



## CADAVERIC STUDY OF PROFUNDA FEMORIS ARTERY

### Anatomy

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### ABSTRACT

**Background:** The Profunda femoris artery is an important artery of the thigh and the largest branch of femoral artery. It originates from the femoral artery on the posterolateral aspect and it gives two branches. On the medial aspect, medial circumflex femoral artery and on lateral aspect lateral circumflex femoral artery in femoral triangle. **Material and methods:** Around 102 femoral triangles were dissected & the origin pattern of profunda femoris artery was studied and its branches. Study carried out in the department of Anatomy, at NMCH, Patna. The routine dissection technique was employed from Cunningham's manual of practical Anatomy 15th Edn. And all observations recorded in the data sheet. **Conclusion:** The most common site of origin of profunda femoris artery was from posterolateral aspect of femoral artery. According to present study when profunda femoris artery originated at a higher level than in that case the lateral circumflex femoral artery originated from femoral artery.

### KEYWORDS

Profunda femoris artery, medial circumflex femoral artery, lateral circumflex femoral artery, femoral artery.

### INTRODUCTION

The chief artery of the lower limb is femoral artery. It enters in the thigh passing below the inguinal ligament midway between the anterior superior iliac spine and pubic symphysis, descends along the anteromedial part of the thigh in the femoral triangle and becomes the popliteal artery as it passes through an opening in adductor magnus near the junction of the middle and distal thirds of the thigh. Arteries are the muscular tubes which convey blood from heart to various parts of the body. The word artery was first discovered by William Harvey. He also realized it, earlier than any anatomist that "structure is a real guide to function. femoral triangle the artery gives large branch; the part of the artery before giving the branch is called as common femoral artery and after giving the large branch the remaining artery is called as superficial femoral artery. The chief artery of the thigh which supplies the muscles of the three compartments is the profunda femoris artery. PFA lies at first lateral to the femoral artery, it spirals posterior to this and the femoral vein to the medial side of the femur, and it passes between pectineus and adductor longus. Then, between the latter adductor brevis and then descends between adductor longus and adductor magnus to finally pierce and anastomose with the upper muscular branch. The lateral circumflex femoral artery is a lateral branch arising near the root of the PFA. It inclines laterally between divisions of the femoral nerve. Thus, it lies as near the femur as neighboring muscles will allow. The medial circumflex femoral artery originates usually from the postromedial aspect of the PFA but often from the femoral artery; this artery supplies the adductor muscles and curves medially round the femur. The medial circumflex artery has the chief duty to supply the head and neck of the femur. Perforating arteries are usually three; they perforate the attachment of adductor magnus to reach the flexor aspect of the thighs. A branch known as the axial, or Ischiatic artery is given off from the umbilical (future internal iliac) artery at embryos of size 9mm. It is the chief arterial stem of the lower extremity. But a little later the Ischiatic is being superseded by the femoral which is a continuation of external iliac artery. Then the profunda femoris artery originates from the posterior wall of the femoral artery. The knowledge of anatomy of arteries helps in clinical ways chiefly in occlusive arterial diseases. For this purpose after discovery of x-rays by Wilhelm and Roentgen, Haschek and Lindenthal first attempted vascular imaging in 1896. They used lime, cinnabar and petroleum products in the brachial artery as contrast medium. Even after the advent of highly advanced imaging techniques, arteriography still remains the main investigation in peripheral occlusive arterial diseases. Peripheral arteriogram are used now a days to evaluate the peripheral occlusive arterial diseases, suspected congenital anomalies, arterial status in trauma imaging of vascular malignancies, demonstration of the vascularity of malignancies and identifying diseases inherent to the arterial system. The femoral artery is easily accessible to the catheterization and thereby to investigate any arterial system in the body. Femoral artery may be ligated in the adductor canal in case of femur fracture or

cut wounds which leads to severe hemorrhages. At that time important collateral circulation develops by the profunda femoris and its branches. The profunda femoris artery is used for arteriography, ultrasound and Doppler imaging, digital subtraction angiography and magnetic resonance imaging.

### OBJECTIVES

To study the position and level of PFA and its branches. To study the anomalies in the position of PFA and its branches.

### Review of Literature

Several centuries and dissections were necessary to establish the concept of normality, abnormality, and variation of the human body. The study of human anatomical variability, however, there is no doubt that his work actually post date those of Vesalius human corporis fabrica, which are full of references to anatomical variations of bones, muscles and vessels;

The adaptation of these terms to our actual background could lead us to consider that Vesalius established variations based on a statistical criteria. The terms "anomaly" or "abnormal" were not used by Vesalius. However, it is commonly known that individuals of the same species are never exactly alike. Both the body as a whole and its internal organs and parts show certain flexibility of size, form, structure and position. To recognize the anatomical variations it is necessary to previously establish the normal pattern of the human body and name its structures. Stevenson and Hall, 1993 said that the incidence of minor anomalies has been reported to range "between" 7% to 41% while that of major anomalies lies between 2% and 3%. The apparent lesser value of minor anomalies may be overlooked by the physician, even though it may well represent a valuable clue to alter embryonic development. Variation means "departure from normal". One question that could be asked today is if publication and study of anatomical variations has sense in the medicine and biology of 21 century or is on the contrary, an exhausted topic. On the other hand, anatomical variations represent an embryological and comparative background for medicine and biology, in order to understand the morphological aspect of the human body and its related structure. Finally, there is a point in commenting that a recent research states that about 10% of clinical malpractice is due to the ignorance of the anatomical variations. Keen J.A., (1961), noted that the description of the arterial trunks of the limbs and of the arrangement of their main branches found in anatomy text books represent, the patterns encountered in a majority of subjects and such patterns are then accepted as the "Normal" or average arrangement. Keen J.A., (1961), opined that studies of variations of arterial arrangements are usually based on the analysis of a large number of dissected right and left limbs, but the authors seldom consider the question of bilateral symmetry in individual cases when a departure from the normal pattern is met with in one limb, it is often assumed that the particular

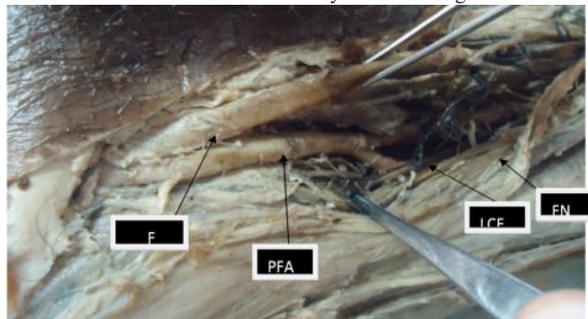
variation is likely to be present also on the other side. Senior's embryological studies in (1924, 1929) confirm that the adult patterns are laid down at an early developmental state; e.g. at the 13mm stage there exists an "axis" artery which runs along the dorsal surface of the thigh and leg. At the 14mm stage, a large direct channel through the rete femoralis has made its appearance and this represents the femoral artery. In the 19mm stage the "axis" artery (Ischiatic artery, inferior gluteal) has become plexiform in appearance, and the posterior aspect of adductor magnus is supplied through another enlarged channel in the rete femoralis which become the profunda femoris and either the first or second perforating. Senior (1924, 1929), there is no question that distribution of arterial abnormalities is more often unilateral than bilateral and that these variations seems to arise independently in either right or left limbs.

**MATERIAL AND METHODS**

The materials used for this study consist of 102 limbs of cadavers used for the routine dissection procedure for under graduate and post graduate students, Study duration of two years. in the department of Anatomy, at Nalanda medical college and Hospital Patna, Bihar. Around 102 femoral triangles were dissected & their history was periodically recorded in data sheet. The routine dissection technique was employed from Cunningham's manual of practical Anatomy 15th Edn. The relations of profunda femoris at its origin from femoral artery were studied and recorded in data sheet whether it originated from posterolateral, lateral, posterior or medial aspect from the femoral artery, The relations of profunda femoris at its origin from femoral artery were studied and recorded in data sheet whether it originated from posterolateral, lateral, posterior or medial aspect from the femoral artery.

**RESULTS AND OBSERVATIONS:**

In present study 102 limbs were dissected in which 72 limbs from male cadavers and 30 limbs from female cadavers were observed for the site of origin of PFA and Medial and Lateral circumflex arteries. In present study 102 limbs were dissected, in which 72 limbs was from male cadavers and 30 limbs was from females cadavers. First the site of origin of PFA was observed. In out of 102 limbs, only in 20 limbs (13 were male & 7 were female) the PFA originated from lateral aspect from femoral artery. The origin of LCF from femoral artery superior to PFA was observed only in 3 limbs. (2 limbs were from male cadavers and one limb was from female cadavers, In 4 limbs of male cadavers, the origin of LCF from FA was found inferior to origin of PFA. But not single female limbs indicated this type of variation, because this type of variation itself was very rare and in addition to that the numbers of female cadavers were very small. The most common distance of origin of PFA from femoral artery according to table-2 is the range between 30-40 mm. Which is also common range in both sexes. And this is the normal distance of origin of PFA. observation of various sites of origin of MF, the present study used 102 limbs where 72 limbs were from male cadavers and 30 limbs were from female cadavers. Out of which in 66 limbs the origin of MCF from PFA on medial aspect were observed (43 male limbs and in 23 female limbs). The origin of MCF from FA superior to origin of PFA was observed in 19 limbs out of 102 limbs. In out of 102 limbs there were 7 limbs where MCF originated either from PFA or from FA that coursed superficial to the femoral vein. Out of 102 limbs, there was only a single case where MCF was absent. The distance of MCF from origin of PFA was more only in one female cadaver limb. Size of PFA : In present study the normal range of size of PFA was 4-8 mm. Only in 1 case the PFA was unduly large the size was 10 mm while in 8 cases the size was very small and range were 2-3 mm.



**High origin of PFA from FA**

The origin of MCF from FA superior to origin of PFA was observed in 19 limbs out of 102 limbs. This type of variation was recorded in 16

male cadaver limbs. While in female this type of variation was present only in 3 limbs. In out of 102 limbs, in 7 limbs unilateral origin of MCF was observed from femoral artery inferior to PFA (4 limbs of male cadavers and 3 limbs of female cadavers were included).

**DISCUSSION**

Knowledge about the site of origin of PFA is important for avoiding iatrogenic femoral arteriovenous fistula or severe secondary hemorrhage while performing FA puncture.

**Comparison of site of origin of profunda femoris with Other studies**

Site of origin	Incidences		
	Present study	H. Lippert and Pabst	Dixit et al
Origin from FA on postero lateral aspect	46.07	48	35.14
Origin from FA on posterior aspect	23.52	46	31.25
Origin from FA on medial aspect	10.78	10	
Origin from external iliac artery	-	<1	

the incidence of origin of PFA on posterolateral aspect from FA is 35.14 % according to Dixit et al, 48% according to H. Lippert & Pabst and 46.07 % according to present study. So, the ratio of posterolateral aspect of PFA is almost same in these three observations. And if compared with the incidence of other variations the posterolateral origin considered being most common site of origin. And the percentage distribution in origin of PFA from posterior aspect from FA is 31.25 % reported by Dixit et al, 46 % noted by H. Lippert and Pabst, while in present study it is 23.72 % and so, compared to H. Lippert and Pabst the incidence is almost half. The percentage distribution about the origin of PFA on medial aspect from FA is 10% as observed by H. Lippert & Pabst and 10.78 % was observed in present study. But not single case was noted by Dixit et al., hence that may be due to less number of cases. Sahin B et al (2003) stated that different ramification pattern occurred as a function of the development of the lower limb during routine dissection, they observed a variation, the deep femoral artery was passing in front of the femoral vein in left lower limb of a 43 year old male cadaver, In Dixit et al data 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. It occurred mostly when both circumflexes originated from FA. Choudhry et al (1995) dissected 112 adult human cadavers and revealed an abnormality of high origin of profunda brachii artery arising from the third part of axillary artery in a single superior extremity. i.e. out of 112 cases, 0.5% cases where profunda brachii had very high origin. Choudhry et al (1995) dissected 112 adult human cadavers and revealed an abnormality of high origin of profunda brachii artery arising from the third part of axillary artery in a single superior extremity. i.e. out of 112 cases, 0.5% cases where profunda brachii had very high origin. So the above two data prove that the incidence of higher origin of profunda femoris artery and profunda brachii are not uncommon. Hence, the knowledge of this type of variation in both arteries are surgically important to avoid secondary hemorrhage. Main aim which prompted this study about the variation in origin of PFA and its circumflexes branches.

**CONCLUSION**

The most common site of origin of profunda femoris artery was from postero lateral aspect of femoral artery. Very rare variation was also observed that profunda femoris artery arising either from posterior or medial to femoral artery and then coursing superficial to femoral vein, which is surgically important.

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