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# Study of profunda femoris artery in central Indian population

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**Abstract**
While performing various vascular diagnostic interventional procedures and graft surgeries knowledge of Profunda femoris artery is useful. Knowledge of its variation in origin and position do help to avoid various post-surgical complications, secondary hemorrhage and in some cases formation of pseudoaneurysms. Thirty lower limbs from formalin fixed adult human cadavers were dissected in the department of anatomy at LN Medical College & Research Centre, Bhopal, India. The distance of origin and position of Profunda femoris artery was measured by using thread, measuring tape and digital vernier calliper. In 100% cases it arise from femoral artery. In majority of the cases, distance of origin of Profunda femoris artery was found to be in the range of 31-40mm and position of origin was found to 50% as posterolateral and other 50% as posterior.

**Keywords:** profunda femoris artery, femoral artery, anatomical variation

## 1. Introduction
Muscles supply of the thigh region is by Profunda Femoris artery which originates from Femoral artery [1]. After taking origin in the femoral region, Profunda Femoris Artery spirals posterior to Femoral Artery and femoral vein to reach the medial side of the femur where it gives Lateral Circumflex Femoral artery, Medial Circumflex Femoral artery, perforating and muscular artery [2]. It passed between pectineus and adductor longus, then between the latter and adductor brevis. Then it descends between adductor longus and adductor magnus. It pierced adductor magnus and gave off perforating branches. The terminal part of it continued as the fourth perforating artery [3]. These perforating branching after piercing adductor magnus form anastomosis in the back of the thigh [2].

A thorough knowledge of the normal anatomy and variations of the site of origin and course of the Profunda Femoris Artery and its branches is not only of paramount surgical importance during vascular diagnostic interventional procedures and surgeries but also helps in reducing the chances of intra-operative secondary haemorrhage and post-operative complications [4]. Variations in origin of profunda femoris artery and its variations is also important to avoid damage during accessing femoral artery [5]. It is also helpful for non-invasive procedures like Doppler, ultrasonography, digital subtraction angiography arteriography and magnetic resonance imaging [2]. Therefore, anatomical knowledge of location and position of Profunda Femoris artery is very important especially for plastic surgeons and interventional radiologists for performing various interventional procedures.

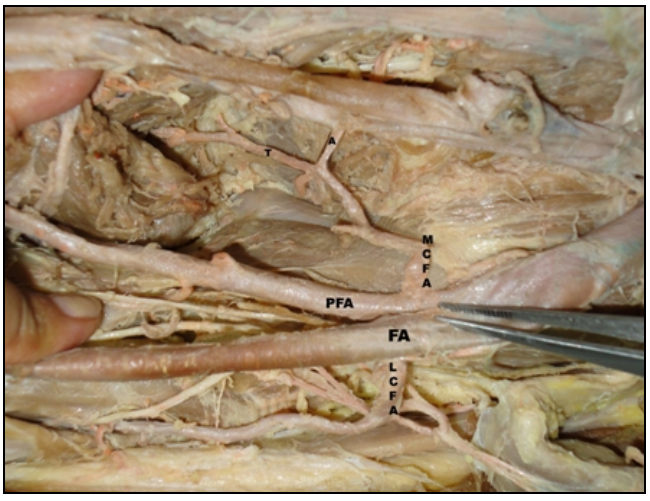


**Fig 1:** Femoral Artery (FA) reflected to show origin of Profunda Femoris Artery (PFA). Lateral Circumflex Femoral Artery (LCFA) and Medial Circumflex Femoral Artery (MCFA) taking origin from Profunda Femoris Artery (PFA).

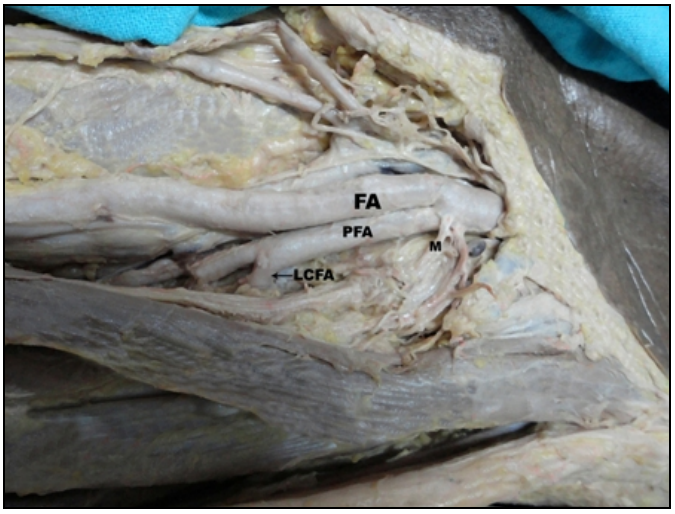


**Fig 2:** High Origin of Profunda Femoris Artery (PFA) along with its Muscular (M) Branches

## 2. Material and methods

The present study was conducted on thirty formalin fixed lower limbs from adult human cadavers (18 of right side and 12 of left side). Out of which 19 limbs belong to male and 11 limbs belong to female. The dissection was done as per Cunningham's manual of practical anatomy, in the Department of Anatomy at LN Medical College & Research Centre, Bhopal, India. Lower limbs which were having damaged arteries were excluded from the study.

After the inguinal region had been dissected, femoral vessels were traced. The origin and the course of Profunda femoris artery was dissected and identified. Along with it, its position were also identified, studied and noted.

After exposing Profunda femoris artery, the point of origin of artery was studied with reference to the femoral artery. Variations in the position of origin of Profunda femoris artery were noted and photographs were taken.

### 2.1 Morphometric study

The following parameter was studied -

+ Distance of origin of Profunda Femoris Artery was measured from the midpoint of the inguinal ligament.

All the measurements were taken in millimetres. The measurements were repeatedly taken to ensure the accuracy. Instrument used for measurements were thread and digital vernier calliper.

### 2.2 Morphological study

Variation in the pattern of origin of position of Profunda femoris artery was described.

Observations were tabulated and analysed statistically.

## 3. Result

After taking the skin incision and dissecting the Femoral Artery, the Profunda Femoris Artery was exposed and its origin was cleared. Position of origin of Profunda Femoris Artery in relation to Femoral Artery was studied. It was seen that the Profunda Femoris Artery originated in 50% of cases from posterior side and in 50 % of cases from posterolateral side.

**Table 1:** Position of origin of profunda femoris artery

| Position | Number of cases | percentage |
|---|---|---|
| Posteriorly | 15 | 50 |
| Posterolaterally | 15 | 50 |
| Total | 30 | 100 |

### 3.1 Distance of origin

Distance of origin of Profunda Femoris Artery was measured from the midpoint of the inguinal ligament by using thread and digital vernier calliper.

**Table 2:** Distance of origin of profunda femoris artery

| Range (MM) | Number of Cases | Percentage |
|---|---|---|
| 0 – 10 | 2 | 6.7 |
| 11 – 20 | 0 | 0 |
| 21 – 30 | 5 | 16.7 |
| 31 – 40 | 9 | 30 |
| 41 – 50 | 8 | 26 |
| 51 – 60 | 6 | 20 |
| Total | 30 | 100 |

As shown in Table 2 the distance of origin of Profunda Femoris Artery was noted. In 30% of the cases the distance of origin was seen in the range of 31 – 40 mm. In 16.7% cases it was between 21 – 30 mm. In 26 % cases range was between 41- 50 mm. In 20% cases it was between 51 – 60 mm which was a very low origin. In 6.7 % cases a very high origin was seen in the range of 0 – 10 mm.

**Table 3:** Comparision of the distance of origin of profunda femoris artery according to side

| Range of distance (MM) | Left | Right |
|---|---|---|
| 0 – 10 | 2 | 0 |
| 11 – 20 | 0 | 0 |
| 21 – 30 | 3 | 2 |
| 31 – 40 | 7 | 2 |
| 41 – 50 | 3 | 5 |
| 51 – 60 | 3 | 3 |
| TOTAL | 18 | 12 |

As shown in table 3, the distance of origin Profunda Femoris Artery was compared on left and right side. On the left side in majority of the cases Profunda Femoris Artery originated in the range of 31 – 40 mm. 3 cases each showed a distance between 21- 30mm, 41 – 50 mm and 51 – 60 mm. But in 2 cases high origin was seen in the range of 0 – 10 mm. On the right side in 5 cases out of 12 (42%), distance was in the range of 41 – 50 mm. 3 cases showed range of 51 - 60 mm and 2 cases each had distance of origin in the range of 21 – 30 and 31 – 40 mm. The high origin was seen to be more common on the left side.

**Table 4:** Comparision of distance of origin of profunda femoris artery according to its sex

| Range (MM) | Female | Male |
|---|---|---|
| 0 – 10 | 0 | 2 |
| 11 – 20 | 0 | 0 |
| 21 – 30 | 4 | 1 |
| 31 – 40 | 2 | 7 |
| 41 – 50 | 4 | 4 |
| 51 – 60 | 1 | 5 |

The distance of origin of Profunda Femoris Artery was compared between females and males in Table 4. In females, 4 cases each, showed the distance of origin in the range of 21 – 30 and 41 – 50 mm. In 2 cases distance of origin was between 31 – 40 mm. A single case had a very low origin in range of 51 – 60 mm. In case of males, majority of the cases showed the origin in the range of 31 – 40 mm. 5 cases showed low origin in the range of 51 – 60 mm. 4 cases were present in the range of 41- 50 mm. In males, 2 cases had a very high origin in range of 0 – 10 mm.

## 4. Discussion

The knowledge of the site of origin of Profunda Femoris Artery is important while performing clinical procedures in the femoral region and hip joint replacement and also for avoiding iatrogenic arteriovenous fistula or severe secondary haemorrhage while performing Femoral Artery puncture [6].

**Table 5:** Position of origin of profunda femoris artery

| Names of Authors | Postero-Lateral (%) | Posterior (%) | Lateral (%) | Medial (%) |
|---|---|---|---|---|
| Dixit *et al*. (2001) [7] | 35.41 | 31.25 | 0 | 0 |
| Prakash *et al*. (2010) [8] | 50 | 46.90 | 0 | 3.1 |
| Dixit *et al*. (2011) [9] | 42.1 | 28.50 | 10.5 | 18.8 |
| Present study | 50 | 50 | 0 | 0 |

According to Dixit *et al*. (2001) the Profunda Femoris Artery originated from posterolateral aspect of the Femoral Artery in 35.41% and from posterior aspect in 31.25% [7]. No details were mentioned about the remainder cases. Prakash *et al*. (2010) reported in 50% extremities, the Profunda Femoris Artery originated from the postero-lateral aspect of the Femoral Artery; whereas it originated from the posterior aspect in 46.9% and medial in 3.1% cases [8]. Dixit *et al*. (2011) reported position of profunda to be 42.1% from posterolateral aspect, 28.5% from posterior side, 18.8% from the medial side and 10.5% from lateral side [9]. In the Present study in 15 out of 30 (50%) extremities, the Profunda Femoris Artery originated from postero – lateral aspect of the Femoral Artery whereas it originated from the posterior aspect in 15 out 30 (50%) specimens.

**Table 6:** Distance of origin of profunda femoris artery

| Name of Authors | Distance of Origin From Mid-Point of The Inguinal Ligament |
|---|---|
| Siddharth *et al*. (1985) [10] | 4.4 |
| Bannister *et al*. (1995) [11] | 3.5 |
| Dixit *et al*. (2001) [7] | 4.7 |
| Prakash *et al*. (2010) [8] | 4.2 |
| Present study | 3.99 |

According to Siddharth *et al*. (1985) [10] the median distance of separation of Profunda Femoris Artery from the mid point of the inguinal ligament was 4.4 cms. [10] Bannister *et al*. (1995) reported the distance of origin to be 3.5 cms from the Femoral Artery [11]. According to Dixit *et al*. (2001) the distance of origin of the root of the profunda femoris was 4.75 cms from the Femoral Artery [7]. Prakash *et al*. (2010) [8] stated that median distance of separation of Profunda Femoris Artery from the mid point of the inguinal ligament was 4.2 cms [8]. In the Present Study the average distance of origin of the Profunda Femoris Artery from midpoint of the inguinal ligament was 39.99 mm. i.e. 3.99 cms.

**Table 7:** Comparison of distance of origin of profunda femoris according to side

| Name of Authors | Right (mm) | Left (in mm) |
|---|---|---|
| Dixit *et al*. (2001) [7] | 41 - 52 | 46 – 54 |
| Baptist *et al*. (2006) [12] | 30 - 40 | 30 – 40 |
| Samarawickrama *et al*. (2009) [13] | 51 - 70 | 21 – 50 |
| Dixit *et al*. (2011) [9] | 31 - 40 | 41 – 50 |
| Present | 41 - 50 | 31 - 40 |

According to Dixit *et al* (2001), the distance of origin of profunda femoris from the mid point of the inguinal ligament on the right side was between 41 – 52 mm and on the left side it was between 46-54 mm [7]. Baptist *et al*. (2006) reported that maximum cases on the right side were in the range of 30-40 mm and on the left side they were in the range of 30-40 mm. Samarawickrama *et al*. (2009) [12] reported maximum number of cases on right side in the range of 51-70 mm and on left side in the range of 21-50 mm [13]. Dixit *et al*. (2011) reported maximum number of cases in the range of 31-40 mm on right side and on left side in the range of 41-50 mm [9]. In the present study majority of the cases are present in the range of 41 - 50 mm on right side and on left side it laid in the range of 31 - 40 mm. So the present study shows that the findings on the right side are in agreement in with Dixit *et al*. (2011) [9]. On the left side it is in agreement with Baptist *et al*. (2006) [12].

**Table 8:** Comparison of distance of origin of profunda femoris artery in males and in females.

| Range (mm) | Female | Male |
|---|---|---|
| 0 – 10 | 0 | 2 |
| 11 – 20 | 0 | 0 |
| 21 – 30 | 4 | 1 |
| 31 – 40 | 2 | 7 |
| 41 – 50 | 4 | 4 |
| 51 – 60 | 1 | 5 |

The distance of origin of Profunda Femoris Artery was compared between females and males. The present study showed that in females the distance of origin was in the range of 21 – 30 and 41 – 50 mm in majority of the cases. A single case had a very low origin in range of 51 – 60 mm. In case of males, majority of the cases showed the origin in the range of 31 – 40 mm. 5 cases showed low origin in the range of 51 – 60 mm. 2 cases showed a very high origin in range of 0 – 10mm. So both low and high origins were common in males.

In the present study the Profunda Femoris Artery most commonly originated at a distance of 31 – 40 mm. There are 2 cases where high origin was seen in the range of 0 – 10 mm. High origin of Profunda Femoris Artery was seen to be more common on left side. Both the cases belong to male cadaver. The advantage of such a high origin of Profunda Femoris Artery is that it can be used for catheterisation and further investigation of any arterial system of the body. According to our study the site of origin of Profunda Femoris Artery was seen equally from posterolateral aspect and from posterior

aspect of Femoral Artery. This is of great surgical importance as such a large and unexpected arterial channel can be damaged while collecting blood in infants from femoral vein or during exposure of saphenous vein for ligation at its junction with the femoral vein [15].

The development of the vasculature in the lower limb precedes the morphological and molecular changes that occur in the limb mesenchyme hence vascular variations are more of a rule than an exception. Anomalous patterns of vascular system may be due to: divergence in the mode and proximo-distal level of branching; presence of unusual compound arterial segments; aberrant vessels that connect with the principal vessels, arcades or plexuses; and vessels occupying exceptional tissue planes and having unsuspected neural, mycological or osteoligamentous relationships [14].

## 5. Conclusion

A thorough knowledge of the normal anatomy and variations of the site of origin and course of the Profunda Femoris Artery and its circumflex branches is not only of paramount surgical importance during vascular diagnostic interventional procedures and surgeries but also helps in reducing the chances of intra-operative secondary haemorrhage and post-operative complications. Needless to say, that the aforementioned anatomical facts should be considered before planning different diagnostic and therapeutic procedures on the Femoral Artery and its branches.

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