various procedures like coronary angiogram ,angioplasty.

II. Materials And Methods

In my present study , totally 50 lower limbs are observed for several variations in branching pattern of profunda femoris artery ,which are obtained from Department of Anatomy of Andhra Medical College ,Visakhapatnam & Government medical college ,Ananthapuram. While dissection ,after reflection of skin,superficial fascia ,deep fascia is incised .Femoral sheath & its compartments are identified .Femoral artery ,Profunda femoris artery ,MCFA ,LCFA are identified and studied about their origin and course.the distance in between the origin of Profunda femoris artery and midinguinal point is also measured.In our present study the course and branching pattern classification of profunda femoris artery and femoral artery are explained according to the study by the Vasquez et al in *(5)* 2007.

III. Results

In our study Profunda femoris artery is arising from Posterolateral aspect of femoral artery in all 50 lower limbs.

In all 50 lower limb specimens , we measure the **D**istance in between **M**idinguinal point & origin of **P**rofunda femoris artery (DMP) on both sides.The maximum DMP on right side is 4.5 cm ,where as on left side is 5.0 cm .The minimum DMP on right & left sides of lowerlimbs is 3cm.The range of DPM observed is 3-5.0 cm.Mean DMP observed in my study is 3.74cm.

Table 1 : showing maximum & minimum values of DMP (Distance in between Midinguinal point and origin of Profunda femoris artery) & Mean DMP

Maximum DMP on right side	Maximium DMP on left side	Minimum DMP on right side	Minimum DMP on left side	Range of DMP	Mean DMP
4.5cm	5.0cm	3.0cm	3.0cm	3.0cm-5.0cm	3.74cm

In our study 18 lower limbs on right side showing type 1a pattern ,16 lower limbs on left side showing type 1a pattern .where as type 1b pattern is observed in 1 lower limb on right side & 2 lower limbs on left side. Type 1c pattern is seen in very minimum number of specimens i.e only 1 on left side and on right side this pattern is not observed.Type 2a pattern is observed in 3 lower limb specimens on right side & 4 specimens on left side.And type 2b pattern is seen in observed in 2 limbs on right side & on left side its observe in 1 specimen only.The type 3 pattern is seen only in 1 specimen on right & 1 specimen on left side.

Table 2 : showing no of specimens with different types of branching pattern

Type	**Right side**	**Left side**	**Total**
1a	18 (36%)	16 (32%)	34 (68%)
1b	1 (2%)	2 (4%)	3 (6%)
1c	0	1 (2%)	1 (2%)
2a	3 (6%)	4 (8%)	7 (14%)
2b	2 (4%)	1 (2%)	3 (6%)
3	1 (2%)	1 (2%)	2 (4%)
Total no of specimens	**25 (50%)**	**25 (50%)**	**50(100%)**

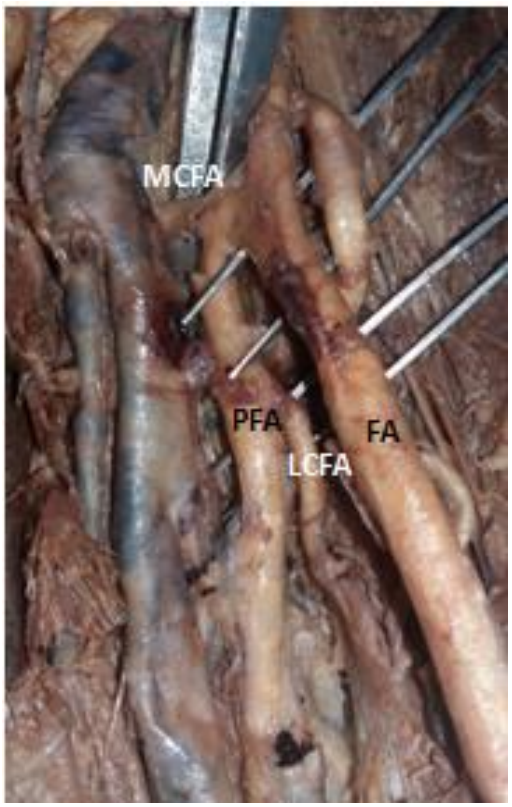

Fig 1 : Showing **Type1a Pattern** in a left leg - LCFA is branched distal to MCFA & MCFA is arising from PFA.

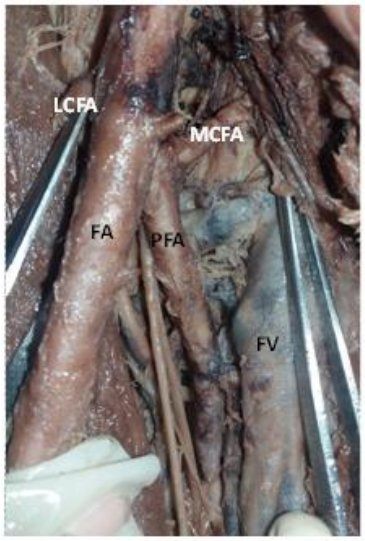

Fig 2 : showing **Type 1b Pattern in right leg** - MCFA is branched distal to LCFA & PFA ,MCFA are arising as a common trunk from FA.

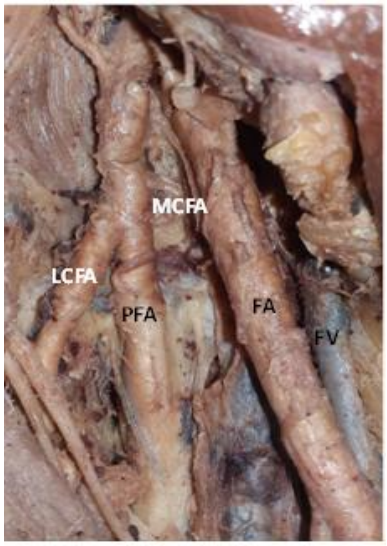

Fig 3 : showing **Type 1c Pattern in right leg** - LCFA is branched at the same level of MCFA.

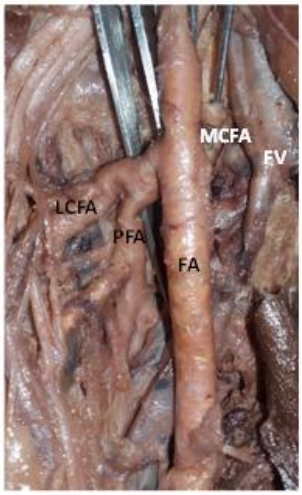

Fig 4: showing **Type 2a Pattern in right leg** - PFA ,LCFA are arising as a common trunk from FA & MCFA is arising as individual branch from FA.

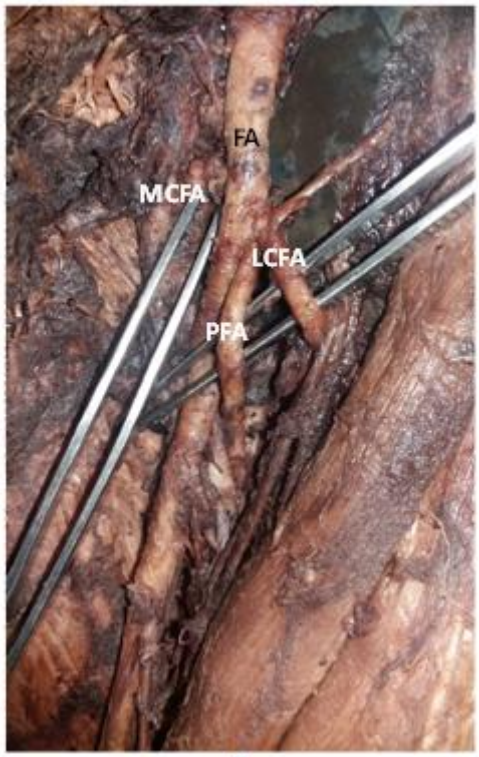

Fig 5 : showing **Type 2b Pattern in left leg** - MCFA is arising from PFA & LCFA is arising from FA.

Fig 6: showing **Type 3 Pattern in right leg** - MCFA & LCFA both are arising from FA.

IV. Discussion

The usual distance in between midinguinal point and point of origin of PFA is 35-40mm.but in our study we are observing the range of DMP is in between 30 mm - 50 mm.and the mean DMP is 3.74 in our study ,this value is closer to the study by vuksanovic BA et al *(10)*i.e 3.5 cm .

Table 3 : Showing value of mean DMP

Author name	**Mean DMP**
Prakash et al (2010) *(9)*	4.2cm
Dixit DP et al (2001) *(4)*	4.75cm
Vuksanovic BA et al (2007) *(10)*	3.5cm
Pretty rathnakar et al (2016) *(7)*	4.33cm
Present study (2019)	3.74cm.

Mean DMP in our present study is 3.74cm ,where as in study by Prakash et al *(9)* mean DP is 4.2 cm ,in Dixit DP et al *(4)* study mean DP is 4.75 cm and 3.5 cm in a study by Vuksanovic BA et al *(10)* ,and in a study by Pretty rathnakar et al *(7)* the mean DP is 4.33cm.

Table 4 : showing Percentage of limbs with different types of vascular pattern.

Author name	**No of limbs observed**	**Type 1 (% of limbs)**	**Type 2 (% of limbs)**	**Type 3(% of limbs)**
Videu et al, 1964 *(20)*	**70**	**60%**	**38.6%**	**1.5%**
Marcade et al, 1978 *(18)*	**100**	**66%**	**14%**	**20%**
Guillot et al, 1979 *(19)*	**90**	**63.3%**	**33.3%**	**1.1%**
Siddarth et al (1985) *(2)*	**100**	**70%**	-	-
Massoud & flecther et al (1997) *(3)*	**188**	**83.8%**	**9.2%**	**6.6%**
Dixit D et al (2001) *(4)*	**228**	**64.4%**	**30%**	**14.2%**
Vazquez et al (2007) *(5)*	**439**	**78.8%**	**20.5%**	**0.5%**
Vishal k et al (2014) *(6)*	**48**	**56.2%**	**39.6%**	**4.2%**
Pretty rathnakar et al (2016) *(7)*	**73**	**61.64%**	**34.23%**	**4.11%**
Present study (2019)	**50**	**76%**	**20%**	**4%**

In Videu et al study (20), type1 ,type 2 ,type 3 patterns are seen in 60% ,38.6% ,1.5% of cases respectively.In a study by the Marcade et al *(18)* 3 types of branching patterns are seen in 66% ,14%,20% of cases respectively.Where as in a study conducted by Guillot et al *(19)*showing type 1 in 63.3%,type 2 in 33.3% ,type 3 in 1.1% of cases. Siddath et al study *(2)* having a incomplete data regarding the percentage of cases.In a study by the Massoud & flecther et al *(3)* , type 1 pattern is observed in 83.8% ,type 2 pattern is in 9.2 % ,type 3 is in 6.6% of cases. In a study by Dixit D et al *(4)* , type 1,type2 ,type 3 patterns are observed in 64.4% ,30%,14.2% of cases respectively.in a Vazquez et al study *(5)* ,3 types of patterns are seen in 78.8% ,20.5%,0.5% of cases concicutively.Study by vishal k et al *(6)* observe type 1 pattern in 56.2% ,type 2 pattern in 39.6%,type3 pattern in 4.2% of cases.In a cadaveric study by Pretty rathnakar et al *(7)* 3 types of patterns are observed in 61.64%,34.23%,4.11% of cases.Where as in our present study type 1 pattern is seen in 76% ,type 2 pattern is seen in 20% ,type 3 pattern is seen in 4% of cases.

V. Conclusion

The information regarding the several variations of branching pattern of profunda femoris artery and its site of origin & course is having a lot of clinical significance related to various diagnostic procedures ,surgical procedures while performing on them. In my view this is mainly useful to Cardiologists ,Radiologists,Vascular surgeons ,General surgeons ,Orthopedicians .

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Dr A Vasanthi. "Anatomical Study on Variations in Branching of Profunda Femoris Artery and its Circumflex arteries." IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 18, no. 8, 2019, pp 59-64.