

STUDY OF PROFUNDA FEMORIS ARTERY OF HUMAN CADAVERS IN RAJKOT CITY, INDIA

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ABSTRACT

Background: The profunda femoris artery is the major branch of the femoral artery. It is at critical place in relation to femoral artery for various interventions.

Aim: To study the origin of profunda femoris artery. And to compare the cross sectional area of profunda femoris artery between right and left limbs.

Material and methods: In this cross sectional study, 51 human femoral triangles from 26 (18 male and 08 female) human cadavers in P.D.U. Government Medical College, Rajkot were dissected and studied during regular dissection classes. Site of origin of profunda femoris artery was noted in relation to femoral artery. The distance of origin of profunda femoris artery from the midpoint of inguinal point was measured and noted. Circumference of profunda femoris artery at the level of origin was measured. The cross sectional area was calculated. Collected data was analyzed by standard statistical formulas with the help of Microsoft excel 2007 and Epi info TM 7 software.

Result: Most common (52.95% cases) site of origin was posterolateral from femoral artery. The mean distance of origin of profunda femoris artery from the midpoint of inguinal ligament was 30.17 mm. There was no significant difference in cross sectional area of right and left profunda femoris artery (at 95% confidence interval)

Conclusion: Profunda femoris artery is used for angiography, ultrasonography and cardiac catheterization also. It is the major blood supply of the thigh. Its relations with femoral artery, femoral vein and femoral nerve makes it important structure for clinicians. Variations in origin of profunda femoris artery must be considered to avoid complication like aneurism and faulty passage of the catheter. High origin of profunda femoris artery is more prone to damage while accessing femoral artery.

KEY WORDS: Profunda femoris Artery, Femoral artery, Midpoint of inguinal ligament, circumference, cross sectional area.

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INTRODUCTION

The femoral artery is commonly used for arterial catheterization, various investigations of any arterial system in the body and for various

clinical procedures like coronary angioplasty. The femoral artery at the femoral triangle is directly opened at the origin of the profunda femoris artery for femoral embolectomy in lower limb

arterial thromboembolism [1]. Femoral artery and profunda femoris artery are commonly used for investigations of various clinical conditions e.g. peripheral occlusive arterial disease, suspected congenital anomalies. Therefore the internal diameter and as well as the origin of the profunda femoris artery and its branches in front of the thigh are of clinical significance in the procedures of Judkins and Seldinger techniques used for diagnosis [2].

Adductor, extensor and flexor compartment of thigh muscles are mainly supplied by profunda femoris artery. The profunda femoris artery gives off lateral circumflex artery, medial circumflex artery, perforating branches and muscular branches in the thigh. The origin of the profunda femoris is on femoral artery medial or posterior side; if it is medial, it may cross anterior to the femoral vein and then pass backwards around its medial side [3]. Profunda femoris is used in hemodialysis; as well as the branches of the profunda femoris are used during breast reconstruction surgery after mastectomy in anterolateral perforator thigh flap as long vascular pedicle in cases of carcinoma of breast [4]. Increasing interventional uses of profunda femoris artery justifies this research study.

Aims and Objectives: The aims of this study were to study the origin of profunda femoris artery; and to compare the right and left profunda femoris artery cross sectional area. For aims following objectives were followed:

To identify the site of origin of profunda femoris artery.

To measure the distance of origin of profunda femoris artery from the Midpoint of the inguinal ligament.

To measure the profunda femoris artery circumference.

To calculate diameter and cross sectional area of the profunda femoris artery.

MATERIALS AND METHODS

This cross sectional study was conducted at Pandit Dindayal Upadhyay Government Medical College, Rajkot, Gujarat (India) during 2011 to 2013. 51 human femoral triangles from 26 (18 male and 08 female) human cadavers in P.D.U. Government Medical College, Rajkot were dissected and studied during regular dissection classes. Femoral artery and its branches were dissected (Figure 1). Profunda femoris artery and the site of its origin was identified (Figure 1). Distance of origin of the profunda femoris artery from the midpoint of the inguinal ligament was measured. Circumference of profunda femoris artery at the level of its origin was measured in millimeters by measure tap. All measurements were taken three times by two independent observers. Average of these measurements was considered for calculation to avoid instrument and observer bias.

With the help of following mathematical equations profunda femoris artery diameter and the circumference were calculated.

Diameter of profunda femoris artery = $(\text{Circumference of profunda femoris artery} \div 3.14)$

Cross sectional Area of profunda femoris artery = $[3.14 \times (\text{Diameter of profunda femoris artery})^2] \div 4$

Data was noted in pretested form. All data was calculated and analysed by standard statistical formulas with the help of Microsoft excel 2007 and Epi info 7™ software.



Fig. 1: Image showing Right Profunda Femoris Artery Originating from Posterolateral side of Femoral Artery (Anatomical Position)

RESULT AND DISCUSSION

In this study, the most common site of origin was posterolateral side (19 out of 26) of femoral artery in the right limb and posterior side (13 out of 25) of the femoral artery in the left limb [Table 1]. There was significant difference in site of origin of profunda femoris artery between right and left limb (Chi-square test, Confidence interval 95%, $p < 0.05$).

Table 1: Side of origin of profunda femoris artery from femoral artery.

Side of origin	Right limb n (%)	Left limb n (%)	Total n (%)
Lateral	1 (3.85%)	4 (16.00%)	5 (9.80%)
Posterior	6 (23.08%)	13 (52.00%)	19 (37.25%)
Posterolateral	19 (73.08%)	8 (32.00%)	27 (52.95%)
Total	26	25	51

Not in a single extremity the profunda femoris artery was originating from the medial side of the femoral artery, which correlates with other studies [Table 2]. In the contrary, Prakash et al. (2010) found profunda femoris artery in 3.4% (2 out of 64) extremities and Dixit et al (2011) found profunda femoris artery in 10.5% extremities originating from the medial side of the femoral artery [Table 2].

Table 2: Comparison of other studies for site of origin of profunda femoris artery.

Study	Site of origin of profunda femoris artery from femoral artery				
	Lateral	Posterior	Posterolateral	Medial	Total cases
Dixit DP et al (2001) [5]	-	31.25%	35.41%	-	48
Prakash et al (2010) [6]	-	46.90%	50.00%	3.10%	64
Dixit DP et al (2011) [7]	18.80%	28.50%	42.10%	10.50%	228
Suthar K et al (2013) [8]	39.00%	7.00%	54.00%	0.00%	100
Peera Set al (2013) [9]	10%	25%	62.50%	0.00%	40

In this study there was no significant difference in the mean distance of origin (from the midpoint of inguinal ligament) of profunda femoris artery between the right (31.50 mm) and the left side (30.76 mm). That correlates with previous studies [Table 3].

Table 3: Distance of origin of the profunda femoris artery from the midpoint of the inguinal ligament.

Distance of origin (mm)	Right limb n (%)	Left limb n (%)	Total n (%)
0-10	5 (19.23%)	3 (12.00%)	8 (15.69%)
11-20	2 (7.69%)	3 (12.00%)	5 (9.80%)
21-30	4 (15.38%)	8 (32.00%)	12 (23.53%)
31-40	7 (26.92%)	4 (16.00%)	11 (21.57%)
41-50	6 (23.08%)	3 (12.00%)	9 (17.65%)
51-60	1 (3.85%)	3 (12.00%)	4 (7.84%)
61-70	1 (3.85%)	1 (4.00%)	2 (3.92%)
Total	26	25	51

In this study, more commonly the profunda femoris artery was originating in the range of 0-50 mm (45 out of 51 femoral triangles) distance from the midpoint of inguinal ligament. The mean distance of origin was 30.17 mm. This was less than the results mentioned by previous studies [Table 4].

Table 4: Comparison of distance of origin of the profunda femoris artery with other studies.

Study	Limb		Distance of origin of profunda femoris artery from midpoint of the inguinal ligament		
	Side	Number		Common site of origin	Mean
Sidharth P et al (1985) [10]	Right	50	-	-	44 mm
	Left	50	-		
Mahadevan V (2008) [3]	Right	-	-	-	35 mm
	Left	-	-		
Dixit DP et al (2001) [5]	Right	24	-	41-52 mm	47.5 mm
	Left	24	-	46-54 mm	
Baptist M et al (2007) [11]	Right	20	-	30-40 mm	-
	Left	20	-	30-40 mm	
Prakash et al (2010) [6]	Right	32	-	Proximal one third	42 mm
	Left	32	-		
Dixit D et al (2011) [7]	Right	114	-	31-40 mm	-
	Left	114	-	41-50 mm	
Suthar K et al (2013) [8]	Right	25	47.9 mm	40-60 mm	46.2 mm
	Left	25	44.5 mm	40-60 mm	
Peera S et al (2013) [9]	Right	20	-	31-55 mm	32.8 mm
	Left	20	-		
Present study	Right	26	31.50 mm	31-40 mm	30.17 mm
	Left	25	30.76 mm	21-30 mm	

In two cases profunda femoris artery was originating at the level of inguinal ligament; that might be damaged during accessing femoral artery or might be mistaken for femoral artery during intervention.

Table 5: Gender wise profunda femoris artery circumference, diameter and cross sectional area.

Profunda femoris artery	Circumference (mm)		Diameter (mm)		Cross-sectional Area (mm ²)	
	Male	Female	Male	Female	Male	Female
Mean	22.58	22.87	7.19	7.28	42.11	42.77
Median	22	22	7.01	7.01	38.54	38.54
Mode	20	25	6.37	7.96	31.85	49.76
Standard Deviation	4.4	3.91	1.4	1.24	15.36	13.85
Standard Error	0.73	1.01	0.23	0.32	2.56	3.58
Range	20	14	6.37	4.46	63.69	49.04
Minimum	10	15	3.18	4.78	7.96	17.91
Maximum	30	29	9.55	9.24	71.66	66.96
Number of cases	36	15	36	15	36	15

Table 6: Profunda femoris artery Circumference, Diameter and Cross sectional area according to side.

Profunda femoris artery	Circumference (mm)		Diameter (mm)		Cross-sectional Area (mm ²)	
	Right	Left	Right	Left	Right	Left
Mean	22.96	22.36	7.31	7.12	42.84	41.74
Median	22	22	7.01	7.01	38.54	38.54
Mode	22	20	7.01	6.37	38.54	31.85
Standard Deviation	3.36	5.02	1.07	1.6	12.49	17.11
Standard Error	0.66	1	0.21	0.32	2.45	3.42
Range	13	19	4.14	6.05	48.65	59
Minimum	17	10	5.41	3.18	23.01	7.96
Maximum	30	29	9.55	9.24	71.66	66.96
Number of cases	26	25	26	25	26	25

There was no significant difference in the Profunda femoris artery circumference between male and female (95% confidence interval, two tailed unpaired t-test, $p = 0.8299$) [Table 5].

There was no significant difference in the calculated Profunda femoris artery diameter between male and female (95% confidence interval, two tailed unpaired t-test, $p = 0.8299$) [Table 5].

There was no significant difference in the calculated Profunda femoris artery cross-sectional area between male and female (95% confidence interval, two tailed unpaired t-test, $p = 0.8865$) [Table 5].

There was no significant difference in the Profunda femoris artery circumference between Right and Left side (95% confidence interval, two tailed paired t-test, $p = 0.7440$) [Table 6].

There was no significant difference in the calcu-

lated Profunda femoris artery diameter between Right and Left side (95% confidence interval, two tailed unpaired t-test, $p = 0.7450$) [Table 6].

There was no significant difference in the calculated Profunda femoris artery cross-sectional area between Right and Left side (95% confidence interval, two tailed unpaired t-test, $p = 0.9141$) [Table 6].

In this study, the largest profunda femoris artery (71.66 mm² cross sectional area) was noted in the right femoral triangle of male cadaver. The smallest profunda femoris artery (7.96 mm² cross sectional area) was noted in left side of male cadaver.

This study was conducted on cadavers embalmed with formalin injectable fluid. There was no significant difference found in estimated diameter of profunda femoris artery between male and female.

CONCLUSION

Profunda femoris artery can be visualized by angiography, ultrasonography, magnetic resonance imaging and subtraction digital angiography. Profunda femoris artery is using more and more interventions nowadays. Surgeons often prepares skin graft from the thigh, myo-cutaneous flap from muscles supplied by profunda femoris artery for surgical reconstruction processes. Knowledge of blood supply from profunda femoris artery is important for that procedures.

Variations in origin of profunda femoris artery and its variations is also important to avoid damage during accessing femoral artery. Extensive study is essential to identify prevalence of different variations of profunda femoris artery and its branches.

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Conflicts of Interests: None

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