

Anatomical Variation in Origin of Profunda Femoris Artery and its Branches

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Abstract

Introduction: Profunda femoris artery (PFA) is the leading branch of femoral artery which supplies all the muscles of thigh. During the procedures arterial catheterization damage to PFA may invite unnecessary and unpredicted complications. Precise anatomy of PFA forms strong foundation to minimize problems. The aims of the present study were to compare the right side and left side origin of profunda femoris artery cross sectional area, and to compare the distance of origin of the femoral artery branches from mid-inguinal point. **Subjects and Methods:** The study was conducted in Mata Gujri Memorial Medical College, Kishanganj, Bihar. This study based on dissections performed on 60 properly embalmed human cadaver specimens. All the mode of origin and its level calculated using statistically parameters and equations. The specimens with range between 21-60 mm in diameter were included for the study in left and right side origin level of PFA identified. **Results:** In the present study out of 60 a total 56 specimens screened for dissected lower limb specimens. The 52 had arising separately from femoral artery, 3 specimens arising as a common trunk with medial circumflex femoral artery, and 1 patient arising s common trunk lateral. Higher level of level of origin of PFA was found to be quite recurrently. The different type of range were observed in lateral circumflex femoral arteries and medial circumflex femoral arteries from right and left sides of arteries. The range between 21-30 mm diameters were successfully noted after the dissection in both the circumflex femoral arteries in right and left side. **Conclusion:** Range of origin of PFA was different in other cases and similar in some cases. Feature understanding regarding variations in point of branches, origin of PFA is clinically shown significance and should not be ignored. And the current observation will help to surgeons for the better understanding of variation and anatomical features of PFA.

Keywords: Profunda femoris artery, Lateral circumflex femoral arteries, Medial circumflex femoral arteries.

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Introduction

In present era for the successful performing any diagnostic and surgical intervention in the femoral region, the understanding of the anatomical variations of the profunda femoris artery (PFA) and its medial and lateral circumflex branches is important. PFA is the essential artery of thigh, it originates laterally from the femoral artery, and after that goes posterior to femoral vein and gives two branches lateral and medial circumflex femoral artery.^[1] PFA is known as a larger branch of the femoral artery.^[2] For the collateral blood flow in the atherosclerotic occlusive disease through collateral pathways in the lower pelvis, starting from the internal iliac arteries the profunda femoral artery has performed an important compensatory role.^[3] Variations in femoral artery branches and its pattern are clinically very essential. Hence, it has received enormous attention from different anatomists and surgeons.^[4] Arterial catheterisation is the easy way for the assessment of femoral artery. The PFA is used for ultrasound, doppler imaging, and

arteriography, magnetic resonance imaging and digital subtraction angiography.^[5] Normally PFA occurs on the posterolateral portion of femoral artery in femoral triangle about 3.5 cm distal to inguinal ligament.^[2] It gives two main branches lateral circumflex femoral artery (LCFA) develops from PFA near the root and medial circumflex femoral artery (MCFA) emanates under the lateral circumflex artery on the medial feature of PFA. The MCFA and LCFA branches anastomose with the interior and exterior iliac arteries.^[2] Apart from femoral artery, even for haemodialysis PFA can be used. The branches of PFA have been used in thigh flaps like vascular pedicle throughout breast reconstruction surgeries following mastectomies. The variations in the branching pattern of PFA used for the prevention of flap necrosis subsequent reconstruction surgeries. The understanding of variations in origin of PFA and its other branches division is of almost significance for preventing flap necrosis, particularly in tensor fascia lata, when used in plastic surgeries.^[5,6] Also, the anatomical understanding of the level of origin of PFA is essential in avoiding iatrogenic femoral arterio-venous fistula created

during inadvertent puncture of femoral artery.^[7] The femoral artery is second site of option after radial artery for position of an arterial line. When simply reachable veins are collapsed femoral vein is used for set of blood flow. Any anatomical variation in PFA must have been taken in account to prevent unpredicted and unpleasant problems. From this study PFA accomplish any variation came across in this study were recorded. After the comparison right side and left side origin of PFA from cross sectional area branches of femoral artery.

The aims of the present study were to compare the right side and left side origin of profunda femoris artery cross sectional area, and to compare the distance of origin of the femoral artery branches from midinguinal point.

Subjects and Methods

A total 60 specimens were enrolled in this study. The data was collected from routine dissection. Femoral artery and its branches were dissected and studied.

With the help of following equations circumference and femoral artery diameter were calculated. After careful dissection, the femoral triangle was exposed and PFA and its branches were identified.

Diameter of femoral artery = (Circumference of femoral artery ÷ 3.14) Eq. (1)

Cross sectional Area of femoral artery = (3.14 × Diameter of femoral artery) ÷ 4 Eq. (2)

Superficial and deep branches of the femoral artery and their origins were identified. The patterns of the PFA and its circumflex femoral branches were estimated, based on the site of their origin. The distance from the midpoint of inguinal ligament to the origin of PFA was measured. Also the distances from the origins of both circumflex femoral arteries and the PFA were measured with a Vernier's calliper, accuracy 0.01 mm. By using a measuring tape the distance of origin of profunda femoris artery from the mid inguinal point was measured. First the skin and superficial fascia was reflected from the front of thigh, after that the splitting of femoral sheath on both the side of femoral vein with revelation of femoral canal and 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 reserve of origin of profunda femoris from the midpoint of inguinal muscle was considered in mm with a scale.

Statistical Analysis:

The collected data were tabulated in excel software sheets and statistically analysed using SPSS version 16.0 for window. The results were expressed as numbers and percentages regarding right and left side. Side comparisons were done by using the unpaired student t-test. Chi-square was generated for the original sites of PFA as well as the original patterns of its lateral circumflex and medial femoral branches. This descriptive anatomical study was conducted at the Department of Anatomy, Mata Gujri Memorial Medical College, Kishanganj, Bihar, after the approval of the ethical committee.

Results

Out of 60 specimens; 56 dissected lower limbs were included in this study. Out of 56 specimens; 52 had arising separately from femoral artery, 3 had arising as a common trunk with medial circumflex femoral artery, and 1 had arising as a common trunk with lateral as mentioned in [Table 1].

Table 1: Mode of origin of profunda femoris artery

Mode of origin	Number of specimens
Arising separately from the femoral artery	52
Arising as a common trunk with Medial Circumflex Femoral Artery	3
Arising as a common trunk with Lateral	1
Total	56

Profunda Femoris Artery (PFA):

The level of origin of PFA in 60 specimens tabulated [Table 2]. The PFA originated from the common femoral artery in approximately 80% or more of the specimens on the left and right -sided limbs. In two cases 51-60 mm range in right side and in one case also 51-20 mm range were find. Distance of origin of PFA from the midpoint of the inguinal ligament, the distance of origin profunda femoris measured was mostly between 31 and 40 mm (in 18 specimens in right side and in 21 cases in left side, respectively).

Table 2: Origin level of profunda femoris artery (PFA)

Distance Range (mm)	Right Side Cases	Left Side Cases
21-30	05	02
31-40	18	21
41-50	05	06
51-60	02	01
Total	30	30

Different sites of origin of PFA: It was reported that PFA originated from posterolateral aspect of femoral artery in 6 cases on right side and 3 cases on left side, from posterior aspect in 2 cases on right and 5 cases on left side, and higher number of cases from 22 in right side and 20 in left side [Table 3].

Table 3: Different sites of origin PFA

Site	Right Side Cases	Left Side Cases
Lateral	22	20
Posterior	02	05
Posterolateral	06	03
Medial	00	02
Total	30	30

Site of origin of lateral circumflex femoral artery (LCFA): the origin of LCFA from PFA on the right and left side is depicted in Table 4 (A). LCFA originated from PFA in 25 and 3 cases from PFA and femoral artery, respectively on right side and 25, 2 and 1 case from PFA, femoral artery, and common trunk from femoral artery on left side.

Distance of origin of Medial Circumflex Femoral Artery (MCFA) from PFA: the details of origin MCFA from PFA. Origin of MCFA on right side was from medial aspect of PFA in 22 cases right and 22 in left, from PFA along with femoral artery in 4 in right and 5 in left cases, from femoral artery, and common trunk from femoral artery in 2 cases and

1 case right and left, respectively.

Total 28 cases in right sided LCFA and 27 cases in left sided LCFA. A total 28 cases in right sided and 28 cases in left sided MCFA. As mentioned in [Table 4 (A)].

Table 4 (A): Lateral and medial circumflex femoral arteries.

Site of Origin	LCFA		MCFA	
	Right	Left	Right	Left
From Profunda Femoral Artery	25	25	22	22
From Femoral Artery	03	02	04	05
Common Trunk From Femoral Artery	00	01	02	01
Total	28	27	28	28

Diameter of Profunda femoris: Mean diameter of PFA in our study was found to be 21-30 mm in 16 and 15 cases in right and left side, respectively in LCFA. Also find in 21-30 mm MCFA in 9 cases and 11 cases in right and left side, respectively mentioned in [Table 4 (B)].

Table 4 (B): lateral & medial circumflex femoral arteries.

Level of Origin Range (mm)	LCFA		MCFA	
	Right	Left	Right	Left
1-10	05	02	04	03
11-20	05	06	07	06
21-30	16	15	09	11
31-40	02	03	05	04
41-50	00	00	03	04
Total	28	26	28	28

Discussion

Due to the embryological variation in the selection of capillary channels during the development of arteries the variations in the branching patterns of PFA are of the lower limb. LCFA and MCFA are branches of PFA. Understanding about the number of variations in femoral artery is very important for surgical procedure. In to the present study reported that there is different type of diameter range in both right and left side femoral artery (LCFA and MCFA). Moreover, both the artery was originated directly from femoral artery. LCFA is tangentially running branch given off near the root of PFA and MCFA is another branch given off from medial and posterior characteristic near the root of PFA.

The normal distance is 35-40 mm of origin of PFA from the midpoint of inguinal ligament.^[2] In our study this distance was between 21-30 mm on right and left side LCFA and MCFA. A study by Uzel et al., in 2008 observed with 0.9% of cases about the common trunk of PFA, LCFA and MCFA. They stated that, a mean distance from mid-inguinal point is 4.2 cm when MCFA arise from femoral artery, and, the mean distance from mid-inguinal point is 5.8 cm when it arises from PFA.^[8] Evans CA et al., in 2007 found both medial and lateral circumflex femoral arteries arising by a common trunk from the femoral artery.^[9]

In the present study different sites of PFA origin reported different ranges of diameter in posterolateral aspect and posterior aspect in right and left sided. Most of the cases were found between the ranges of 31-40 mm distance of origin level of PFA out of 60 cases. Moreover, the level of origin ranges in LCFA and MCFA were found in most of the 21-30 mm distance range in both the right and left side of

the LCFA and MCFA. In LCFA no case were observed between the ranges of 41-50 mm level of origin in LCFA.

Generally, from femoral artery PFA were arises about 3.5 cm distal to the inguinal ligament.^[6] Dixit et al., observed distance 41-50 mm on the left side and between 31-40 mm on right side.^[1] Prakash et al., well-known this distance to be 4.2 cm.^[7] Siddharth P et al., found as 4.4 cm.^[9] Vedat Sabanciogullari et al., reported the distance of the originating point to the midpoint of the inguinal ligament was found to be 2.2 cm in the left and 5.6 cm in the right.^[10] Tanyeli E et al., observed the origin of LCFA from the femoral artery inferior to the PFA.^[11] Dixit DP et al., also stated that MCFA on an average was arising in 20.63% of cases from the femoral artery and in 62.5% of cases from the profunda.^[12] These findings are similar to 36% and 59% found by Lipshutz et al., and 40% and 53% reported by Clarke and Colborn.^[13,14]

The limitations of this study, it was not comparative study between any especial group of specimens. Also, the major lower numbers of cases were taken for the study. Moreover, the no angiographic data were present in this study.

Conclusion

Knowledge about the variant and normal sites and distance of the origin level of PFA and its medial and lateral circumflex branches are not only of large practice and clinical importance during diagnostic, surgery and operative interventional trial but also helps in decreasing of the intra-operative and post-operative difficulties in femoral region. Variation in femoral artery and its branches must be considered for clinical practice. An extensive study with large amount of cases was required for find out variation in femoral artery branches and PFA.

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