International Journal of Medical Science in Clinical Research and Review
Online ISSN: 2581-8945
Available Online at http://www.ijmscrr.in Volume 6|Issue 02 (March-April)|2023 Page: 350-355

Original Research Paper

Anatomical Variations of Femoral Artery in the site of Origin of Profunda femoris, Lateral Circumflex Femoral, and Medial Circumflex femoral Arteries

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Article Received: 01-02-2023, Revised: 14-02-2023, Accepted: 03-03-2023

ABSTRACT:

Background: In the realm of medicine, it is general knowledge that the femoral artery can function as an entry point for a broad variety of diagnostic and investigative procedures to be carried out. **Aim**: The present study is to determine the anatomical variations of the origins of the Profunda Femoris Artery (PFA), Lateral Circumflex Femoral Artery (LCFA), and Medial Circumflex Femoral Artery (MCFA). **Materials & methods**: T The Institutional Ethics Committee has approved this work. Upon approval, this investigation got under way. This cadaveric investigation involved 60 embalmed and formalin-fixed remains from the anatomy departments of Index Medical College & Hospital. Sixty bodies preserved in formalin were used in the investigation (38 male and 22 female). **Results**: It was found that the PFA originated from the lateral side. As measured from its beginning, the shortest length of the PFA origin from the Mid Inguinal Point (MIP) was exactly 2.2 centimeters. 5.8 centimeters was the longest length that was measured. It was established that 4.4 centimeters is the length that is most typical. There was a total of 18 samples, and out of those, there were six cases (12%) in which the LCFA and the PFA originated as a Common Trunk (CT) from the FA. The FA was the starting point for all of the samples. Four out of thirty-six samples (6%) had all three LCFA branches emanated directly from the PFA. The MCFA originated from the PFA in 36 out of the 60 specimens that were investigated, while it originated from the FA in 22 out of those specimens (33%). In four of the cases, the MCFA emerged as a common trunk (CT) in conjunction with the PFA. **Conclusion**: The origins of the PFA, Lateral Circumflex Femoral Artery, and MCFA vary. Orthopedists and surgeons who perform femoral surgery will benefit from this study. Also, it will be helpful to doctors before interventional treatments and radiologists for picture interpretation.

INTRODUCTION:

The femoral artery is made when the external iliac artery keeps going into the thigh, where it changes into the femoral artery [1]. The most important blood vessel in the thigh is the femoral artery. It runs through the thigh. The femoral artery, which is the main artery in the lower leg, brings blood to the muscles in the anterior, medial, and lateral parts of the thigh. The femoral artery is in the groin, and it is also the largest artery in the lower leg [1-3]. The femoral artery goes into the thigh about where the anterior superior iliac spine and the pubic symphysis meet [4]. The pubic symphysis is the name for this area. The femoral artery starts its journey through the thigh at this point. It is on the psoas major tendon, which connects the hip capsule to the artery [1,4]. The part of the body that surrounds the hip joint is called the hip capsule. At this point, you can feel its pulse and use it for the process of arterial catheterization [4]. Most of the time, an arterial line is put in the radial artery, but the femoral artery is a close second [2,5,6]. Through the femoral artery, doctors can do a wide range of diagnostic and research procedures as a matter of course [6]. Some of the procedures that fall under this category (MRI) are angiograms, the insertion of central lines, ultrasonography, Doppler imaging, digital subtraction angiography, and magnetic resonance imaging [6]. Because surgeons and radiologists use the femoral artery and its branches in a wide range of procedures, it is important to know how they are put together [7]. This is because the femoral artery and the branches that come off of it are often used. Also, it is very important to be aware of any changes that might happen in the femoral artery and any of its branches [8]. Clinicians in the age of interventional radiology need to know exactly how

the origins of the profunda femoris, as well as the medial and lateral femoral circumflex arteries, vary from person to person [1, 4, 9, 10]. This is because these differences can have a big effect on the way a patient's treatment turns out. It is hard to find a study in the medical literature that looks at how the femoral, profunda femoris, medial, and lateral femoral circumflex arteries all begin. This will help interventional radiologists figure out if there are any differences in the way it branches. This study will help vascular surgeons understand how a femoral artery with an abnormal branching pattern works so they can take the right steps to fix it. The present study is to determine the anatomical variations of the origins of the Profunda Femoris Artery (PFA), Lateral Circumflex Femoral Artery (LCFA), and Medial Circumflex Femoral Artery (MCFA).

MATERIAL AND METHODS:

The Institutional Ethics Committee has approved this work. Upon approval, this investigation got under way. This cadaveric investigation involved 60 embalmed and formalin-fixed remains from the anatomy departments of Index Medical College & Hospital. Sixty bodies preserved in formalin were used in the investigation (38 male and 22 female).

This cadaveric investigation involved 60 embalmed and formalin-fixed bodies and was completed. The anatomy departments at Index Medical College and Hospital looked at the remains of sixty people (38 males and 22 women). Here is the breakdown of 120 femoral triangles. On the front of the thigh, the skin and uppermost layer of fascia will be sliced and pulled back. To make the cut for the fascia transfer, this was done. To reach the femoral triangle, it is necessary to remove the superficial inguinal lymph nodes and the great saphenous vein. The inguinal ligament is located, then it is taken out of the body and evaluated. To observe the blood vessels inside the femoral artery and its major branches, the femoral sheath must be cut open. The medial and lateral circumflex femoral branches of the profunda femoris artery would be meticulously severed and designated. Then, they are carefully divided. It was done to find out where their adventure had started and where it would end. In addition, they calculated the distance from their starting point to the beginning of the profunda femoris artery and noted their findings. They also determine the distance between their starting point and their destination. Vernier calipers were used to measure the profunda femoris artery close to where it separates from the femoral artery. As a result, the outcomes are more precise. To be used later, the findings of this measurement would be recorded.

RESULTS:

It was found that the PFA originated from the posterolateral aspect of the FA in 36 of the 60 lower limb specimens that were dissected. In 16 of the specimens, it was found that the PFA originated from the posterior side of the FA, and in 8 of the specimens, it was found that the PFA originated from the lateral side. As measured from its beginning, the shortest length of the PFA origin from the MIP was exactly 2.2 centimeters. 5.8 centimeters was the longest length that was measured. It was established that 4.4 centimeters is the length that is most typical. There was a total of six instances, or 4%, in which a high origin of PFA emerged at a distance of 2.2 cm from the MIP.

Table 1: Distance of origin of PFA from MIP

Minimal length	2.2 cm
Maximal length	5.8 cm
Mean length	4.4 cm

Lateral Circumflex Femoral Artery Birthplace:

The typical branching pattern was seen in 42 out of the 60 samples that accounts to 70 %, which suggests that the Lateral Circumflex Femoral Artery (LCFA) derived from the PFA. In 18 out of the 40 cases, or 30 % of the total, the LCFA was derived from the FA. There was a total of 18 samples, and out of those, there were six cases (12%) in which the LCFA and the PFA originated as a Common Trunk (CT) from the FA. The FA was the starting point for all of the samples. Four out of thirty-six samples (6%) had all three LCFA branches emanated directly from the PFA.

Table 2: Lateral Circumflex Femoral Artery (LCFA) origin

Origin of LCFA	Frequency	Percentage
From PFA	42	72%
From FA	18	28%

Table 3: Origin of LCFA from PFA (out of 70 %)

Separate trunk from PFA	**87 %**
Branches of LCFA arising directlyfrom the FA	**13 %**

Table 4: Origin of LCFA from FA (out of 30 %)

Separate trunk from FA	**80 %**
Common Trunk (CT) with PFA	**20 %**

Site of origin of Medial Circumflex Femoral Artery (MCFA)

The MCFA originated from the PFA in 36 out of the 60 specimens that were investigated, while it originated from the FA in 22 out of those specimens (33%). In four of the cases, the MCFA emerged as a CT in conjunction with the PFA.

Table 5: Site of origin of Medial Circumflex Femoral Artery (MCFA)

Site of origin of MCFA	Frequency	Percentage
From PFA	**36**	**67 %**
From FA	**22**	**33 %**

DISCUSSION:

Site of origin of Profunda Femoris Artery (PFA):

The PFA was shown to have originated at the posterolateral aspect of the FA in 42.1% of instances, at the posterior aspect of the FA in 28.5% of cases, at the lateral side of the FA in 18.8% of cases, and at the medial side of the FA in 10.6% of cases, as stated in research [11]. These locations were all thought to be FA locations at one point or another. Based on the findings of a case study [12], researchers arrived to the realization that the PFA on both sides of the FA had their origins on the medial side of the FA. A table was utilized to illustrate these findings. The posterior fascia aponeurotica (PFA) was found to have become detached from the posterior, posterolateral, lateral, and medial sides of the fascia aponeurotica (FA) in 44.64%, 30.36%, 21.43%, and 3.57% of instances, respectively, according to a studies [13-15]. According to the findings of a separate investigation, the PFA was found to have originated from the posterior, posterolateral, and lateral parts of the patient's femoral artery in 8%, 52%, and 40% of the patient's femoral artery, respectively. This was discovered to be the case in terms of the percentage of the patient's femoral artery that was affected [14]. It was observed that the PFA had its roots on the posterolateral side of the FA in 36 out of the 60 lower limb specimens that were subjected to the dissection process. These specimens were taken from different parts of the lower limb. This was the conclusion that was presented to the general public. In eight of the cases, it was found that the PFA began on the lateral side of the FA, whereas in sixteen of the cases, it was found that the PFA began on the posterior side of the FA. In total, twenty-two of the cases involved the PFA. Both of these hypotheses about the beginnings of the story were proven to be correct. In order to minimize the risk of complications during a variety of surgical procedures, such as the replacement of a hip joint, the repair of a femoral hernia, and vascular resectioning, among others, it is essential to have anatomical knowledge of the variations that can be found in the PFA's site of origin and the branching pattern. While performing a femoral puncture, it is helpful to have knowledge about the point of origin of the PFA in order to prevent creating an iatrogenic arteriovenous fistula. This is because an iatrogenic arteriovenous fistula is more likely to occur when the PFA emerges from the medial side of the FA.

Lateral Circumflex Femoral Artery (LCFA) Birthplace:

According to the findings of Sinkeet et al. [16], 65.5% of LCFA is formed from PFA, whereas the remaining 34.5% is derived from FA. CT origin with MCFA accounted for 14.3%, CT origin with PFA accounted for 10.7%, and CT origin as a distinct trunk accounted for 2.4%. There was a trifurcation with PFA and MCFA in 7.1% of the instances that were examined. During the normal dissection of a male corpse, Pooja et al. [17] found a double LCFA on the right side of the body. This was described in their case report. The FA that was located beneath the MIP was the progenitor of the auxiliary LCFA, which in turn was the progenitor of the SEA, the SCIA, and the SEPA. According to the findings of Suthar et al. [18], LCFA was shown to have originated from PFA 80% of the time and FA 20% of the time. In addition, [19] indicated that 90% of the LCFA was derived from PFA, whereas only 10% was derived from FA. The characteristic branching pattern was observed in 42 of the 60 samples, which accounts for 70% of the total, suggesting that the LCFA originated from the PFA. There were a total of 60 samples taken. In 18 out of the 40 instances, or thirty percent of the total, the LCFA was generated from the FA. The total number of samples was 18, and out of those, there were six instances (12%) in which the LCFA and PFA began as a Common Trunk (CT) from the FA. The FA was utilized as the point of departure for all of the samples. Due of its varied evolutionary history, the LCFA is susceptible to iatrogenic damage during surgical procedures such as total hip replacement. The aortopopliteal bypass, coronary artery bypass graft (CABG), and anterolateral thigh flaps are all examples of reconstructive surgical procedures that make use of LCFA branches. It is possible for the descending branch of the LCFA to serve as a collateral vessel in cases where the superficial femoral artery is blocked. LCFA, according to the findings of several studies, has the potential to be utilized in the reconstruction of significant deformities brought on by gunshot wounds to the face. Understanding the LCFA's roots as well as the myriad ways in which its branching pattern can vary is essential in light of the numerous clinical repercussions it might have.

Medial Circumflex Femoral Artery (MCFA) Birthplace:

According to the findings of the study that was carried out by Josh and colleagues [20], the MCFA was derived from the PFA in 67.2% of the cases, while only 32.8% of the cases had the FA being derived. According to the findings of Dixit et al. [11], the PFA was the origin of the MCFA in 56.1% of the cases, the FA in 43.9% of the cases, and the CT in 14% of the cases. According to the findings of a study that was carried out by Mamatha and colleagues [22], the MCFA originates from the PFA in 97.5% of all cases, whilst the FA is to blame for only 2.5% of all occurrences. The point at which the MCFA broke away from the FA was only 3.2 centimeters away from the position at which the PFA did the same thing. In a case study that they conducted, Pullana et al. [21] stated that the posterior region of the PFA is where the origin of the MCFA can be discovered. It is stated that this spot is quite close to the origin of the PFA, which can be discovered directly beneath the inguinal ligament. In this particular instance, the posterior fetal artery (PFA) also functioned as the origin of the deep circumflex iliac artery (DCIA). It was determined that the PFA was the source of the MCFA in 36 of the 60 specimens that were analyzed, whilst the FA was the source of the MCFA in 22 of those specimens (which is equivalent to 33%) respectively. It was determined that the MCFA was present alongside the PFA in the CT capacity in four of the cases. Injuries to the main circumflex femoral artery (MCFA), which is the primary artery that supplies blood to the head and neck of the femur, are common when femoral neck fractures are present. The MCFA is the key blood vessel that serves these areas. While doing trocanteric and intertrocanteric osteotomies, it is extremely necessary to have a comprehensive understanding of the anatomy of the MCFA. An understanding of the branching pattern of the MCFA is required for both the repair of acetabular fractures using posterior approaches and the prevention of iatrogenic vascular necrosis of the head of the femur during hip reconstruction surgery. This understanding can be obtained by studying the pattern itself. Because of this, hip surgeons have a responsibility to be knowledgeable about the several MCFA variants. While doing flap surgery in the upper medial femoral region, it is of the utmost importance to have a solid understanding of the anatomy of the MCFA as well as its pattern of branching. This is because the MCFA is the major blood vessel that supplies the flap.

CONCLUSION:

The origins of the PFA, Lateral Circumflex Femoral Artery, and MCFA vary. Orthopedists and surgeons who perform femoral surgery will benefit from this study. Also, it will be helpful to doctors before interventional treatments and radiologists for picture interpretation.

Conflict of interest: None declared.

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How to Cite:

Vemaiah Adimulam1, Dr.Avantika Bamne2. (2023). Anatomical variations of femoral artery in the site of origin of profunda femoris, lateral circumflex femoral, and medial circumflex femoral arteries. *International Journal of Medical Science in Clinical Research and Review*, *6*(02), Page: 350–355. Retrieved from https://ijmscrr.in/index.php/ijmscrr/article/view/494