

## Bilateral anomalous origin of the medial circumflex femoral artery : a case report

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### Abstract

**Aim :** The femoral artery (FA) and its branches play important roles in the arterial supply of the lower extremity. If the femoral artery is occluded, the circulation of the extremity is maintained by certain anastomoses. Therefore, identification of variations of these arteries is critical from a clinical and surgical point of view.

**Method :** Present study was done during routine dissections at the Department of Anatomy, Government Medical College and Hospital, Chandigarh, India.

**Observations:** A bilateral variation of the medial circumflex femoral artery (MCFA) was observed in a formalin-fixed cadaver. In this case, on the right side MCFA branched off from the posterolateral aspect of the FA and on the left side artery arose from the common trunk of femoral artery with the deep femoral artery.

**Conclusion :** The morphological knowledge will help the surgeons to avoid complications like catastrophic bleeding and diagnostic misinterpretations

**Keywords:** Deep femoral artery, Femoral artery, Medial circumflex femoral artery, Lateral circumflex femoral artery.

### Introduction

Medial circumflex femoral artery is a branch of profundafemoris artery (also known as deep femoral artery ,DFA). It arises from the posteromedial aspect of the profundafemoris artery in the femoral triangle, at the level of the lateral circumflex femoral artery (LCFA), travels between the psoas major and pectineus muscles. It is an important artery in supplying blood to the head and neck of the femur, to the adductor muscles and to fatty tissue in the acetabular fossa. Because of its close relationship with this area there is a high risk of severing the artery after trauma or during operations such as total hip arthroplasty. At the upper margin of the adductor magnus, it gives off its transverse and ascending branches which anastomoses with the LCFA, inferior gluteal artery, and the first perforating branch of the deep femoral artery<sup>1</sup>. This anastomosis within the intertrochanteric fossa is known as the cruciate anastomosis. In case of an occlusion of the FA, the circulation of the lower extremity is accomplished via this anastomosis<sup>2,3</sup>.

The morphological knowledge of the branching pattern of FA is essential to the surgeons and radiologists, as this particular arterial system is often assessed in procedures like coronary angioplasty. The knowledge about anatomical variations in this arterial system including the MCFA and LCFA may prevent the intraoperative complications like catastrophic bleeding and haemorrhagic shock<sup>4</sup>.

### Material and Methods

Bilateral anomaly of the MCFA was observed during routine dissection in the lower limbs of an adult male formalin-fixed cadaver in the Department of Anatomy ,Government Medical College & Hospital, Chandigarh. Dissection of femoral artery and its branches were carried out on both the sides. Origin, course and branching pattern

of the middle circumflex artery were observed on the both limbs. Measurements were taken with the help of digital vernier caliper. Photographs of the dissected parts were taken.

### Observations

We observed the right MCFA branched off from the posterolateral aspect of the femoral artery, 30.18mm distal to the inguinal ligament (Fig 1). The diameter of the MCFA at its origin and at the point where it entered b/w pectineus and adductor brevis was 6.75 and 4.81 mm, respectively. After branching off from the femoral artery, the MCFA ran on the anterior surface of the pectineus muscle for about 36.33 mm, passed posterior to femoral vein and finally entered into the gap between pectineus and adductor brevis and soon bifurcated into ascending and transverse branches. The diameter of the MCFA gradually decreases towards its termination. The diameter of the femoral artery before and after it gave off the MCFA was 12 mm and 10.71 mm respectively. The origin of the DFA was 48.33 mm distal to the inguinal ligament and the diameter of the artery was 9.17mm. The origin of the LCFA was 24.65 mm away from the origin of DFA and 46.09 mm away from the origin of the MCFA. The diameter of LCFA was measured to be 5.47 mm.

On the left side the MCFA arose from the common trunk of femoral artery with the deep femoral artery at a distance of 33.14 from the inguinal ligament, which was a little lower than the right artery (Fig 2). The diameter of left MCFA at its origin was 6.61 mm and at the point of passage between the pectineus and adductor brevis was 5.49mm. It travelled for a distance of 22.67 mm on the anterior aspect of the pectineus, passed posterior to the femoral vein and finally entered into

the gap between pectineus and adductor brevis and terminate by divided into ascending and transverse branches. The diameter of the femoral artery before and after it gave off the MCFA was 10.78mm and 8.50 mm respectively. The origin of the DFA was 40.85 mm distal to the inguinal ligament and the diameter of the artery was 9.53 mm. The origin of the LCFA was 23.75 mm away from the origin of DFA and 23.14 mm away from the origin of the MCFA. The diameter of LCFA was measured to be 6.24 mm. Another observation made that MCFA was more in diameter as compare to the LCFA on both the sides.

**Development**

Variations in the arterial supply of the lower extremity are the result of anomalies during embryological development. The first vessels to develop in the extremities are the primary axial artery, which drains to the peripheral marginal sinus, and its branches. With the development of the extremities, new vessels bud off from existing vessels and the distribution of the vessels undergoes changes. The arterial system of the lower extremity starts to develop when the embryo is 6 mm in length and ends at intrauterine 3 months. When the embryo is 9 mm, the sciatic artery arising from the posterior root of the umbilical artery comprises the main artery of the lower extremity. In mammals, the FA, which is the continuation of the external iliac artery and it is main artery of the lower extremity. The primary axial artery is represented by the DFA at the thigh. When the embryo grows to 14 mm in length, anastomoses between the femoral and sciatic arteries occur around the adductor canal. Parallel to the development of the FA and its branches, the upper part of the sciatic artery persists as the inferior gluteal artery. In accordance with embryological descriptions of other authors, the MCFA appears as an independent vessel from the rete femorale, the blood flow destined for its territory makes an unusual choice of source channels, and instead of arising from the posteromedial aspect of the FA as is usual, it arises from the posterolateral aspect of the FA. Alterations during this complex developmental stage could result in many variations in the lower extremity<sup>3</sup>.

**Discussion**

The MCFA is the main artery that supplies the femoral head and neck and it is usually injured during femoral neck fractures. Therefore, clinicians and surgeons who are interested in this region should be familiar with the variations of this artery. Aseptic necrosis of the femoral head could occur after femoral neck fractures<sup>5</sup>. In literature the origin variability of MCFA was divided into two group i.e from the deep femoral artery and from femoral artery (Table 1).

One of the study describes a case in which the artery ran along the anterior surface of the pectineus muscle, lying on the medial side of the femoral nerve it crossed the FA deeper to it and passed between the psoas major and pectineus muscles<sup>18</sup>. In the present case the MCFA travelled along the anterior aspect of the pectineus, passed posterior to the femoral vein and entered between pectineus and adductor brevis instead of passing between psoas major and pectineus and terminate by divided into ascending and transverse branches on both sides.

In previous study the average distance of MCFA from the origin of DFA was 1.99±0.68cm.the average distance from midpoint of inguinal ligament was 4.5±1.62cm<sup>19</sup>. In the current study distance between DFA and MCFA was measured to be 46.09 mm on the right side and 23.14 mm on the left side. Distance between MCFA and inguinal ligament was 30.18 mm on the right sided and 33.14 mm on the left side. Higher origin of MCFA makes it prone to damage when the femoral artery is punctured for various cardiac interventional procedures or it may be damaged while collecting blood in infants from the femoral vein. In a study by E.Ciftcioglu.et al 2009 diameter of MCFA at origin was 6 mm.We observed the diameter on the right side was 6.75 mm and on the left side was 6.61mm which is slightly more than the previous study.

**Conclusion**

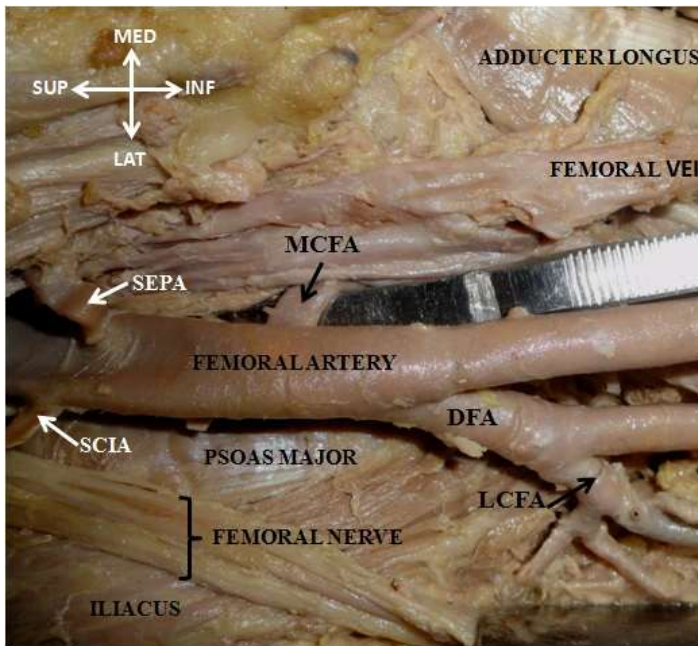
Comprehensive knowledge of the extracapsular anatomy of the MCFA (origin, course, and branches) would safeguard against avascular necrosis of the femoral head when the posterior approach is required in procedures such as reconstructive surgery of the hip and acetabular fracture fixation<sup>20</sup>. Similarly, knowledge of the anatomy of the MCFA and its branches is critical during flap surgery to be performed in the upper medial femoral region<sup>21</sup>.Present case shows origin of MCFA from rete femorale at variable distances bilaterally.

**Acknowledgement**

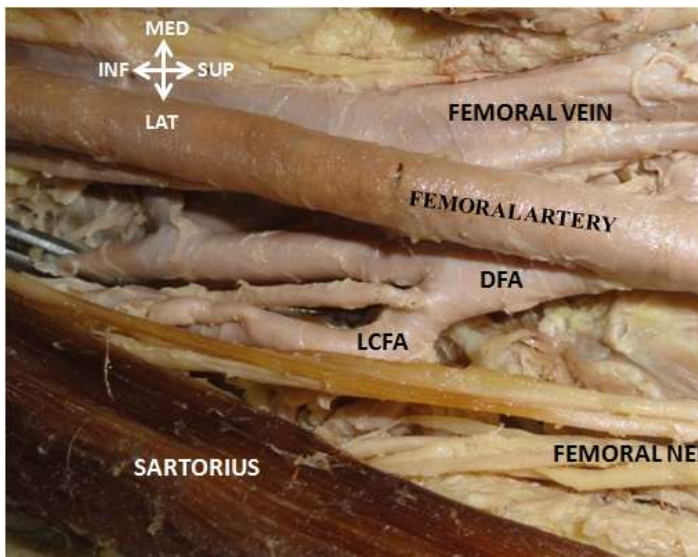
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Study	femoral artery	Deep femoral artery	Incidence% Common
	16.7		83.3
Gautier et al. 2000 <sup>20</sup>			
	20.63		62.5
Dixit et al. 2001 <sup>6</sup>			
	48.9		51.5
Başar et al. 2002 <sup>7</sup>			
	15		79
Tanyeli et al. 2006 <sup>8</sup>			
	77.8		22.2
Vazquez et al2007 <sup>9</sup>			
	31		62
Samarawickrama2009 <sup>10</sup>			
	32.8		67.2
Prakash et al. 2010 <sup>11</sup>			
	38.6		61.4
Dixita et al. 2011 <sup>12</sup>			
	33.3		59.9
Lalović et al. 2013 <sup>13</sup>			
	20		75
Peera & Sugavasi 2013 <sup>14</sup>			
	18.4		65
Shiny Vinila et al. 2013 <sup>15</sup>			
	18		82
Pawan P.2014 <sup>16</sup>			
waseem.2015 <sup>17</sup>			

**Table 1:** The incidence of variable origin of medial circumflex femoral artery in series study. (courtesy by Waseem Al Talalwah)



**Fig1:** The medial circumflex femoral artery arising deep from the femoral artery on the right side. MCFA-Medial circumflex femoral artery, DFA-Deep femoral artery, LCFA- Lateral circumflex femoral artery, SEPA-Superficial external pudendal artery, SCIA-Superficial circumflex iliac artery



**Fig 2 :** The medial circumflex femoral artery arising from the common trunk of femoral artery with the deep femoral artery on the left side. MCFA-Medial circumflex femoral artery, DFA-Deep femoral artery, LCFA-Lateral circumflex femoral artery

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