

MORPHOLOGICAL STUDY OF ORIGIN OF PROFUNDA FEMORIS ARTERY IN HUMAN CADAVERS

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ABSTRACT

Background: Profunda femoris artery is an important and largest branch of femoral artery. It supplies all the compartments of the thigh as well as it supply the head and neck of femur and its branches form anastomosis around head of femur. So, the study of variation of profunda femoris artery is of great value for radiologist and surgeon during diagnostic and surgical intervention.

Materials and Methods: The present study includes 102 lower limbs of adult formalin fixed human cadavers used for the routine dissection procedure for under graduate and post graduate students in the department of Anatomy of three medical college in Karnataka, India over a period of 3 years (2011-2014). The study was done by dissection method as per Cunningham's manual of Practical Anatomy.

Results: During the study, it was found that profunda femoris artery was originating abnormally from the femoral artery. Out of 102 limbs that were studied, 47 limbs (46.07%) originated from posterolateral aspect, 20 limbs (19.60%) on lateral aspect, 11 limbs (10.78%) on medial aspect, 24 limbs (23.52%) on posterior aspect of femoral artery. High origin of profunda femoris artery (0- 10 mm) from femoral artery (distance from the midpoint of inguinal ligament) was seen in 2 limbs.

Conclusion: In the present study, we found the different types of variations in the origin of profunda femoris artery from femoral artery and also the variation in the distance of origin. Surgeon and radiologist should consider this variation in mind during vascular invasion and surgeries in femoral region.

KEY WORD: Profunda femoral artery, Femoral artery, Medial circumflex femoral artery, Lateral circumflex femoral artery.

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INTRODUCTION

Profunda femoris artery is the most important artery of thigh, it originates laterally from the femoral artery, and then goes posterior to femoral vein and gives two branches medial and

lateral circumflex femoral artery. It supplies all the compartments of thigh, as well as head and neck of femur [1,2]. These vessels are also useful for catheterization in various diagnostic procedures like arteriography, angiography and

Doppler imaging technique. Because of the relation of Profunda femoris artery with femur and hip bone there may be chances of development of aneurysm after penetrating injury, internal and external fixation of hip bone and during catheterization [3-6]. In the past, many studies found variation in the origin of profunda femoris artery. Now-a-days, because of the emergence of radiological intervention for diagnosis of various diseases like vascular occlusive disease and congenital anomalies of vessels, and before going for catheterization, knowledge of variation in the origin of artery is useful to prevent the various serious conditions like pseudo aneurysm, thrombosis and embolism. Lack of this variation knowledge during surgery and procedure can cause severe hemorrhage and complications.

MATERIALS AND METHODS

The present study includes 102 lower limbs of adult formalin fixed human cadavers used for the routine dissection procedure for under graduate and post graduate students in the department of Anatomy, M.R. Medical College, KBN Medical college and H K E Homeopathic College, Karnataka, India during the year 2011-2014. The study was done by dissection method as per Cunningham's manual of Practical Anatomy. First the skin & superficial fascia was reflected from the front of thigh, after that the splitting of femoral sheath on both side of femoral vein with exposure of femoral canal & femoral artery and lastly the profunda femoris at its origin from femoral artery were studied and noted in data sheet according to the origin from the femoral artery and distance of origin of profunda femoris from the midpoint of inguinal ligament was measured in millimeters with a scale & Vernier caliper and recorded in data sheet.

RESULTS

In the present study, 102 limbs were dissected out of which 72 limbs were male cadavers and 30 limbs were female cadavers and they were observed for the site of origin of PFA. The present study also measured the distance of origin of PFA.

Out of 102 limbs, we found that the profunda femoris artery originated from posterolateral,

lateral, medial and posterior aspect of the femoral artery.

In 20 limbs (19.60%) the PFA originated from the lateral aspect of femoral artery. The PFA originated from posterolateral side of FA in 47 limbs (46.1%), medial aspect of FA was observed in 11 limbs (10.8%) and from the posterior aspect it originated in 24 limbs (23.5%).

In our study, we found that, Median distance of origin of profunda femoris artery from the femoral artery is 3.47cm. Only 2 limbs of male cadavers were observed where the PFA originated at a higher level and the range was between 0-10 mm, and not observed in female. The reason was, the number of female cadavers was very small, only 15 female cadavers out 51 cadavers. Lower level of origin was found in 3 limbs and the range is 71-80 mm.

The origin of PFA from femoral artery according to Table 2 is in the range between 30-40 mm, which is also a common range in both sexes from midpoint of inguinal ligament.

Fig. 1: Showing origin of profunda femoris artery on posterolateral aspect.

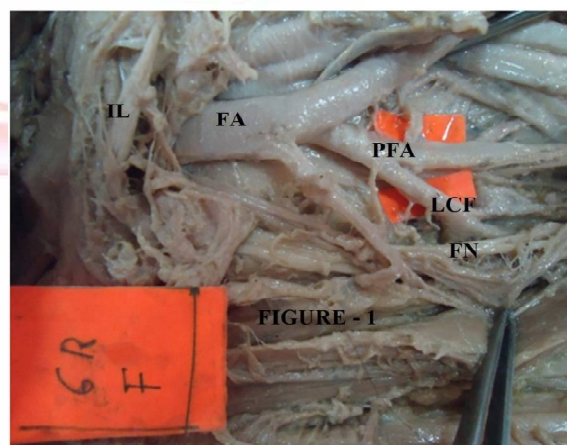


Fig. 2: Showing origin of profunda femoris artery on lateral aspect.

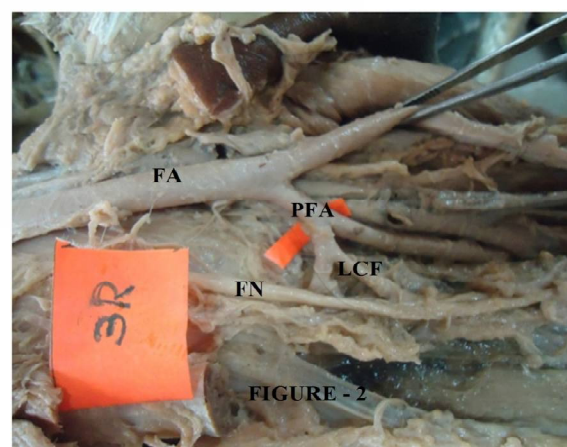


Fig. 3: Showing origin of profunda femoris artery on medial aspect.

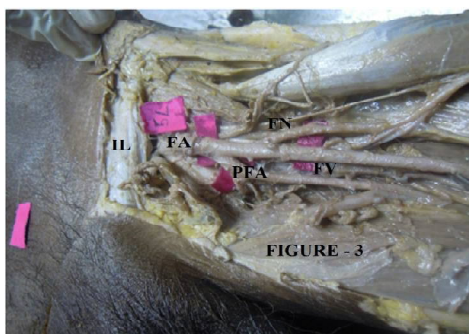


Fig. 4: Showing origin of profunda femoris artery on posterior aspect.

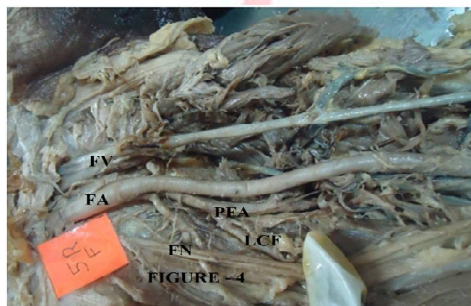


Fig. 5: Showing high origin of profunda femoris artery.

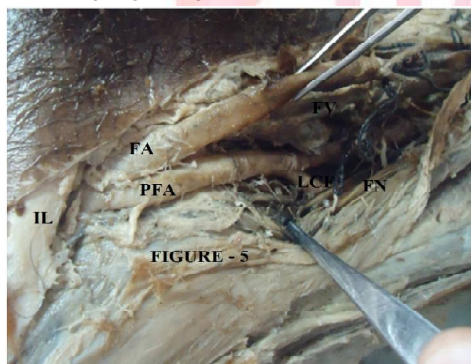


Table 1: Showing origin of profunda femoris artery from the femoral artery (male and female distribution, right and left side distribution).

Site of origin from FA	Right side No. of limbs	left side No. of limbs	Bilateral No. of limbs	Percentage frequency
Lateral aspect	4 M, 2 F = 6	5 M, 5 F = 10	4 M, 0 F = 4	12.7% M, 6.8% F = 19.6%
Posterolateral aspect	6 M, 4 F = 10	6 M, 3 F = 9	22 M, 6 F = 28	33.3% M, 12.7% F = 46.1%
Medial aspect	3 M, 1 F = 4	4 M, 1 F = 5	2 M, 0 F = 2	8.8% M, 1.96% F = 10.8%
Posterior aspect	4 M, 4 F = 8	2 M, 2 F = 4	10 M, 2 F = 12	15.7% M, 7.8% F = 23.5%
Total	28	28	46	100%

FA- femoral artery, M male, F- female

Table 2: Showing origin distance of PFA from the FA to midpoint of inguinal ligament.

Range (mm)	No. of Limbs on right side	No. of limbs on left side
0-10	1 M, 0 F = 1	1 M, 0 F = 1
11-20	5 M, 4 F = 9	3 M, 2 F = 5
21-30	5 M, 3 F = 8	10 M, 4 F = 14
31-40	13 M, 4 F = 17	8 M, 6 F = 14
41-50	6 M, 2 F = 8	9 M, 2 F = 11
51-60	3 M, 2 F = 5	2 M, 1 F = 3
61-70	2 M, 0 F = 2	1 M, 0 F = 1
71-80	2 M, 0 F = 2	1 M, 0 F = 1

mm- millimeter, M-male, F- female

Table 3: Comparison of site of origin of profunda femoris with other studies.

Site of origin from FA	Incidences %					
	Present study	Dixit et al 2011 [11]	Siripom T 2012 [9]	Samarawickrama et al 2009 [10]	Prakash et al 2010 [7]	Vaibhav a et al 2014 [8]
Postero lateral aspect	46.07	35.14	30.36	30	50	47.5
Posterior aspect	23.52	31.25	44.64	46	46.9	21.66
Medial aspect	10.78	-	3.57	-	3.1	14.16
Lateral aspect	19.6	-	21.43	23	=	16.66

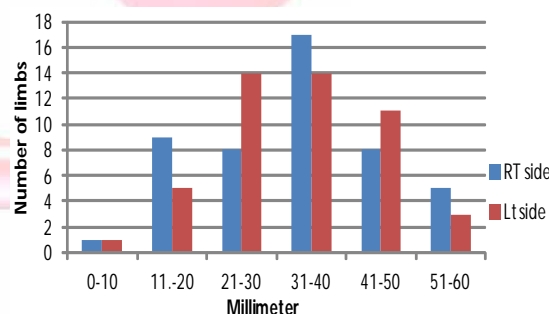
FA – femoral artery

Table 4: Comparisons of median distance of origin of profunda femoris artery from femoral artery in various studies.

Author	Year of study	Median distance of origin of PFA from FA from the midpoint of inguinal ligament(cm)
Dixit D P et al 2011 [11]	2001	4.7
Prakash et al 2010 [7]	2010	4.2
Mamatha h et al 2012 [17]	2012	3.9
Siripom et al 2012 [9]	2012	3.46
Suthar k et al 2013 [16]	2013	4.7
Danish Anwer et al 2013 [18]	2013	3.71
Present study	2011-2014	3.47

PFA- profunda femoris artery, FA- femoral artery

Graph 1: Bar Chart showing distance of origin of PFA from Midpoint of Inguinal ligament in mm



DISCUSSION

Knowledge of the variation of the site of origin of PFA is important for preventing iatrogenic femoral arteriovenous fistula and severe hemorrhage while performing FA catheterization and other surgeries in femoral region.

In present study, we found variation in origin, side and distance of profunda femoris artery.

Variation in the Origin of Profunda femoral artery: In present study, most common site of origin of PFA on posterolateral aspect from FA is 46.07%. Prakash et al [7] also found, most common site of origin is posterolateral 50%, 47.5% found by Vaibhav et al study on posterolateral side.⁽⁸⁾ So the percentage of origin of posterolateral aspect of PFA is almost same in all observations.

According to Siriporn T et al [9] and Samarawickrama et al [10] common site of origin of PFA is posterior aspect 44.64% and 46%. 28.5 % noted by Daksha Dixit et al [11], while in present study it is 23.72 % and so, compared to all study posterior origin is less common except Siriporn T and Samarawickrama studies.

Distribution about the origin of PFA on medial aspect from FA is 10.5% as observed by Daksha dixit, and 10.78 % was observed in present study, other study we noted in Table 3. From all the study, we conclude that medial side of origin is less common but most dangerous because of presence of femoral vein.

Bergman et al said that, if PFA arises from medial aspect of FA, then FA may split into three vessels almost of equal caliber that are profunda, femoral and lateral circumflex [12]. In the present study very few number of limbs were found, where the above variation was observed.

In other rare and dangerous variation, Sahin B et al found, the deep femoral artery was passing in front of the femoral vein in left lower limb of a 43 year old male cadaver [13]. This type of variation also observed in 5 limbs by Daksha dixit.

In our study, in 25 limbs PFA arises either from medial aspect or from the posterior aspect of FA. Out of these 2 limbs were found where the PFA coursed anterior to the femoral vein. This type of variation forms an arterial circle around the sapheno femoral junction. This type of variation is dangerous during blood collection in infant from femoral vein because it causes severe hemorrhage. It is also dangerous during saphenous vein ligation in varicose vein surgery.

Variation in distance of origin of Profunda femoris artery from Femoral artery: The normal distance of origin of PFA from midpoint of inguinal ligament was 3.5-4 cm [1, 2]. In many cases, deviation was noted where PFA originated above or below this point. In present study it was 31-40mm.

Origin point is important from surgical view, which is related to the high origin at which the PFA arises, also noted by Vishal k et al [14]. In our study we found only 2 cases.

Dixit et al 2001, studied that the low origin was found in only one limb and the range was 77-88

mm. In present study, only 2 right limbs showed where PFA originated at a lower level and distance was 71-80mm. Comparisons of median distance of origin of PFA by various authors' studies in Table 4.

Anatomical variations found at the level of the division of the femoral artery and profunda femoris artery can be explained in the lower animals. "The profunda femoris artery is a branch of the internal iliac artery". At the time of evolution, the origin shifted distally from the femoral artery. Hence, developmental arrest at different stages may lead to anatomical variations related to the division of the femoral artery [8].

From all the above discussion, we conclude that the knowledge of various variations is very crucial during catheterization of FA and surgeries in femoral region to prevent severe hemorrhagic event.

Abbreviations

PFA- Profunda Femoris Artery
 FA- Femoral Artery
 LCF- Lateral Circumflex Femoral Artery
 MCF- Medial Circumflex Femoral Artery
 IL- Inguinal Ligament
 M- Male
 F- Female
 mm- Millimeter
 Cm- Centimeter

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Conflicts of Interests: None

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