



## A STUDY OF VARIATIONS IN THE ORIGIN OF MEDIAL CIRCUMFLEX FEMORAL ARTERY.

### Surgery

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### ABSTRACT

The course and ramification of the lower limb vessels have received attention from anatomists and surgeons. There is a high risk of damage to the medial circumflex femoral artery after trauma, during surgery such as hip arthroplasty. This study was done in 50 adult lower limb specimens from 25 human cadavers in the Institute of Anatomy, Madras Medical College, Chennai by direct dissection method. The aim of this study was to determine the pattern of origin of MCFA and to find the distance of origin of MCFA from midpoint of the inguinal ligament; the mid inguinal point and from the origin of profunda femoris artery. The results were discussed in the article. Knowing the origin variability of the medial circumflex artery may help to avoid iatrogenic fault in several procedures to protect the vascular supply of the lower limb.

### KEYWORDS

medial circumflex femoral artery, profunda femoris artery, femoral artery.

#### 1. Introduction:

The course and ramification of the lower limb vessels have received attention from anatomists and surgeons. The medial circumflex femoral artery usually originates from the postero medial aspect of the profunda femoris artery, but often it originates from the femoral artery itself [1]. Medial femoral circumflex artery is a vital artery supplying the head and neck of femur, adductor thigh muscles and adipose tissue in the acetabular fossa. Because of its close relationship with these structures there is a high risk of damage to the artery after trauma, during surgery such as total hip arthroplasty. So it is important to avoid injury to MCFA during surgery to prevent necrosis of the femoral head.

Medial circumflex femoral artery has a great importance in the plastic surgery as a vascular pedicle content, such as the transverse upper gracilis(TUG) flap, and medial circumflex femoral (gracilis) perforator free flap.

Because of all these reasons we have made an attempt to study the variations in the origin of medial circumflex femoral artery.

#### 2. Aims and Objectives:

The aim of this study was

- [i] To determine the pattern of origin of MCFA,
- [ii] To find the distance of origin of MCFA from the midpoint of the inguinal ligament
- [iii] To find the distance of origin of MCFA from the MIP.
- [iv] To find the distance of origin of MCFA from the origin of profunda femoris artery.
- [v] To help the surgeons, orthopedicians, radiologists and clinicians to be familiar with the variations of MCFA while performing osteotomies and to avoid iatrogenic avascular necrosis of the head of the femur

#### 3. Material and Methods:

The study material consisted of 50 adult lower limb specimens from 25 adult human cadavers allotted for dissection to the I MBBS students in the Institute of Anatomy, Madras Medical College, Chennai. The method adopted for study was direct dissection method. A horizontal incision was made from the anterior superior iliac spine to the pubic tubercle. A vertical incision was put from the pubic tubercle to the medial femoral condyle. Another horizontal incision was put at the level of tibial tuberosity. The skin and the superficial fascia was reflected. The femoral artery was identified and then the profunda femoris artery and its branches were traced. The MCFA was identified and the pattern of its origin was noted. Then the distance between the origin of MCFA to the mid point of the inguinal ligament, mid inguinal point and to the origin of profunda femoris artery were measured. All the measurements were taken to the nearest millimetre using the vernier callipers which is accurate to 0.1 millimetre. Microsoft office excel 2007 computer program was used to calculate the mean value of the measurements.

#### 4. Observations:

The origin of mCFA was recorded in all 50 specimens.[Table-1]. In 42 specimens MCFA was originating from the PFA [84%]. [Figure-1]

In 6 specimens MCFA was originating from the femoral artery as a single trunk [12%]. [Figure -2]

In 2 specimens MCFA was originating as a common trunk from the femoral artery along with PFA.[4%] [Figure -3]

**Table-1 Pattern of origin of MCFA in the present study**

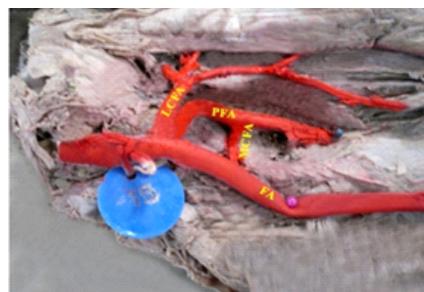
s.no	Parameters	Result
1.	Origin of MCFA from PFA	84%
2.	Origin of MCFA from FA [including common trunk]	12%
3	common trunk of origin of MCFA with PFA	4%

The distance from the point of origin of MCFA to the mid inguinal point, mid point of the inguinal ligament and the point of origin of profunda femoris artery was measured using vernier calipers and was tabulated.[Table-2]. The mean value was found using Microsoft office excel 2007 program.

**Figure -1. MCFA Originating from PFA**



**Figure 2 –MCFA Originating from FA**



**Figure -3 –MCFA originating from FA as a common trunk with PFA.**



**Table-2. Distance between the origin of MCFA and MIP; Mid point of Inguinal Ligament AND PFAO.**

Parameters	When MCFA arises from PFA	When MCFA arises from FA
Mean distance from the MCFAO and MIP	5.2 cm	4.7 cm
Mean distance from the MCFAO and the mid point of inguinal ligament	56.3mm	43.2 mm
Mean distance from MCFAO and PFAO	2.6 cm	2.7 cm

**5. Discussion**

Embryologically the primary axial artery is a chief artery of the lower limb. During lower limb development, new vessels develop and distribute in bud. Based on sideways theory, the femoral system develop as the sciatic artery regresses. The medial circumflex femoral artery developed independently from the rete femorale as a result of the blood flow projected in unusual region leading to unusual choice of source channels. This could explain the unusual origin, site of medial circumflex femoral artery from the posterolateral instead of posteromedial aspect of the femoral artery usually. Therefore, anatomical variation results in diverse supply of lower extremity. Therefore, the variability of the medial circumflex femoral artery

**Table-3. Origins of MCFA from PFA**

	Authors	NO.OF LL DISSECTED	From PFA
1.	Ercan tanyeli [3]	100	79%
2	MB Samarawickrama [4]	26	62%
3	Mamatha et al [5]	40	87.5%
4.	Danish anwer et al [6]	60	73.3%
7	Siddharth et al [9]	100	63%
8	Prakash et al [10]	64	67.20%
9	Shiny vinila [11]	27	66%
10	Sowmiya et al[12]	50	92%
11	Nenad lalovic[13]	42	59.5%
12	Pavan P Havaladar [14]	50	41
13	Vaishali [15]	103	
14	Gautier e et al [16]	24	83.3%
15	Clarke SM et al [17]		53%
16	Waseem al talalwah[2]	342	57%
17	Present study	50	84%

in origin and its level in relation to deep femoral arteries is due to embryonic development of the primitive plexus of the femoral trees and the primitive artery regression either completely or incompletely [2].

The table.3 gives the comparison of the present study with other studies on the site of origin of MCFA from PFA.

**[I] PATTERN OF ORIGIN OF MCFA**

In the present study in 42 specimens MCFA was originating from the PFA [84%]. In 6 specimens MCFA was originating from the femoral artery as a single trunk. [12%]. In 2 specimens MCFA was originating as a common trunk from the femoral artery along with profunda femoris artery[4%].

**[ii] Origin of MCFA from the Profunda Femoris Artery[Table.3]**

According to Clarke sm et al, Waseem et al and Nenad lalovic et al the incidence of origin of MCFA from PFA is 53%, 57% and 59.5% respectively .

According to Samarawickrama et al, Siddharth et al, Elizabeth et al, Shiny vinila et al and Prakash et al the incidence of origin of MCFA from PFA is 62%, 63%, 64%; 66%; and 67.2% respectively.

According to Danish anwer and Ercan tanyeli it is 73.3% and 79% respectively.

According to Gautier et al; Mamatha et al and Sowmiya et al it is 83.3%; 87.5% and 92% respectively. In the present study the incidence of origin of MCFA from PFA is 84%. So the present study coincides with the finding of Gautier et al and is very close to Mamatha et al and Ercan tanyeli but differs with other authors findings.

**[iii] Origin of MCFA from the Femoral Artery- [Table.4]**

According to Gautier et al; Ercan tanyeli et al; Siddharth et al; Waseem et al and Clarke e al the incidence of origin of MCFA from femoral artery including the common trunk is 16.7%; 21%; 37%; 39.3% and 47% respectively. In the present study the incidence of origin of MCFA from femoral artery including the common trunk is 16%. So the present study coincides with the finding of Gautier et al and is very close to Ercan tanyeli, but differs from other authors findings.

**[iii] Origin of MCFA from the Femoral artery as a common trunk with PFA [Table-4]**

According to Ercan tanyeli et al, Nenad lalovic et al Elizabeth et al and Samarawickrama, the incidence of origin of MCFA from the femoral artery as a common trunk with PFA was 2%; 2.4%; 4%; and 8%. In the present study the origin of MCFA from the femoral artery as a common trunk with PFA was from 4%. So the present study coincides with the study of Elizabeth, and is very close to Ercan tanyeli and Nenad lalovic, but differs with the finding of Samarawickrama.

**Table-4. Comparison of Origin of MCFA from FA as a single trunk and as a common trunk with PFA**

s.no	Authors	From FA including common stem	CT from FA with PFA
1.	Ercan tanyeli [3]	21%	2%
2	MB Samarawickrama[4]		8%
3	Elizabeth et al [8]		4%
4	Siddharth et al [9]	37%	
5	Nenad lalovic [13]		2.4%
6	Gautier e et al [16]	16.7%	
7	Clarke SM et al [17]	47%	
8	Waseem al talalwah [2]	39.3%	
9	Present study	16%	4%

**[iv] Distance between the origin of MCFA from the mid point of the inguinal ligament :**

According to Rakesh kumar et al and Shiny vinila et al the mean distance between the origin of MCFA from the mid point of the inguinal ligament was 42.62 mm and 4.5 +/- 1.62 cm. Nenad lalovic et al found that the mean distance between the origin of MCFA from the mid point of the inguinal ligament when MCFA arises from FA was 44.2 mm and the mean distance between the origin of MCFA from the mid point of the inguinal ligament when MCFA arises from PFA was 57.9mm. In the present study the mean distance between the origin of MCFA from the mid point of the inguinal ligament when MCFA arises from FA was 43.2 mm and the mean distance between the origin of MCFA from the mid point of the inguinal ligament when MCFA arises from PFA was 56.3 mm. Therefore the present study coincides with the findings of the above authors.

**[v] Mean distance between the origin of MCFA from the mid inguinal point :**

According to Shaik Mohammad Peera [18] the mean distance between the origin of MCFA from the mid inguinal point when MCFA arises from FA was 2.68 cm and mean distance between the origin of MCFA from the mid inguinal point when MCFA arises from PFA was

4.5 cm. In the present study the mean distance between the origin of MCFA from the mid inguinal point when MCFA arises from FA was 4.7 cm and the mean distance between the origin of MCFA from the mid inguinal point when MCFA arises from PFA was 5.2 cm. Therefore the present study differs with the findings of Shaik Mohammed Peera.

#### [vi] Mean distance between the origin of MCFA from the origin of PFA :

According to Prakash et al and Sowmiya et al the mean distance between the origin of MCFA from the origin of PFA when MCFA arises from FA was 2.3 cm proximal to PFAO and 0.5 to 8.5 cm respectively and the Mean distance between the origin of MCFA from the origin of PFA when MCFA arises from PFA was 2cm and 0.1 to 5.6 cm respectively. Shiny vinila found that the Mean distance between the origin of MCFA from the mid inguinal point to be 2.09+/- 0.68 cm on right side and 1.88 +/- 0.68 cm on the left side. In the present study we found the mean distance between the origin of MCFA from the origin of PFA when MCFA arises from FA to be 2.7 cm which is nearly equal to above authors findings and the mean distance between the origin of MCFA from the origin of PFA when MCFA arises from PFA as 2.6 cm which is also nearly equal to above authors findings.

Damage to medial circumflex femoral artery leads to avascular necrosis of the head of the femur as it is the chief artery for it. These variations in the origin of medial circumflex femoral artery needs to be taken into account and considered in all surgical and interventional procedures.

#### 6. Conclusion

Understanding anatomical feature of the medial circumflex femoral artery may help in decreasing incidence of avascular necrosis of the femoral head during embolization, arterial catheterization procedure or hip surgery. Therefore, clinicians have to be aware of the medial circumflex femoral artery origin to alert vascular and orthopaedic surgeons to diminish the iatrogenic error. Consequently, the variable origin of femoral artery and its level is clinically important to modify the end to end arterial anastomosis, bypass procedure or interposition graft operation leading to intact vascular supply of lower extremities.

Conflict of interest: none

#### ABBREVIATIONS:

MCFA-Medial circumfemoral artery

PFA-Profunda femoris artery

FA-Femoral artery

MIP-Mid Inguinal Point

PFAO- Origin of Profunda Femoris Artery

MCFAO- Origin of Medial Circumflex Femoral Artery

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