

Inter-relatedness of the origins of the deep femoral artery and femoral circumflex arteries

Joachim Perera¹

The Ceylon Journal of Medical Science 1995; 38: 11-14

Abstract

124 femoral regions were dissected and the origins of the deep femoral and femoral circumflex arteries were demonstrated. The specimens were grouped according to the origins of the femoral circumflex arteries.

In group A, where both femoral circumflex arteries arise from the deep femoral artery, it was noted that the medial femoral circumflex artery has a more proximal origin than the lateral femoral circumflex artery.

In group B, where either one or both femoral circumflex arteries arise from the common femoral artery it was noted that the deep femoral artery originated most distally when measured from the mid point of the inguinal ligament. It was also noted that in some specimens in group B, either one or both femoral circumflex arteries arise at the same level as the deep femoral artery. In none of the specimens were the origins of the femoral circumflex arteries distal to the origin of the deep femoral artery.

Key Words: deep femoral artery, medial femoral circumflex artery, lateral femoral circumflex artery, common femoral artery.

Introduction

The external iliac artery continues into the thigh as the common femoral artery (CFA) (1). The deep femoral artery (DFA) arises from the CFA about 4cm below the mid point of the inguinal ligament. Medial and lateral femoral circumflex arteries are usually given off from the deep femoral artery. Occasionally one or both

circumflex arteries may arise directly from the common femoral artery (2).

The branches of the DFA and the circumflex femoral arteries anastomose with branches of the internal iliac artery in the hip region and with branches of the popliteal artery around the knee joint. These anastomoses play an important role in the blood supply to the proximal and distal regions of the femur (3,4).

The branching patterns of the DFA and the circumflex femoral arteries have been extensively studied (5,6,7). Yet the relative positions of the origins of these vessels have not been adequately described.

The objective of this study is to analyse the inter-relatedness of the origins of the DFA and the femoral circumflex arteries.

Materials and Methods

124 femoral regions of 36 males and 28 females obtained from cadavers were dissected in the Department of Anatomy of the Faculty of Medicine, Colombo. Four specimens were not included in the study as the femoral arteries in the region of the femoral triangle were damaged during the process of injecting formaldehyde for preservation. The CFA and the origins of the DFA and the femoral circumflex arteries were demonstrated.

The specimens were divided into two groups (group A and group B) according to the origins of the femoral circumflex arteries (Fig. 1). In group A both femoral circumflex arteries originated from the DFA and in group B either one or both femoral circumflex arteries arose from the CFA.

¹ Senior Lecturer, Department of Anatomy, University of Colombo, Colombo.

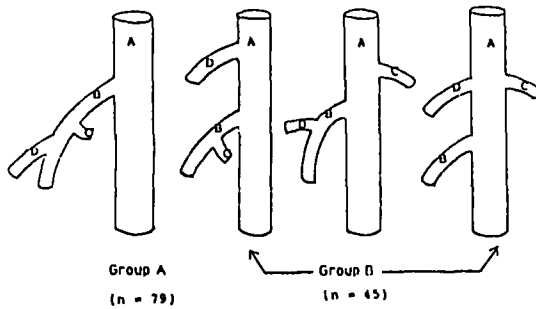


Fig. 1
Patterns of origin of the femoral circumflex arteries

- A - common femoral artery
- B - deep femoral artery
- C - medial circumflex artery
- D - lateral circumflex artery

The distances of origin of the femoral circumflex arteries from the origin of the DFA was measured in group A. Measurements were made in centimeters using a calibrated vernier sliding caliper. The point of the acute angle made by the branching arteries were considered as the referral points (5). The differences in the mean distances were statistically analysed using the Student's t test. The relative positions of the origins of the medial femoral circumflex artery (MFC) and the lateral femoral circumflex artery (LFC) were noted. The relative positions of the origins of the DFA, MFC and LFC was noted in group B.

Results

Table 1 shows the mean distance of origin of the MFC and LFC in group A of specimens. The mean distance of origin of the MFC was 1.882 cm and that of the LFC was 2.362cm, measured from the origin of the DFA. The difference between the mean distances were significant ($p < 0.001$). This shows that the MFC has a more proximal origin than the LFC, along the trunk of the DFA.

Table 2 shows the relative positions of the origins of the MFC and LFC along the DFA in group A of specimens. In 70(88.6%) the origin of the MFC was proximal to the origin of the LFC.

Table 1. The distance of origin of the MFC and LFC in group A, measured from the origin of DFA (n = 79)

Artery	Distance (cm)	SD
MFC	1,882	±0.92
LFC	2,362	±0.86

Group A - both circumflex arteries arising from the DFA

MFC - medial femoral circumflex artery

LFC - lateral femoral circumflex artery

DFA - deep femoral artery

cm - centimeters

SD - standard deviation

Table 2. The relative positions of the origins of the MFC and LFC along the DFA in group A (n = 79)

Artery	position	number	%
MFC	proximal	70	88.6
LFC	proximal	06	7.6
MFC and LFC	same level	03	3.8

Group A - both femoral circumflex arteries arising from DFA.

MFC - medial femoral circumflex artery

LFC - lateral femoral circumflex artery

DFA - deep femoral artery

Table 3 shows the relative positions of the origins of the MFC and LFC in group B in relation to the origin of the DFA from the CFA. In a majority, either MFC and/or LFC arose from the CFA at the same level as the DFA.

Discussion

The DFA arises from the CFA within 8cm below the mid point of the inguinal ligament with a mean distance of 4.4cm(6). The circumflex arteries are usually given off from the DFA. Occasionally either one or both circumflex arteries may arise from the CFA. Clarke and

Table 3. The position of the MFC and LFC along the CFA in relation to the origin of the DFA in group B(n = 45)

Artery	proximal	same level	distal
	n(%)	n(%)	n(%)
MFC	17(37.7)	19(42.3)	-
LFC	04(08.8)	02(04.5)	-
MFC and LFC	-	03(06.7)	-

Group B – one or both circumflex arteries arising from the common femoral artery.

MFC – medial femoral circumflex artery

LFC – lateral femoral circumflex artery

DFA – deep femoral artery

n = number

Colborn has shown that in 60% the MFC arose from the DFA and in 40% from the CFA(7). The LFC is less variable and in more than 70% it arises from the DFA(8). It has been shown that when the femoral circumflex arteries arose from the CFA there is a distal migration of the origin of the DFA(9).

When the femoral artery is ligated above the origin of the DFA the collateral circulations formed by the branches of the DFA and the femoral circumflex arteries open up. These anastomotic channels consists of

1. Superior and inferior gluteal branches of the internal iliac artery with the branches of the MFC and LFC.
2. The obturator branch of the internal iliac artery with the ascending branch of the MFC.
3. Inferior gluteal branch of the internal iliac artery with perforating branches of the DFA(10).

In addition to this the descending branch of the LFC anastomoses with the lateral superior genicular branch of the popliteal artery in the formation of the genicular anastomoses(11). Although variations in the anatomy of the origin and distribution of the DFA and the femoral

circumflex arteries had been extensively studied, the inter-relatedness of their origins has not been adequately described (5,6,7). A knowledge of these variations is important in the identification of these vessels in surgery of the femoral region and in the interpretation of femoral arteriograms (12, 13, 14, 15).

In this study both femoral circumflex arteries arose from the DFA in 79 specimens (Fig. 1). In this group the mean distance of origin of the MFC was 1.882cm and that of LFC was 2.362cm. As the difference between the mean distances were statistically significant it is evident that the origin of the MFC is much more proximal than the origin of the LFC along the trunk of the DFA.

As shown in Table 2, in 70(88.6%) specimens of group A, the origin of the MFC was more proximal than the origin of the LFC, when they were arising from the trunk of the DFA. Yet it is important to note that in 3(3.8%), both femoral circumflex arteries had a common origin and in 6(7.6%) the origin of the LFC was much more proximal than the origin of the MFC. These findings are important in the identification of the femoral circumflex arteries and their anastomotic channels in femoral arteriograms(15).

In 45 specimens belonging to group B either one or both femoral circumflex arteries arose directly from the CFA(Fig. 1). In this study it was observed that when one or both femoral circumflex arteries were arising directly from the CFA, their origins were much more proximal than the origin of the DFA (Table 3). Among 6 specimens where the LFC originated from the CFA, in 4(8.8%) the origin of the LFC was proximal to that of the DFA. In 36 specimens where the MFC was arising from the CFA, in 17(37.7%) the origin of the MFC was proximal to that of the DFA.

In 3 specimens where both femoral circumflex arteries arose directly from the CFA, their origins were at the same level as the origin of the DFA.

In none of the specimens were the origins of the femoral circumflex arteries distal to that of the DFA. It was also observed that in 24(53.5%) the origin of one or both femoral circumflex arteries were at the same level as the origin of the DFA.

A knowledge of the relative positions of the origins of the DFA and the femoral circumflex arteries may be important in surgery of the femoral region in trauma and in occlusive arterial diseases.

Conclusions

This study shows that

1. when both femoral circumflex arteries arose from the DFA, the origin of the MFC along the DFA is more frequently proximally situated than that of the LFC.
2. when both femoral circumflex arteries arose from the CFA they do so at the same level as the origin of the DFA.
3. in a majority, the origin of the femoral circumflex arteries are at the same level as the origin of the DFA, along the CFA.
4. the MFC or LFC never has their origins distal to that of the DFA.

References

1. Romanes GJ. *Cunningham's Text Book of Anatomy*. Volume 1; 15th Edition. Oxford University Press 1986; p 143.
2. Williams PL, Warwick R, Dyson M, Bannister LH. *Gray's Anatomy: 37th Edition*; London: Churchill Livingstone 1992; p 783.
3. Sevt S, Thompson RG. The distribution and anastomosis of arteries supplying the head and neck of femur. *Journal of Bone and Joint Surgery (British Volume)* 1965; 47B: 560-573.
3. Howe JR, Lacey WWT, Schwartz RP. A study of the gross anatomy of the arteries supplying the proximal portion of the femur and the acetabulum. *Journal of Bone and Joint Surgery (American Volume)* 1950; 32A: 856-865.
5. Keen JA. A study of the arterial variations in the limbs with special reference to symmetry of vascular pattern. *American Journal of Anatomy* 1961; 108: 245-261.
6. Siddharth P, Smith NL, Mason RA, Giron F. Variational anatomy of the deep femoral artery. *Anatomical Records* 1985; 212: 206-209.
7. Clarke SM, Colborn GL. The medial femoral circumflex artery: Its clinical anatomy and nomenclature. *Clinical Anatomy* 1993; 6: 94-105.
8. Perera J. Variability of the femoral circumflex arteries. *The Ceylon Journal of Medical Science*. 1993; 36:39-42.
9. Perera J. Anatomy of the origin of the deep femoral artery. *Ceylon Medical Journal* 1995; 40:139-141.
10. Williams PL, Warwick R, Dyson M, Bannister LH. *Gray's Anatomy: 37th Edition*; London; Churchill Livingstone 1992; p 784.
11. Williams PL, Warwick R, Dyson M, Bannister LH. *Gray's Anatomy: 37th Edition*; London: Churchill Livingstone 1992; p 786.
12. Rintoul RF. *Farquharson's Text Book of Operative Surgery: 7th Edition*. London: Churchill Livingstone 1986; p 32-33.
13. Rob C, Smith R. *Operative Surgery: Vol. Vascular Surgery Ed. Rob C Ed 3, 1976*; London: Butterworths p 20-21.
14. Rob C, Smith R. *Operative Surgery: Vol. Accident Surgery Ed. London PS Ed 3, 1976*; London: Butterworths, p 83.
15. Abrams L. Herbert. *Abrams Angiography; Vascular and Interventional Radiology. Volume 3: 3rd Edition*; Boston: Little - Brown and Company 1983; p 1835-1836.