

A Study of Anatomical Variations in the Origin of Profunda Femoris Artery in Human Cadavers

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ABSTRACT

Introduction: Accurate knowledge about the anatomical variations of origin of Profunda Femoris Artery (PFA) is important for clinicians for diagnostic imaging and performing surgeries around the aforesaid vessels in femoral triangle.

Objective: To study the anatomical variations of the site of origin and to measure the mean distance between the mid inguinal point (MIP) and origin of PFA from Femoral Artery (FA) in millimeters with a scale and a caliper and to correlate it clinically.

Material and Methods: The present work was conducted on adult human cadavers placed for dissection in the departments of anatomy, in four government medical colleges situated in Patna, Bihar. The total numbers of cadavers studied were 25 and the total numbers of femoral triangles examined were 50. Femoral triangle was dissected and the variations in the origin of PFA as well as distance of the origin of PFA from MIP were noted down.

Results: PFA originated from femoral Artery in 98% of the cases while in 2 % it originated as a common trunk with Lateral Circumflex Femoral Artery (LCFA) from femoral Artery. The PFA arose most commonly (64%) from postero-lateral side, whereas the sites of origin from the lateral and posterior aspects were 22% and 12% respectively. The mean distance of origin of PFA from the mid inguinal point observed in this study was 41.1 mm.

Conclusion: PFA originating from the anterior aspect (2%) was rarely observed in other studies done so far. Therefore, this study highlights and recommend that surgeons should be careful about the unusual variations while performing invasive procedures on the FA and its branches.

Keywords: PFA (Profunda Femoris Artery), FA (Femoral Artery), LCFA (Lateral Circumflex Femoral Artery), MCFA- Medial Circumflex Femoral Artery, CT-Common Trunk, MIP- Mid Inguinal Point

INTRODUCTION

The Profunda Femoris Artery (PFA) is a large branch which arises laterally from femoral artery approximately 3.5 cm distal to the inguinal ligament [1] which provides blood supply to muscles of the thigh and head and neck of femur. It gives two main branches Lateral Circumflex Femoral Artery (LCFA) and Medial Circumflex Femoral Artery (MCFA) [1].

The information about the branching pattern of FA and its vascular system is of paramount importance for the cardiologists and radiologists, as this is often accessed in procedures like coronary angioplasty. Besides this, Peripheral arteriograms are being used commonly to evaluate 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.

Profunda femoris artery is used for haemodialysis, vascular reconstructive procedures and various radio imaging techniques like ultrasound, doppler Imaging and magnetic resonance imaging [2]. The anatomical knowledge of the level of origin of profunda femoris artery is important in avoiding iatrogenic femoral arterio-venous

fistula formed during accidental puncture of femoral artery [3]

Precise knowledge about the anatomical variations of origin of Profunda femoris Artery and its branches is equally important for performing surgeries around the vessels in femoral triangle as it reduces chances of peri-operative complications.

The branches of profunda femoris are used in anterolateral perforator thigh flap as long vascular pedicle during breast reconstruction after mastectomy in cases of carcinoma breast [4]. Flap necrosis following reconstruction surgeries can be prevented by knowing the variations in the branching pattern of PFA. [5].

MATERIAL AND METHODS

The present study was conducted between August 2017 to March 2020 on properly embalmed adult human cadavers placed for dissection for undergraduate and postgraduate teaching in the departments of anatomy of four government medical colleges situated in Patna, Bihar. The total numbers of cadavers studied were 25. The numbers of cadavers examined in various medical colleges were: twelve (12) in Indira Gandhi Institute of Medical Sciences (IGIMS), Patna, seven (7) in Patna Medical College, Patna, three (3) in Nalanda Medical College, Patna and three (3) in All India Institute of Medical Sciences, Patna. Hence, the total numbers of lower limbs examined

and femoral triangles dissected were 50(fifty), of which twenty-five each belonged to left and right sides. Femoral triangles were dissected and the profunda femoris arteries were exposed in the following manner: First, an oblique incision was given starting from anterior superior iliac spine along the inguinal ligament up to pubic tubercle and then a transverse incision at the junction of the upper 2/3rd and lower 1/3rd of thigh was given. After that a vertical incision from the midpoint of first incision downwards to the middle of transverse incision was taken. Femoral triangle and adductor canal of one lower limb (thigh) was first dissected by reflecting the skin, superficial fascia and deep fascia. After separating the superficial structures, the femoral artery and profunda femoris artery were exposed by opening the femoral sheath. Cadavers examined were numbered. The origin of profunda femoris artery was noted down and the distance of origin of profunda femoris artery from midpoint of inguinal ligament was measured with a scale and slide caliper in millimeter (Fig-1) and the variations regarding site and level of origin of the PFA were also noted. Lastly photographs were taken and the dissected area was properly dealt with after making all observation. The same procedure was repeated on the other lower limb (thigh).

RESULTS



Figure-1: Showing the process of measurement of distance of origin of Profunda Femoris Artery from the mid-inguinal point with a scale and caliper.

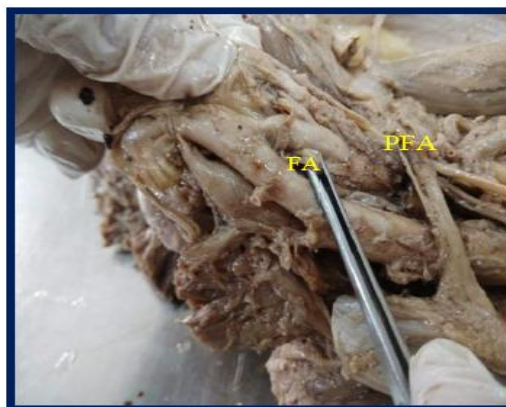


Figure-2: Showing Profunda Femoris Artery coming out from femoral artery



Figure-3: Showing profunda femoris artery coming out as a common trunk with Left Circumflex Femoral Artery (LCFA)

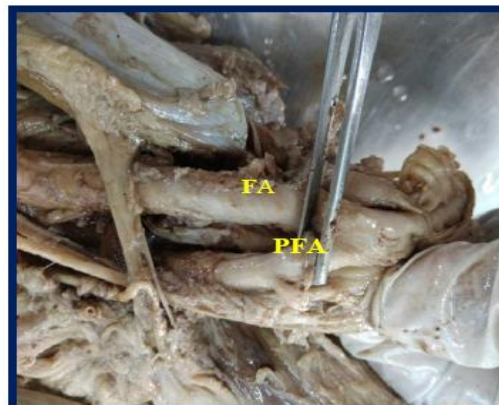


Figure-4: Showing site of origin of profunda femoris artery coming out from postero-lateral aspect.



Figure-5: Showing site of origin of profunda femoris artery coming out from lateral aspect.

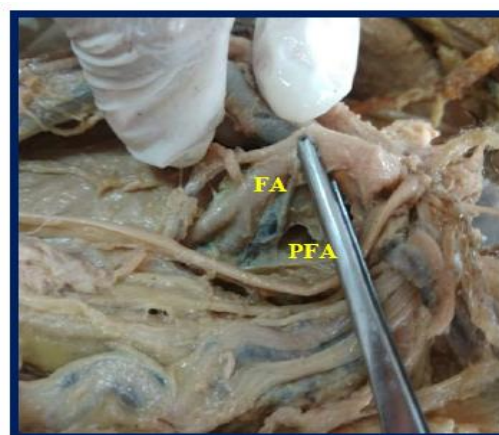


Figure-6: Showing site of origin of profunda femoris artery coming out from posterior aspect.

In the present study, out of 50 lower limbs, the profunda femoris artery originated from femoral artery in 98% (Fig-2) of the cases while in 2% it originated as a common trunk with LCFA from femoral artery (Fig-3). PFA arose most commonly (64%) from postero-lateral side (Fig-4), whereas the sites of origin from the lateral (Fig-5) and posterior aspects (Fig-6) were found to be 22% and 12% respectively. In 02% of the cases it was noted to have originated from the anterior aspect (Fig-7). The distance of origin of profunda femoris artery from mid inguinal point (MIP) varied between 21 mm to 55 mm in this study. It was found in the range between 31-40 mm and 41-50 mm in 40 percent of the cases each. High origin of PFA (21-30mm) was observed in 12% of the limbs while low level of origin in the range of 51-60 mm was noted in 08%. The mean distance of

origin of profunda femoris Artery from the midpoint of inguinal ligament was found to be 41.1mm

DISCUSSION

Knowledge of anatomy of vessels is important for various vascular surgeries, interventional radiological procedure and plastic & reconstructive surgeries. The anomalies which affect the arterial patterns of the limbs are based on an unusual selection of channels from a primary capillary plexus. The most appropriate channels enlarge whilst others retract and disappear, thereby establishing the final arterial pattern.

In this study, PFA originated mostly from the postero-lateral side of the femoral artery in 64%. This was similar to the findings by Rathnakar pretty et al [9] who have found PFA originating from the postero-lateral side in 61.6% of the

specimen. In the studies by Prakash et al.[7], Dixit DP, Mehta LA et al.[3], and by Dixit DP, Kubat DM et al.[12], the PFA originated from the postero-lateral aspect of FA was found in (50%), (35.4%) and (42.1%) of cases respectively. In 22% of the cases in this study, it originated from the posterior side of the femoral artery which was close to that of Vaibhav et al (21.6%)[9], Ashraf et al(25.6%) [8] and Nagpal hema et al (25%) [13] respectively. The profunda femoris artery was found to have originated from the posterior side of the femoral artery in 31.25% by Dixit DP et al [3], and 44.64% by Siriporn et al., [16]respectively which was noticeably higher than the present study. PFA originating from the lateral aspect of the femoral Artery was found in 12 % of the cases in present study which was similar to that observed by Nagpal hema et al (10%) [13], while Siriporn et al., [16] and Ashraf et al [8] reported that PFA arose from the lateral side of femoral artery in 20% and 21.43% respectively, which was higher than present study. In 2% of cases it originated from anterior side of femoral artery in present study. The profunda femoris artery originating from the antero-lateral aspect of the femoral artery was observed in 2.5% of cases in the study by Nagpal hema et al [13] in 2017 while Sangeeta et al [10]in 2015 reported it to be 3%. The knowledge of the site of origin of the profunda femoris artery helps in avoiding iatrogenic femoral arterio-venous fistula while performing puncture in femoral Artery and it enables to identify the correct site of making incision for surgical exposure of the common femoral and profunda femoris junction. In this study the mean distance of origin of profunda femoris artery from the midpoint of inguinal ligament was found to be 41.1 mm which was comparable to that reported in the literature by Dixit et al [3](47.5mm), Siddhartha et al [6] (44mm) and Prakash et al [7] (42mm). This was less than that reported by Bannister[15] (35mm), Vuksanovic [14] (37.5mm). High level of origin of PFA from MIP in the range

between 21-30mm noted in this study (12%) was noticeably lower than the studies conducted by MB Samarawickrama et al [17] who found that in 23% of the cases the PFA was originating closer to the inguinal ligament and that reported by Sabnis AS et a[18] who found that in (30%) lower limbs the PFA was arising just below the inguinal ligament.

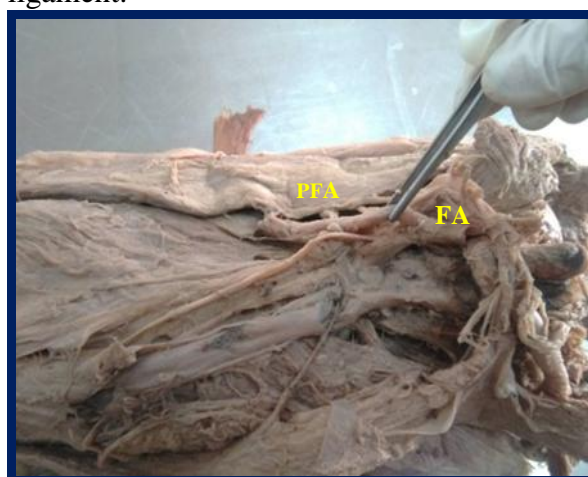


Figure-7: Showing site of origin of profunda femoris artery coming out from anterior aspect.

CONCLUSION

In the present study, the profunda femoris artery originated from femoral artery in 98% of the cases while in 2 % it originated as a common trunk with LCFA from femoral artery. The mean distance of origin of the profunda femoris artery from MIP in present study was found to be 41.1 mm which was consistent with other studies. However, in 80% of the limbs the distance of origin from MIP was found in the range between 31mm and 50 mm. Not in single limb PFA was found to have originated closer to inguinal ligament up to a distance of 20 mm from the MIP. The profunda femoris artery arose most commonly (64%) from postero-lateral side, whereas the sites of origin from the lateral and posterior aspects were 22% and 12% respectively. Unlike other studies, in 02% of the cases it was noted to have originated from the anterior aspect. Even though the variations observed in this study were in concordance with other studies some of the observation like profunda femoris artery originating from the anterior aspect (2%)

was rarely observed in other studies done so far. Therefore, this study highlights the need of being careful about the unusual variations and recommends that surgeons should be aware of such variations while performing invasive procedures on the femoral Artery and its branches. It can be concluded that the clinicians and surgeons should be well acquainted with such variations while performing any invasive, diagnostic and therapeutic procedures on the proximal part of the femoral Artery and its branches, more particularly around profunda femoris artery.

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