International Journal Dental and Medical Sciences Research
Volume 3, Issue 6, Nov-Dec 2021 pp 635-639 www.ijdmsrjournal.com ISSN: 2582-6018

A Study of Anatomical Variations in the Origin of Lateral Circumflex Femoral Arteries in Human Cadavers

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Submitted: 15-12-2021 Revised: 27-12-2021 Accepted: 30-12-2021

ABSTRACT
INTRODUCTION-
In clinical practice, accurate knowledge about the anatomical variations of origin of Lateral circumflex femoris Artery (LCFA) and its branches is important for clinicians for performing aorto popliteal bypass, coronary artery bypass grafting, extracranial-intracranial bypass surgeries and antero-lateral thigh flaps. Knowledge of variations is also useful to avoid iatrogenic vascular necrosis of the head of femur during reconstructive surgery of the hip and operate the acetabular fractures through the posterolateral approach.
OBJECTIVE- To study the anatomical variations of the site of origin of origin of LCFA and to measure the mean distance of LCFA from Profunda femrois artery(PFA) 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,India. 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 LCFA from PFA as well as distance of the origin of LCFA from PFA were noted down.

RESULTS- Out of 50 lower limbs, LCFA originating from Profunda Femoris Artery (PFA) was found in 90% (45/50) of the cases, while in 06%(3/50) it arose as a common trunk with MCFA from PFA. Origins of LCFA as a common trunk along with PFA from FA were found in 2 % of the limbs. Similarly, LCFA was found to have originated as a common trunk with MCFA from FA in 2% of the limbs. The mean distance of the origin of Lateral Circumflex Artery from the profunda Femoris Artery in this study was found to be 20.7mm

CONCLUSION- This study highlights the very unusual variation of the origin of LCFA. The LCFA arising as a common trunk with MCFA from PFA in six (6) percent of the cadavers examined has been very rarely reported in other studies which emphasizes and recommends **that** that surgeon should be careful about the unusual variations while performing invasive procedures in this region.
KEYWORDS—PFA (Profunda Femoris Artery), FA (Femoral Artery), LCFA (Lateral Circumflex Femoral Artery),MCFA- Medial Circumflex Femoral Artery,CT-Common Trunk

I. INTRODUCTION

The Lateral Circumflex Femoral Artery (LCFA) is an artery that arises usually near the root of Profunda Femoris Artery (PFA). It passes between the divisions of the femoral nerve posterior to sartorius and rectus femoris muscle and divides in to ascending, transverse and descending branches. [1]. The LCFA contributes mainly to the blood supply of the muscles in the lateral compartment of the thigh, and to a lesser extent also contributes to the blood supply of the head and neck of the femur. Around the shaft of the femur, the LCFA encircles the superior part of the femoral shaft and anastomoses with the medial circumflex artery of the thigh (MCFA) [2]. The ascending branch supplies the anterior part of the gluteal region, transverse branch winds around the femur, while the descending branch joins genicular peri-articular anastomosis [2]. Therefore, the LCFA contributes to blood supply to the head and neck of the femur, greater trochanter, the vastus lateralis and the knee [3]

In clinical practice, the branches of the LCFA have a variety of functions where it is used in anterolateral thigh flaps [4], aortopopliteal bypass [5,6] coronary artery bypass grafting [7] and extracranial-intracranial bypass surgeries [8]. Arterial grafts provide better patency rates for coronary artery bypass grafting than saphenous veins in both the short and long term [9].

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Convincing evidence from previous studies [10,11] suggest that injury to the lateral femoral cutaneous nerve (LFCN) and LCFA are the major drawbacks in performing hip arthoplasty through the anterior approach. Inadequate knowledge of the anatomy of the anterior thigh relating to the anterior approach to hip arthroplasty could possibly lead to intra-operative bleeding if the ascending branch of the LCFA is transected by mistake [12,13]. Therefore, a accurate knowledge of the anatomy of this region is crucial as lives of patients could be lost if the surgeon transects vessels which could otherwise be circumvented. This article therefore explores the variations of the LCFA.

II. 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 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 LCFA was noted down after blunt and fine dissection and the distance of origin of LCFA from the PFA was measured with a scale and slide caliper in millimeter (Fig-1) and was categorized to five groups of 10 mm range. The variations regarding site of origin of the LCFA 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)

III. RESULTS

In the present study, out of 50 lower limbs, LCFA originating from PFA(Fig-2) was found in 90% (45/50) of the cases, while in 06%(3/50) it arose as a common trunk with MCFA from PFA(Fig-3). Origins of LCFA as a common trunk along with PFA from FA were found in 2 % of the limbs.(Fig-4). Similarly, LCFA was found to have originated as a common trunk with MCFA from FA in 2% of the limbs (Fig-5).

The distance of origin of LCFA from profunda femoris artery varied between 02mm to 50 mm in this study. It was found in the range between 31-40 mm in 33 percent of the limbs whereas in 31 percent it was noted to be in the range between 21-30 mm. High origin of LCFA (up to 20mm from the PFA) was observed in 34 percent out of which it was found in between 01-10 mm in 18% while in 16% it was between 11-20 mm. In between 41- 50 mm it was found to be as low as 2 percent. The mean distance of the origin of lateral circumflex artery from the profunda Femoris Artery in this study was found to be 20.7mm

Figure-1: Showing measurement of lateral circumflex femoral artery from profunda femoris artery

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Figure-2: Showing origin of lateral circumflex femoral artery from profunda femoris artery

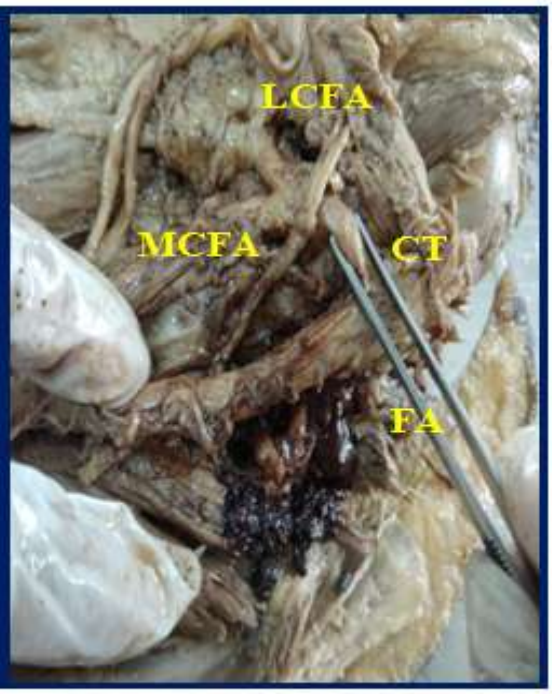

Figure-3: Showing origin of Lateral Circumflex Femoral Artery as common trunk with Medial Circumflex Femoral Artery from Femoral Artery

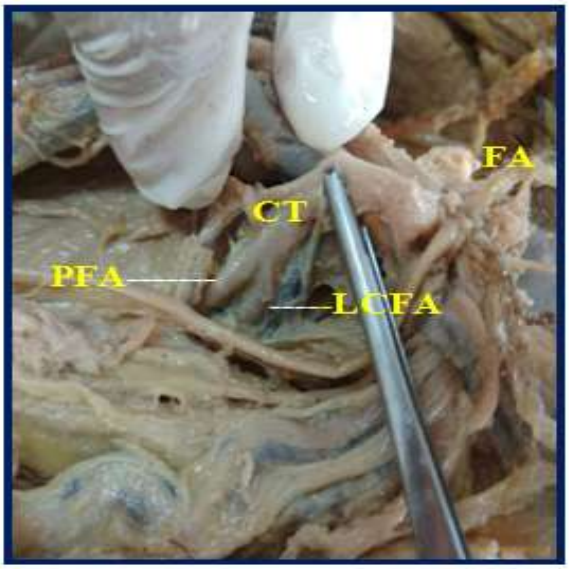

Figure-4: Showing origin of lateral circumflex femoral artery from common trunk along with profunda femoris artery from femoral artery.

Figure-5:
Showing origin of lateral circumflex femoral artery coming out from common trunk along with medial circumflex femoral artery from profunda femoral artery

IV. 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 the lateral circumflex femoral artery mostly (90%) originated from the profunda femoris artery. This is similar to that reported by Chauhan et al [20] , Manika et al [21], Jana, Giri et al. [19] who found these results to be 90%, 87% and 91% respectively .In the studies by N mogale et al, [22] , Prakash et al[17], and Dixit et al [14] LCFA originating from the PFA was found in 78.9%, 81.25% and 83.34% respectively which was lower than the present study. In 04 % of the specimens it originated from Common Femoral Artery, out of which it arose as a common trunk with MCFA (2%) while in other 02 % it arose as common trunk with PFA. These findings are comparable to that found by Manika et al [21], Jana,Giri et al [19] and Chauhan et al [20] and Vaibhav Anjankar et al. [18] who had reported LCFA originating from Femoral Artery in 09%,07% and 9.8% and 8.33% of cases respectively. Dixit et al [14] also observed that LCFA originated from Femoral Artery in 5.2% However, it is lower than reported by Prakash et al [17] (18.75%) and Uzel [16] (22.7.1%). In the remaining 2% of cases it originated as a common trunk with MCFA from Profunda Femoris Artery. The average distance of the origin of Lateral Circumflex Artery from the Profund Femoris Artery in this study was found to be 20.7mm which is comparable to the observation made by Prakash et al [17] (25mm),Sidarth et al [15] (15mm), Chauhan et al [20] (18.4mm) . However it was found to be much higher at 48 mm by Uzel [16] et al in Turkish population,

V. CONCLUSION

The knowledge of variations in the origin of lateral circumflex femoral artery is extremely valuable in preventing iatrogenic injury to these vessels during surgical procedures around the femoral triangle. In this study it was found that in as high as 90% of the cases, LCFA originated from PFA, while in 06% it arose as a common trunk with MCFA from PFA. Origin of LCFA as a common trunk along with PFA from femoral Artery and as a common trunk with MCFA from femoral artery were also found and was noted to be similar at as low as 2.0% . The mean distance of the origin of lateral circumflex artery from the profunda femoris Artery in this study was found to be 20.7mm

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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