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Original Research Article

MORPHOLOGICAL STUDY OF PROFUNDA FEMORIS ARTERY: A CADAVERIC STUDY

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ABSTRACT

Introduction: The anatomical knowledge of variations of femoral artery and its branches is important as it is frequently accessed by surgeons and radiologists for number of procedures. Profunda femoris artery is the largest branch of femoral artery, it is chief supply of the thigh. It is frequently incorporated in vascular reconstructive procedures in the proximal leg. Femoral artery is frequently accessed by radiologists for number of procedures, and surgeons. Accurate knowledge of anatomical variations of femoral artery and its branches including profunda femoris, medial and lateral femoral circumflex arteries is required to minimize complications and hence it is suggested for the clinicians planning surgery and intervention.

Materials and Methods: In the present study, dissection was performed on 70 lower extremities of 35 embalmed cadavers in the department of Anatomy, Yenepoya Medical College Mangalore. The distance of the site of origin of profunda femoris artery from the midpoint of the inguinal ligament was measured in mm with a scale and recorded. The site of origin of medial and lateral circumflex femoral arteries were studied.

Results: In present study of profunda femoris artery, we found posterolateral and lateral aspect of origin was common (72.85%) than posterior and posteromedial aspect of origin (19.83%). In three limbs (3.03%) profunda femoris artery was originating from medial side of femoral artery and it coursed superficial to femoral vein. As per various literatures this is rare. The site of origin of profunda femoris artery was between 21-40 mm on 48 limbs. In 12 limbs we found high origin of profunda femoris artery (distance < 10mm). In 10% cases profunda femoris artery took origin as a common stem of femoral artery, that is origin of profunda femoris and two circumflex arteries from single site.

Conclusion: Anatomical knowledge of branching pattern of femoral and profunda femoral artery and their distance of origin is very important to surgeons to avoid inadvertent damage to these vessels and to avoid complications during surgeries. the complications in vascular reconstructive surgeries.

KEY WORDS: Mid-Inguinal Point, Profunda Femoris Artery, Medial Circumflex Femoral Artery, Lateral Circumflex Femoral Artery.

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INTRODUCTION

The femoral artery is the continuation of external iliac artery. It gives off numerous branches in the proximal part of thigh. The superficial epigastric artery arises anteriorly from the femoral artery approximately 1 cm distal to the inguinal ligament. The superficial circumflex iliac artery arises near or along with the superficial epigastric artery. The superficial external pudendal artery arises medially from the femoral artery, close to the preceding branches. The profunda femoris artery is a larger branch of the femoral artery which arises laterally about 3.5 cm distal to the inguinal ligament [1]. The lateral circumflex femoral artery is a laterally running branch given off near the root of the profunda femoris artery. The medial circumflex femoral artery arises from the posteromedial aspect of the profunda femoris artery [2].

Profunda femoris artery (PFA), or arteria profunda femoris, is the largest branch of femoral artery (FA). It is the principal supply to the muscles of the thigh. It forms the main route of collateral circulation in occlusion of femoral artery. The femoral artery at the femoral triangle is directly opened at the origin of the PFA for femoral embolectomy in lower limb arterial thromboembolism. [3] The PFA is also used for arteriography, flap surgery etc. It is frequently incorporated in vascular reconstructive procedures in the proximal leg. PFA shows variations in terms of point of origin, course and branches. These variations have received attention of surgeons, radiologists, cardiologists and anatomists. Variations may not danger the life of patients and they are usually subclinical, but knowledge of variation in the origin of PFA and its branches is of great significance for preventing flap necrosis, particularly tensor fascia lata when used in plastic and reconstructive surgery and also important for the vascular surgeons and interventional radiologists [4]. This knowledge is also essential in the surgical repair of femoral hernias, in vascular reconstructive procedures in the proximal leg.

In this study we measure the distance between mid-point of inguinal ligament and the site of origin of PFA. We also observed the variations in the branching pattern of medial circumflex femoral artery (MCFA) and lateral circumflex femoral artery (LCFA). The anatomical knowledge of location of the PFA and variations of its branches is very important for clinicians, surgeons, plastic surgeons, radiologists and interventional radiologists for performing various clinical procedures.

MATERIALS AND METHODS

The present study was conducted at Yenepoya Medical College, Mangalore (India) during 2013 to 2017.Thirty- five properly embalmed and formalin fixed adult cadavers (31 males and 4 females) were selected for the present study. 70 femoral triangles were dissected as follows: the skin from the front of thigh was incised and reflected followed by the superficial fascia. The great saphenous vein and superficial inguinal lymph nodes were identified and the fascia lata was incised thus exposing the femoral triangle. The inguinal canal along with the inguinal ligament were identified, so were the adductor longus and sartorius muscles. The femoral sheath was identified and its compartments were dissected thus clearing the femoral artery and its major branches. The profunda femoris artery with its medial and lateral circumflex femoral branches were dissected and identified. Their origin and courses were studied. The relation of profunda femoris artery at its origin to the femoral artery was studied. The distance of the site of origin of profunda femoris artery from the midpoint of the inguinal ligament was measured in mm with a scale and recorded. The site of origin of medial and lateral circumflex femoral arteries were studied.

Fig. 1: Showing anterolateral origin of PFA from FA.

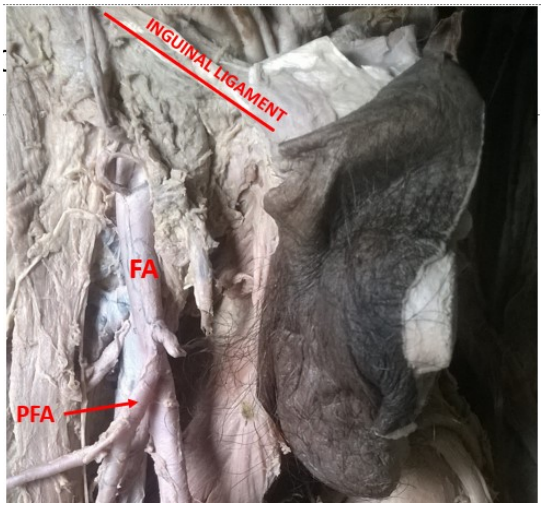


Fig. 2: Showing medial origin of PFA from FA.

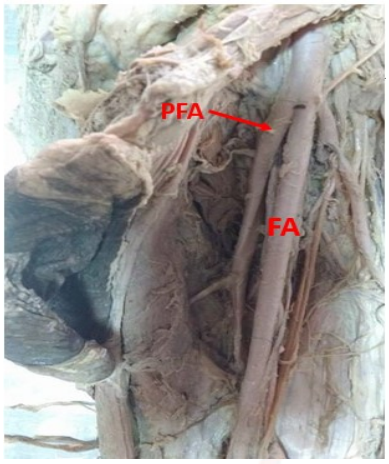
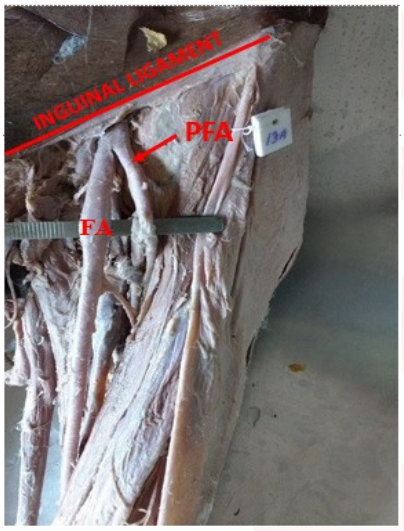


Fig. 3: Showing high origin of PFA from FA.



RESULTS AND DISCUSSION

Site of origin of PFA from femoral artery.

Table 1: Showing site of origin of PFA.

Site of origin of PFA from FA	No. of cases	Percentage (%)
Posterolateral	34	48.57
Lateral	17	24.28
Posteromedial	6	8.57
Posterior	8	11.26
Medial	3	4.28
Anterolateral	2	2.85
Total	70	100

In present study, we found posterolateral and lateral aspect of origin of PFA was common (72.85%) than posterior and posteromedial aspect of origin (19.83%). Among all types, the posterolateral origin of PFA was the most common with an incidence of 48.57%. This corelates with the other studies as shown in the table 2.

Sangeetha et al in 2015 found that in about 13.63% cases the PFA was originating from posteromedial side which is a rare finding. In the present study we found the incidence to be 8.57%.

In the present study the incidence of origin of PFA from anterolateral side was found to be 2.85% which is a very unique finding. Sangeetha et al in 2015 found the incidence to be 1.51% which closely resembles our study.

Table 2: Showing comparison of site of origin of PFA from FA with other studies.

Study	Site of origin of PFA from femoral artery in %					
	Lateral	Posterior	Posterolateral	Medial	Posteromedial	Anterolateral
Dixit DP et al 2011	18.8	28.5	42.1	10.5	-	-
Suthar K et al 2013	39	7	54	-	-	-
Peera S et al 2013	10	25	62.5	-	-	-
Vaibhav P et al 2014	16.66	21.66	47.5	14.16	-	-
Pradip R et al 2015	9.8	37.25	52.95	-	-	-
Sangeetha et al 2015	18.17	10.61	53.03	3.03	13.63	1.51
Present study	24.28	11.26	48.57	4.28	8.57	2.85

Origin of PFA with reference to midpoint of inguinal ligament: In the present study, the distance of origin of PFA with reference to midpoint of inguinal ligament ranged between 10 to 70 mm. About 32.9 % was in the range of 31-40 mm. The average distance was found to be 41.5 mm which is comparable to other studies by Dixit et al[6] - 47.5mm, Siddharth et al[18] - 44 mm and Prakash et al [4] - 42 mm.

Table 3: Showing distance of origin of PFA from midpoint of inguinal ligament.

Distance in mm	No. of limbs	Percentage (%)
0 - 10	12	17.1
11-20	9	12.9
21 - 30	10	14.3
31 - 40	23	32.9
41 - 50	7	10
51 - 60	4	5.7
61 – 70	4	5.7
71 - 75	1	1.4

High origin of PFA: High origin is considered when the PFA arises closer to the inguinal ligament i.e between 0 to 10mm. In our study we found that in 17.1 % (12 limbs) cases the PFA had a high origin. In 2009 Samarawickrama et al [3] studied 26 lower limbs and found the incidence to be 23 % which very much resembles our study. Sabnis et al [19] in 2013 studied 60 lower limbs and found the incidence to be 30%, whereas Suthar et al [16] in 2013 studied 50 lower limbs and found it to be 23%. The knowledge regarding the point of origin of the PFA

helps in avoiding the iatrogenic femoral ar-teriovenous fistula while performing femoral artery puncture [6].

Table 4: Showing the comparison of incidence of high origin of PFA with other studies.

Study	No of limbs	Percentage
Samarawickrama et al (2009)	26	23
Dixit DP et al (2011)	228	0.9
Mamatha H et al (2012)	40	5
Sabnis et al (2013)	60	30
Suthar K et al (2013)	50	23
Present study	70	17.1

Variations in branching pattern of PFA: In the present study, in 38.57% (27 limbs) PFA was originating in common with LCFA. In 35.71% (25 limbs) it was originating in common with MCFA. In about 10% (7 limbs) it was originating in common with MCFA and LCFA i.e it was trifurcating.

Table 5: Showing pattern of origin of PFA.

Pattern of origin of PFA	No. of limbs	Percentage (%)
Common origin with LCFA	27	38.57
Common origin with MCFA	25	35.71
Common origin with both circumflex arteries.	7	10
TOTAL	59	84.28

In about 4.28% of cases, the LCFA was originating directly from femoral artery. Prakash et al found it to be about 18.7% and Suthar et al in 20% cases. This is in contrast to their studies where the incidence was higher compared to our study.

In 11.42% cases MCFA was originating directly from femoral artery which is comparable with Mamatha et al (12.5%) and Danish et al (21.7%). But Samarwickrama et al found it to be 31.1 % while Prakash et found it to be 32.8% which is slightly higher.

Table 6: Showing origin of MCFA and LCFA from femoral artery.

Origin of MCFA and LCFA from femoral artery	No. of limbs	Percentage (%)
Origin of LCFA	3	4.28
Origin of MCFA	8	11.42
Total	11	15.7

Variations may not danger the life of patients and they are usually subclinical, but knowledge of variation in the origin of PFA and its branches is of great significance for preventing flap necrosis, particularly tensor fascia lata when used in plastic and reconstructive surgery and also important for the vascular surgeons and interventional radiologists [4].

CONCLUSION

According to our study, the most common site of origin of PFA was from posterolateral and lateral side of FA. A very rare variation was also observed that PFA arising from medial side of FA with superficial course on FV. We also noted high origin of PFA from anterolateral site of FA. Such finding is also very rare and is important to avoid inadvertent damage to these vessels and to avoid complications during surgeries. The anatomical knowledge of location of profunda femoris artery and variations of its branches i.e. medial and lateral circumflex femoral arteries is important especially for the surgeons, radiologists and cardiologists.

ABBREVIATIONS

PFA- Profunda femoris artery

FA – Femoral artery

MCFA - Medial circumflex femoral artery

LCFA - Lateral circumflex femoral artery

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Conflicts of Interests: None

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