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CASE REPORT

Unusual disposition of lateral circumflex femoral artery: Anatomical description and clinical implications

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Abstract

The anatomical knowledge of arterial variations of lower limb is of utmost significance for the present day surgeons and interventional radiologists for minimizing complications during vascular reconstructive procedures, catheterization procedures and surgical intervention for embolism. Lateral Circumflex Femoral Artery (LCFA) is an important branch of Profunda Femoris artery and precise knowledge of its variations can be of great relevance during surgical and radiological procedures in femoral region. The present study reports a unique case of anomalous route taken by LCFA posterior to femoral nerve associated with a prominent muscular branch from Femoral artery mimicking the course of LCFA. Documentation of such variations is highly significant. It may serve as guideline for surgeons in reducing the incidence of postoperative complications where LCFA is used as a long vascular pedicle in anterolateral perforator thigh flap and in breast reconstruction after mastectomy. Ignorance of such variations can lead to fatal intraoperative haemorrhage and incapacitating sensory and motor deficit due to injury to femoral nerve branches which are closely related to these vessels.

Key words: Lateral circumflex femoral artery; Femoral nerve; Femoral artery; Angiography; Reconstructive surgical procedures; Surgical flaps

Core tip: The knowledge of variations in site of origin and course of the Profunda femoris artery and its circumflex branches is of utmost clinical significance during diagnostic imaging procedures and surgeries performed in the femoral triangle. The present study highlights an abnormal course of the lateral circumflex femoral artery (LCFA) posterior to the femoral nerve associated with a significant muscular branch of femoral artery which mimicked the course of LCFA. Knowledge of such variations maybe of great help to surgeons, interventional radiologists and physicians in reducing the chances of intraoperative secondary haemorrhage and postoperative complications.

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INTRODUCTION

Arterial variations of lower limb have always been of utmost importance due to their involvement in vascular reconstructive surgeries, catheterization procedures and in raising myocutaneous flaps with vascular pedicles. The recent use of lateral circumflex femoral artery (LCFA) in coronary artery bypass grafting as well as anterolateral thigh cutaneous flaps for oral and oropharyngeal reconstructions has further enhanced the relevance of normal and variant anatomy of LCFA. In view of anatomical variations, preoperative angiographic evaluation of femoral arterial system becomes mandatory in surgical procedures involving the LCFA. Literature reports several variations in origin of LCFA[1,2]. However reports of variant course of LCFA as described in the present study are few.

CASE REPORT

In a unique case, during cadaveric dissection, variant course of LCFA was detected in the right lower extremity of a 53 years old adult Indian male cadaver.

The Profunda Femoris Artery (PFA) took origin as usual from the Femoral Artery (FA), at a distance of 5 cm from the mid inguinal point. At a distance of 7 cm from the same anatomical landmark, LCFA was seen to arise from PFA (Figure 1). LCFA traversed deep to the posterior division of femoral nerve unlike its usual course anterior to the latter. Coursing for 2 cm, the LCFA divided into ascending, transverse and descending branches each of which also traversed behind the posterior division of femoral nerve (Figure 2). The trifurcation of LCFA was immediately posterior to the site where the posterior division of Femoral Nerve (FN) divided into multiple muscular branches.

A prominent muscular branch was given off from FA, 3 cm distal to origin of PFA and 1.5 cm distal to LCFA. This branch traversed parallel to LCFA, mimicked the usual course of latter and passed laterally between the branches of posterior division of Femoral Nerve. The proximal part of the muscular branch was deep to the posterior division of femoral nerve while the terminal branches coursed between the saphenous nerve (SN) and never to vastus lateralis (NVL). Interestingly, this muscular branch arising from FA, appeared to take the course normally taken by LCFA, between divisions of femoral nerve before it terminated by supplying the Vastus Lateralis muscle (Figures 1 and 2).

DISCUSSION

Anatomical knowledge of LCFA including its variations has gained significant importance with the involvement of LCFA in anterolateral thigh free flap[3], aortopopliteal bypass[4] and extracranial intracranial bypass surgery[5]. With the advent of novel harvesting and reconstructive techniques, precise anatomical knowledge of LCFA becomes further important.

The LCFA, commonly a branch of PFA, traverses between divisions of FN, posterior to Sartorius and Rectus Femoris muscles. Coursing behind these structures it divides into ascending, transverse and descending branches. The LCFA contributes blood supply to head and neck of femur, greater trochanter, vastus lateralis and knee joint[6].

Literature reports the use of descending branch of LCFA as a collateral[7] and use of ascending branch in vascularised iliac transplantation[8]. Variations in the origin of LCFA have been reported in cadaveric[9] as well as angiographic studies[10]. However our study is unique as it reports an unusual route taken by LCFA, posterior to the posterior division of femoral nerve and additional presence of a prominent muscular branch of FA which mimics the normal route of LCFA, coursing between the branches of femoral nerve to terminate in vastus lateralis.

Anomalous route of LCFA is of utmost importance to surgeons while raising free rectus femoris muscle flaps with a branch of posterior division of FN, for one stage reconstruction of facial paralysis[11]. Awareness of such anatomical variations as reported in our case may prevent inadvertent injury to LCFA while handling the branches of femoral nerve.

Preoperative anatomical assessment of LCFA through arteriographic study is also essential. The LCFA is frequently explored for its use as new arterial graft for coronary artery bypass grafting[12]. During such surgical procedures, an atypical course of LCFA may lead to an unfortunate sequel of injury to branches of femoral nerve traversing in front of LCFA.

The femoral nerve block is routinely given at a site just above the origin of PFA during knee replacement surgery. Ignorance of the presence of LCFA behind the posterior division of femoral nerve may lead to misinterpretation of absence of LCFA behind the latter and hence consequential accidental injury to LCFA. Exploration of femoral nerve for anaesthetic procedures, therefore, requires awareness of variant course of LCFA in relation to femoral nerve.

Racial differences in direct origin of LCFA from FA have been reported[13]. Studies also report anatomic pattern and calibre of both LCFA and perforators nourishing the anterolateral thigh flap[1]. However, variations in course of LCFA are few. Knowledge of arterial variations is extremely important as these may be the source of intraoperative iatrogenic haemorrhage or post operative complications. Arterial variations of lower extremity as reported in the present case are also important because of their close association with repair of femoral hernias.

Literature reports cadaveric and angiographic studies involving LCFA. Angiographic studies are of utmost importance although difficulties may be encountered

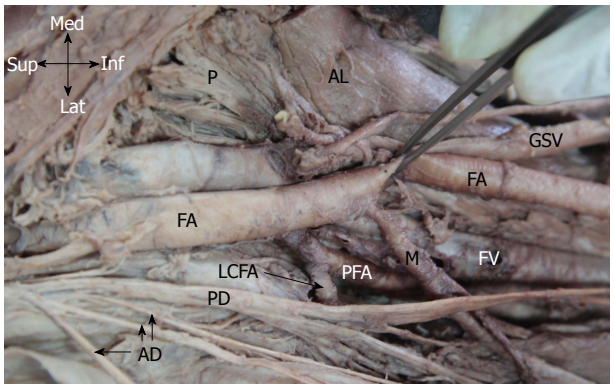

Figure 1 Right femoral region showing. Med: Medial; Lat: Lateral; Sup: Superior; Inf: Inferior; FA: Femoral Artery; FV: Femoral Vein; GSV: Great Saphenous Vein; AL: Adductor longus; P: Pectineus; PFA: Profunda femoris artery; LCFA: Lateral circumflex femoral artery; PD: Posterior division of femoral nerve; AD: Anterior division of femoral nerve; M: Muscular branch of FA.

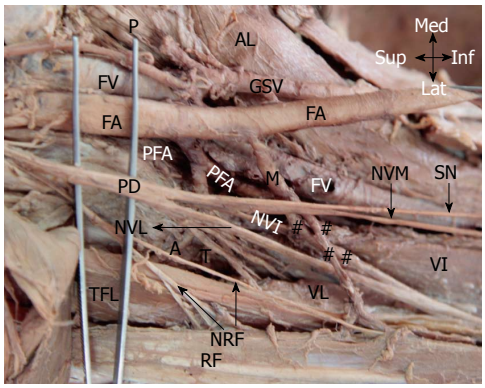

Figure 2 Right femoral region showing. Med: Medial; Lat: Lateral; Sup: Superior; Inf: Inferior; FA: Femoral Artery; FV: Femoral Vein; GSV: Great Saphenous Vein; AL: Adductor longus; P: Pectineus; PFA: Profunda femoris artery; LCFA: Lateral circumflex femoral artery; PD: Posterior division of femoral nerve; M: Muscular branch of FA; TFL: Tensor fascia lata; RF: Rectus femoris; VI: Vastus intermedialis; VL: Vastus lateralis; NVM: Nerve to vastus medialis; SN: Saphenous nerve; NVL: Nerve to vastus lateralis; NVI: Nerve to vastus intermedius; NRF: Nerve to rectus femoris; #: Terminal branches of M; A: Ascending branch of LCFA; T: transverse branch of LCFA.

while defining route and branches of LCFA on angiography. Our study describes variant course of LCFA associated with a prominent muscular branch from FA mimicking the usual route of LCFA. Reports of such cases may be of great importance in bridging the gap between cadaveric and angiographic studies of LCFA.

In aortoiliac occlusive diseases, bypass to the PFA or FA has emerged as a suitable mode of treatment. But in patients with total occlusion of femoral artery as well as profunda femoris artery, bypass to the LCFA was found to be successful[14]. Hence, knowledge of course and branching pattern of LCFA, as reported in our case is extremely important in management of patients with multilevel occlusive diseases of iliac and femoral arteries.

Anatomical knowledge of branches of LCFA is also important while using sharp ended version guidewires during hip fracture surgery[15]. Such surgical procedures, involving exploration of branches of LCFA, may lead to iatrogenic injury to the ascending branch of LCFA because of its variant course behind the femoral nerve.

In the present case, the main trunk of LCFA, as well as its ascending, transverse and descending branches coursed behind the posterior division of femoral nerve. At the same time a prominent muscular branch of FA was seen mimicking the usual course of LCFA, by coursing between the branches of posterior division femoral nerve. Knowledge of such variations is important in surgical transplantation procedures where the branches of LCFA are of utmost use. It may simplify the procedure of flap dissection involving LCFA, especially when anterolateral thigh flap is the easiest and has the least morbidity[16].

Developmental arrests at different stages may lead to anatomical variations related to branches of femoral artery. Vasculature development in the lower limb is preceded by morphological and molecular changes that occur in the limb mesenchyme, therefore variations in vascular pattern are often recorded[17].

With increasing challenges in the field of surgery and occurrence of uncommon anatomic variations, it becomes imperative for the present day surgeons, interventional radiologists and anatomists to be aware of anatomical variations of LCFA - its variant course and muscular branches mimicking the normal course of LCFA. Ignorance of such variations can not only lead to fatal intraoperative haemorrhage but also injury to the branches of femoral nerve which are in close relation to these vessels. Such avoidable femoral nerve lesions can lead to incapacitating sensory and motor deficit. Our study is a sincere effort in this field for minimizing injury to vital structures of lower limb like the femoral nerve and the lateral circumflex femoral artery. We, as anatomists, humbly submit that awareness of vascular variations as encountered in our study is of tremendous significance for successful reconstructive procedures of the region.

COMMENTS

Case characteristics

Anomalous route taken by lateral circumflex femoral artery (LCFA) posterior to femoral nerve and presence of a prominent muscular branch from Femoral artery mimicking the course of LCFA.

Clinical diagnosis

Arterial variants as reported in the present study are of utmost significance in anterolateral thigh flap surgeries, coronary artery bypass grafting and femoral nerve block in knee surgeries.

Differential diagnosis

Anatomical awareness of variant course of LCFA associated with a prominent muscular branch from Femoral Artery (FA) mimicking the course of LCFA is imperative for vascular surgeons and interventional radiologists. The muscular branch of FA can be mistaken for LCFA leading to the accidental ligation of the wrong vessel.

Related reports

Literature reports several variations in origin of LCFA. However reports of variant course of LCFA as described in the present study are few. This vessel as well as its branches are now extensively used in reconstructive and bypass surgeries.

Term explanation

LCFA normally courses in between the branches of Femoral Nerve.

Experiences and lessons

Ignorance of such variations can lead to fatal intraoperative haemorrhage and incapacitating sensory and motor deficit.

Peer review

This article highlights the importance of vascular variations of lower limb encountered in cadaveric studies and its application in surgery, anaesthesiology and interventional radiology.

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