

Original article:

A study of superficial branches of femoral artery in femoral triangle

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ABSTRACT

Introduction: Femoral artery is an important artery of the lower limb. Superficial branches of the femoral artery are used for various flap surgeries. In this study we measured the distance between mid-inguinal point (MIP) and the site of origin of superficial epigastric artery (SEA), superficial circumflex iliac artery (SCIA) and superficial external pudendal artery (SEPA).

Materials and methods: This study was performed on one hundred and three lower limbs of properly embalmed cadavers. The various parameters were measured.

Results: The mean distance between MIP and the site of origin of superficial epigastric artery was 1.5 ± 0.78 cm on the right side and on the left side it was 1.6 ± 0.68 cm. The mean distance between MIP and the site of origin of superficial circumflex iliac artery was 2.0 ± 0.86 cm on the right side and on the left side it was 2.0 ± 0.71 cm. The mean distance between MIP and the site of origin of superficial external pudendal artery was 2.9 ± 1.28 cm on the right side and on the left side it was 2.9 ± 1.24 cm.

Conclusion: The anatomical knowledge and location of superficial branches of femoral artery is important for clinicians, surgeons and plastic surgeons for creating flaps in various reconstructive surgeries.

Keywords: Mid-inguinal point, superficial circumflex iliac artery

INTRODUCTION

Femoral artery is the principal artery supplying the lower limb. In the femoral triangle, it is superficial in position and gives three branches i. e. superficial epigastric artery (SEA), superficial circumflex iliac artery (SCIA) and superficial external pudendal artery (SEPA). Superficial branches of femoral artery are used by plastic surgeons for raising cutaneous flaps in surgeries like in breast reconstruction, penile reconstruction, and vulvar reconstruction etc. Hence, the anatomical knowledge regarding the exact location of

superficial branches of femoral artery is important. In this study, we observed the superficial branches of femoral artery were present or not and if present, the site of their origin. We measured the distance between mid-inguinal point (MIP) and the site of origin of SEA, SCIA and SEPA. This study will help clinicians, surgeons and plastic surgeons in planning for flaps in various reconstructive surgeries.

MATERIALS AND METHODS

One hundred and three lower limbs of 54 formalin-fixed cadavers from a tertiary care hospital were

dissected carefully. In five lower limbs, the femoral artery and its branches had got cut during dissection by students and hence were not included in this study. The femoral triangle was dissected carefully. Superficial branches of femoral artery were identified. The anterior superior iliac spine (ASIS) and pubic symphysis (PS) were identified and marked with the help of coloured pins. The distance between ASIS and PS was measured with scale and the midpoint of this distance was taken as mid-inguinal point (MIP). The MIP was also marked with a coloured pin. The distance from MIP and the site of origin of SEA, SCIA and SEPA (Fig 1 and 2) was measured. This study was conducted over a period of two years.

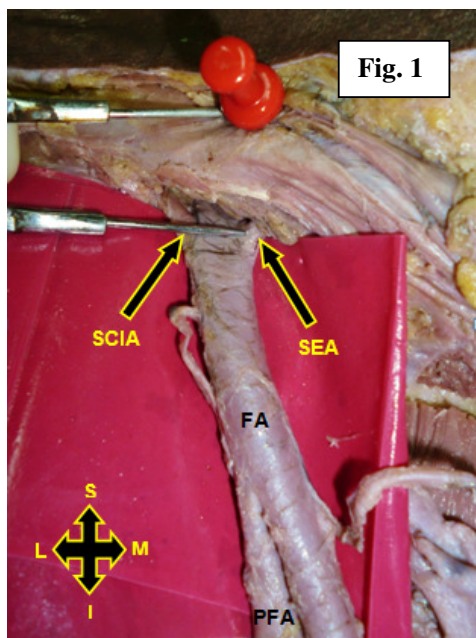


Fig. 1: Measurement of the distance between the mid-inguinal point (MIP) (red pin) and the site of origin of superficial epigastric artery (SEA) [FA – Femoral artery, PFA - Profunda femoris

artery, SCIA – Superficial circumflex iliac artery]

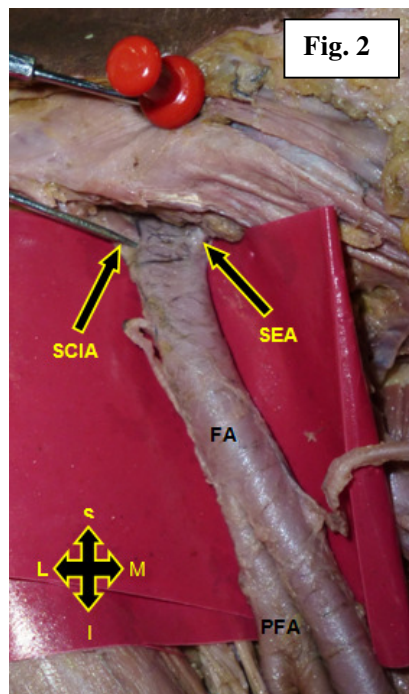


Fig. 2: Measurement of the distance between the mid-inguinal point (MIP) (red pin) and the site of origin of superficial circumflex iliac artery (SCIA) [FA – Femoral artery, PFA – Profunda femoris artery, SEA – Superficial epigastric artery]

RESULTS

1. Superficial epigastric artery

It was observed that the superficial epigastric artery was absent in 11 right lower limbs and 13 left lower limbs. We found that there was a common trunk for SEA and SCIA from femoral artery in a single (1.9%) right lower limb and 9 (17.6%) left lower limbs. (Fig. 3)

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Table 1: Distance between MIP and the site of origin of superficial epigastric artery (SEA)

DISTANCE (in cm)	NO. OF SPECIMENS	
	RIGHT	LEFT
0 – 1.0	12	7
1.1 – 2.0	23	22
2.1 – 3.0	3	7
3.1 – 4.0	3	2

The range of distance between MIP and the site of origin of SEA was 0.5 – 4.0 cm in 41 right lower limbs and 0.4 – 3.4 cm in 38 left lower limbs. The mean distance was 1.5 ± 0.78 cm on the right side and on the left side it was 1.6 ± 0.68 cm.

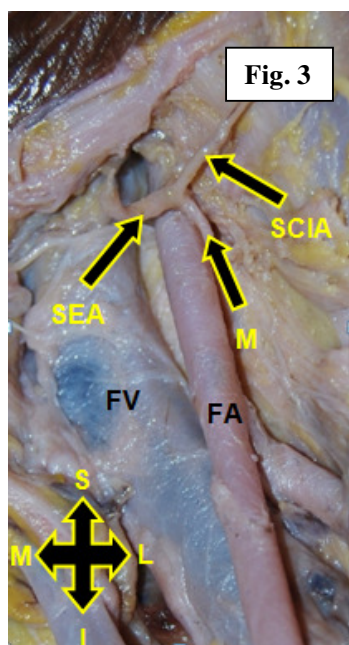


Fig. 3: Superficial epigastric artery (SEA) and superficial circumflex iliac artery (SCIA) arising from femoral artery (FA) as a common stem [M – Muscular branch, FV – Femoral vein]

2. Superficial circumflex iliac artery

The superficial circumflex iliac artery was present in all the right lower limbs and absent in only one left lower limb. In a single (1.9%) right lower limb and 9 (17.6%) left lower limbs, it was found that the SCIA was arising as a common trunk with SEA (Fig. 3).

Table 2: Distance between MIP and the site of origin of superficial circumflex iliac artery (SCIA)

DISTANCE (in cm)	NO. OF SPECIMENS	
	RIGHT	LEFT
0 – 1.0	1	1
1.1 – 2.0	33	28
2.1 – 3.0	11	16
3.1 – 4.0	5	4
4.1 – 5.0	2	1

The range of distance between MIP and the site of origin of SCIA was 0.9 – 4.6 cm in 52 right lower limbs and 0.7 - 4.2 cm in 50 left lower limbs. The mean distance was 2.0 ± 0.86 cm on the right side and on the left side it was 2.0 ± 0.71 cm.

3. Superficial external pudendal artery

The superficial external pudendal artery was absent in 10 right lower limbs and 7 left lower limbs. We also found that there was a common trunk showing origins of SEA, SCIA and SEPA at a distance of 1.5 cm from MIP (Fig. 4). This variation was found in the right lower limb of a female cadaver.

Table 3: Distance between MIP and the site of origin of superficial external pudendal artery (SEPA)

DISTANCE (in cm)	NO. OF SPECIMENS	
	RIGHT	LEFT
0 – 1.0	2	1
1.1 – 2.0	10	11
2.1 – 3.0	9	12
3.1 – 4.0	11	10
4.1 – 5.0	9	8
5.1 – 6.0	1	2

The range of distance between MIP and the site of origin of SEPA was 1.0 – 5.5 cm in 42 right lower limbs and 1.0 – 5.4 cm in 44 left lower limbs. The mean distance was 2.9 ± 1.28 cm on the right side and on the left side it was 2.9 ± 1.24 cm

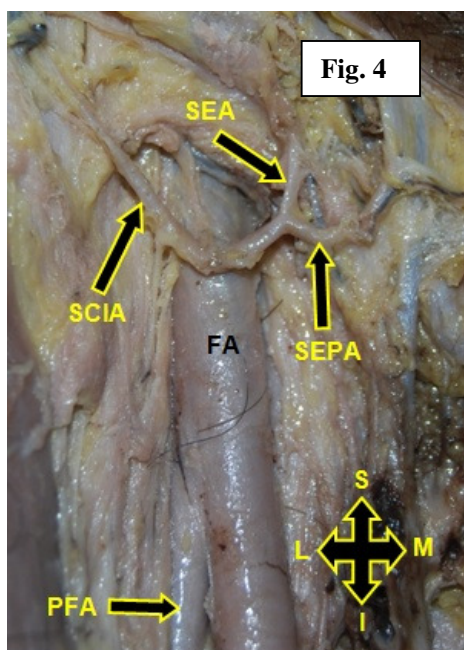


Fig. 4: All superficial branches (i.e. SEA – Superficial epigastric artery, SCIA – Superficial circumflex iliac artery, SEPA – Superficial external pudendal artery) arising from the femoral artery (FA) as a common stem [PFA – Profunda femoris artery]

DISCUSSION

Some authors have measured the distance of superficial branches from midpoint of inguinal ligament or just from inguinal ligament. We have tabulated those studies separately.

ORIGIN OF SUPERFICIAL EPIGASTRIC ARTERY (SEA) WITH REFERENCE TO MIP
According to the study done by Taylor and Daniel in 1975, the SEA was found to be absent in 35% of

lower limbs. However they did not measure the distance between the MIP and the site of origin of SEA [1]. In 2004, Reardon CM et al dissected 22 lower limbs and found that SEA was present in 20 out of 22 lower limbs (90.9%) [2].

Mahdi Fathi et al in 2006 dissected 40 lower limbs and found that the SEA was absent only in a single lower limb (2.5%); in another lower limb, it was not identified due to a large hematoma in the groin [3].

Table 4: Distance between the midpoint of inguinal ligament and the site of origin of SEA

AUTHORS (YEAR OF STUDY)	MEAN DISTANCE BETWEEN THE MIDPOINT OF INGUINAL LIGAMENT AND THE SITE OF ORIGIN OF SEA (in cm)
Reardon CM et al (2004)	< 1
Mahdi Fathi et al (2006)	< 2

According to the study done by Zachary Menn and Aldona Spiegel, the SEA was found to be absent in 42% of 278 total patients. In the remaining 58% of the patients an identifiable SEA was present [4]. In 2012, Manjappa T and Raghavendra VP studied the source of origin, side of origin and the distance from MIP and the site of origin of SEA. They dissected 40 lower limbs and found that the SEA was present in all the lower limbs [5].

Suthar K, Patil D et al in 2013, dissected 50 lower limbs and measured the distance of origin of SEA from the MIP [6]. In the present study, the SEA was found to be absent in 21.1% of the right lower limbs and 25.5% of the left lower limbs. The distances between MIP and the site of origin of SEA in the above mentioned studies are tabulated below.

Table 5: Distance between the MIP and the site of origin of SEA

AUTHORS (YEAR OF STUDY)	MEAN DISTANCE BETWEEN THE MIP AND THE SITE OF ORIGIN OF SEA (in cm)	
	RIGHT	LEFT
Zachary Menn & Aldona Spiegel	2 – 5	2 – 5
Manjappa T & Raghavendra VP (2012)	< 3 (87.5%) 3.1 – 6.0 (12.5%)	< 3 (87.5%) 3.1 – 6.0 (12.5%)
Suthar K, Patil D et al (2013)	2.3	2.2
Present study (2013)	1.5 ± 0.78	1.6 ± 0.68

ORIGIN OF SUPERFICIAL CIRCUMFLEX ILIAC ARTERY (SCIA) WITH REFERENCE TO MIP

According to the study done by Taylor and Daniel in 1975, the SCIA was present in all the dissected

lower limbs. The site of origin of SCIA was within 5 cm of the inguinal ligament [1].

Cassio V Penteadó in 1983 dissected 43 formalin-fixed cadavers and found that the SCIA was a constant vessel [7].

Table 6: Distance between inguinal ligament and the site of origin of SCIA

AUTHORS (YEAR OF STUDY)	MEAN DISTANCE BETWEEN INGUINAL LIGAMENT AND THE SITE OF ORIGIN OF SCIA (in cm)
Taylor and Daniel (1975)	< 5
Cassio V Penteadó (1983)	1.4

In 2012, Manjappa T and Raghavendra VP found that the SCIA was present in all the lower limbs. It arose from the femoral artery as a separate branch in 52.5% of cases [5]. Suthar K, Patil D et al in 2013, dissected 50 lower limbs and measured the distance of origin of SCIA from the MIP [6].

In the present study, the SCIA was present in all the right lower limbs and absent in 2% of the left lower limbs. The distances between MIP and the site of origin of SCIA in the above mentioned studies are tabulated below.

Table 7: Distance between the MIP and the site of origin of SCIA

AUTHORS (YEAR OF STUDY)	MEAN DISTANCE BETWEEN THE MIP AND THE SITE OF ORIGIN OF SCIA (in cm)	
	RIGHT	LEFT
Manjappa T & Raghavendra (2012)	< 3 (92.5%) 3.1 – 6.0 (7.5%)	< 3 (92.5%) 3.1 – 6.0 (7.5%)
Suthar K, Patil D et al (2013)	1.3	1.4
Present study (2013)	2.0 ± 0.86	2.0 ± 0.71

ORIGIN OF SUPERFICIAL EXTERNAL PUDENDAL ARTERY (SEPA) WITH REFERENCE TO MIP

In 2006, Osvaldir Lanzoni La Falce et al dissected 50 lower limbs and found that the SEPA was present in 92% of lower limbs and was found to be absent in 8% of lower limbs. The distance of origin of SEPA from the inguinal ligament varied between 0.8 – 8.5 cm. The mean of this distance was 5.3 ± 0.87 cm on the right side and 4.8 ± 1.0 cm on the left side [8].

Manjappa T and Raghavendra VP in 2012 found that the SEPA was present in all the lower limbs. It

arose from the femoral artery as a separate branch in 57.5% of cases [5].

In 2013, Suthar K, Patil D et al dissected 50 lower limbs measured the distance of origin of SEPA from the MIP [6]. In the present study, the SEPA was found to be absent in 19.2% of the right lower limbs and in 13.7% of the left lower limb. The distances between MIP and the site of origin of SEPA in the above mentioned studies are tabulated below.

Table 8: Distance between the MIP and the site of origin of SEPA

AUTHORS (YEAR OF STUDY)	MEAN DISTANCE BETWEEN THE MIP AND THE SITE OF ORIGIN OF SEPA (in cm)	
	RIGHT	LEFT
Manjappa T & Raghavendra (2012)	< 3 (45%) 3.1 – 6.0 (55%)	< 3 (45%) 3.1 – 6.0 (55%)
Suthar K, Patil D et al (2013)	2.6	2.7
Present study (2013)	2.9 ± 1.28	2.9 ± 1.24

Table 9: SEA and SCIA arising from a common stem from the femoral artery

AUTHORS (YEAR OF STUDY)	NO. OF CASES SHOWING SEA AND SCIA ARISING FROM COMMON STEM FROM THE FEMORAL ARTERY	
Taylor and Daniel (1975)	48%	
Cassio V Penteadó (1983)	41.7%	
Reardon CM et al (2004)	70%	
Mahdi Fathi et al (2006)	18.4%	
Manjappa T, Raghavendra VP (2012)	35%	
Present study (2013)	Right – 1.9%	Left – 17.6%

CONCLUSION

The studies describing anatomy and location of superficial branches of femoral artery are sparse in the literature. This study will help clinicians, surgeons and plastic surgeons for creating flaps in various reconstructive surgeries.

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