

Variations in the Branching Pattern of Femoral Artery: A Cadaveric Study

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ABSTRACT

Aim: The aim of this study is the variations in the branching pattern of femoral artery.

Methodology: For the study material were consist of 25 lower limbs from adult human cadavers used for routine dissection procedure for under graduate students in Department of Anatomy, TMMC & RC, Moradabad, Uttar Pradesh, India.

Results: In this study, among the 25 specimens, 19 specimens we found that origin of femoral artery coincided with the mid inguinal point & in 3 specimens the origin of femoral artery is lateral to the mid inguinal point, more towards midpoint of inguinal ligament. In the rest 3 specimens the origin of femoral artery was medial to mid inguinal point.

Conclusion: It can be suggested by this study that the branching pattern of the femoral artery as reported will be definitely useful to the cardiologists, radiologists, plastic surgeons and vascular surgeons in their future endeavors.

Keywords: Femoral Artery, Profunda Femoris Artery, Mid Inguinal Point, Inguinal Ligament.

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INTRODUCTION

William Harvey described the roles of arteries and veins in the 17th century. An artery is a muscular tube that carries blood from the heart to other parts of the body. The femoral artery, a continuation of the external iliac artery, is a large artery in the thigh and the main arterial supply to the lower limb. It is one of the most easily accessible arteries for catheterization. The Profunda Femoris artery (PFA) is a large branch of the femoral artery that arises laterally, 3.5 cm distal to the inguinal ligament. The knowledge about the branching pattern of FA and its vascular system is essential to the cardiologists and radiologists, as this arterial system is often assessed in procedures like coronary angioplasty. PFA gives off two main branches known as Lateral Circumflex Femoral Artery (LCFA) and Medial Circumflex Femoral Artery (MCFA).¹ The profunda femoris artery is used for arteriography, ultrasound and Doppler imaging, digital subtraction angiography and magnetic resonance imaging. In addition to the femoral artery, PFA is also used for hemodialysis in the recent era. The branches of PFA are also used in anterolateral perforator thigh flap as a vascular pedicle during breast reconstruction after mastectomy in case of carcinoma of the breast. The branching pattern of PFA should be known to prevent the flap necrosis after reconstruction surgeries.² The MCFA supplies blood to the head and neck of femur, to the adductor muscles and to fatty tissue in the acetabular fossa. Therefore, the particular information of the branching pattern of MCFA is desired for precisely carrying out

trochanteric & intertrochanteric osteotomies. The information of MFCA helps to avoid iatrogenic vascular necrosis of the femoral head in reconstructive surgery of the hip and fixation of acetabular fractures through the posterior approach.^{3,4}

The precise knowledge of the arterial system including the MCFA and LCFA and its anatomical variations is required to prevent the intraoperative bleeding. Since, the combined study of the variations in the origin and branching pattern of the PFA, MCFA & LCFA are rare in literature. The present study was undertaken.

MATERIALS & METHODS

Study Area

The case study was carried out in the Departments of Anatomy of Teerthanker Medical College Moradabad.

Study Duration

One year.

Data Collection

For the study; material were consist of 25 lower limbs from adult human cadavers used for routine dissection procedure routine dissection procedure for under graduate students in Department of Anatomy, Teerthanker Mahaveer Medical College & Research Centre, Moradabad, Uttar Pradesh, India. The femoral artery and its branching patterns were studied by conventional dissection method. & All the variations and measurements were taken immediate after dissection by measuring tape in mm.

Inclusion Criteria

All the lower limbs from cadaver, both male and female are included in this study.

Exclusion Criteria

Lower limbs with degenerative or pathological deformities or injuries were excluded.

Ethical Approval

Duration of this study was one year and Institutional ethical committee clearance was taken well in advance before starting the study.

Data Analysis: Data were analyzed by using Microsoft excel.

Table 1: Origin of femoral artery in relation to mid inguinal point

Origin	n	%
With the mid inguinal point	19	76%
From lateral to mid inguinal point	3	12%
From medial to mid inguinal point	3	12%
Total	25	100%

Table 2: Origin of the superficial circumflex iliac artery

Origin	n	%
From the lateral side of inguinal artery	24	96%
Artery absent	1	4%
Total	25	100%

Table 3: Origin of the superficial external pudendal artery

Origin	n	%
From the femoral artery as a single trunk	23	92%
As a common trunk, with superficial epigastric artery from the femoral artery	2	8%
Total	25	100%

Table 4: Origin of the superficial epigastric artery

Origin	n	%
From the anterior aspect of femoral artery as a single trunk	23	92%
As a common trunk, from the superficial external pudendal artery	2	8%
Total	25	100%

Table 5: Origin of the deep external pudendal artery

Origin	n	%
From the medial side of femoral artery & passes medially across the pectineus anterior to adductor longus	25	100%
Total	25	100%

Table 6: Origin of the profunda femoris artery

Origin	n	%
Lateral from the femoral artery	20	80%
Posterolateral from the femoral artery	3	12%
Posterior from the femoral artery	2	8%
Total	25	100%

Table 7: Presence of abnormal branches from femoral artery

Origin	n
Origin of medial circumflex femoral artery from femoral artery	2
Origin of medial circumflex femoral artery from femoral artery	3
Total	5

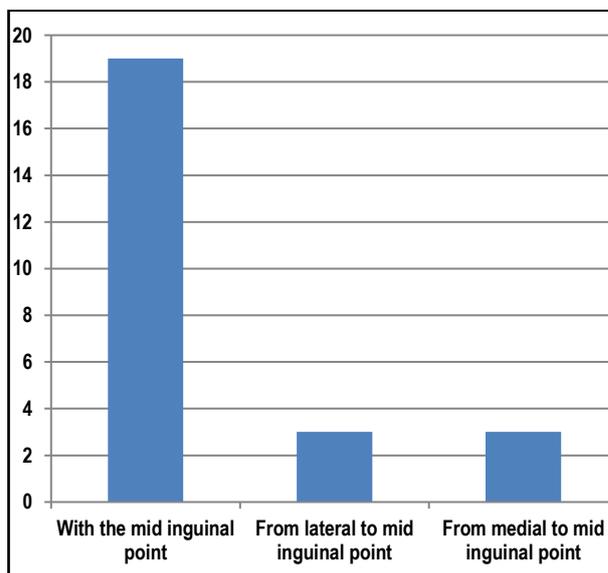


Chart 1: Origin of femoral artery in relation to mid inguinal point

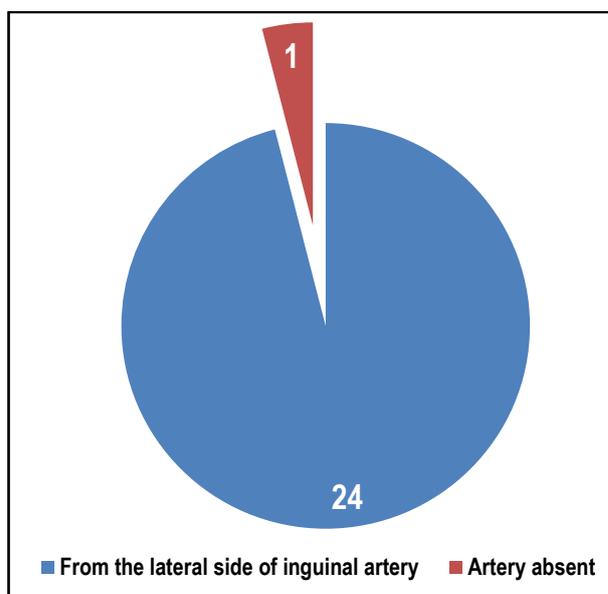


Chart 2: Origin of the superficial circumflex iliac artery

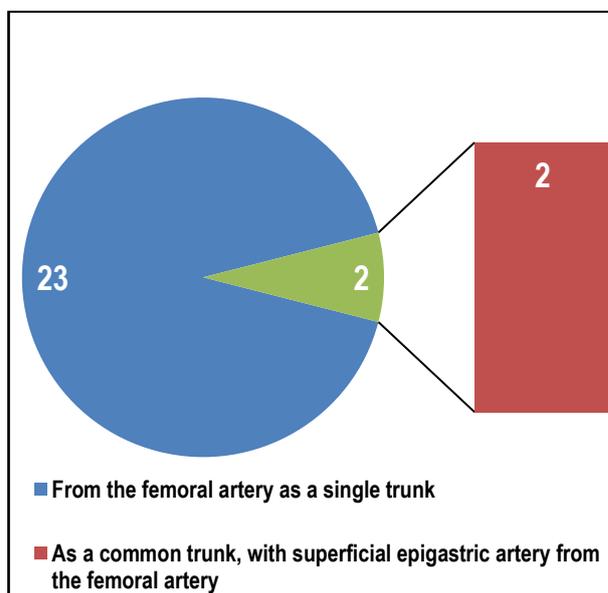


Chart 3: Origin of the superficial external pudendal artery

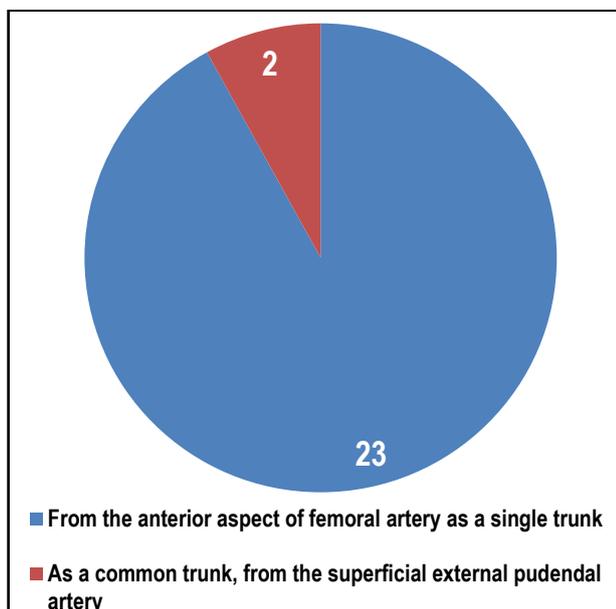


Chart 4: Origin of the superficial epigastric artery

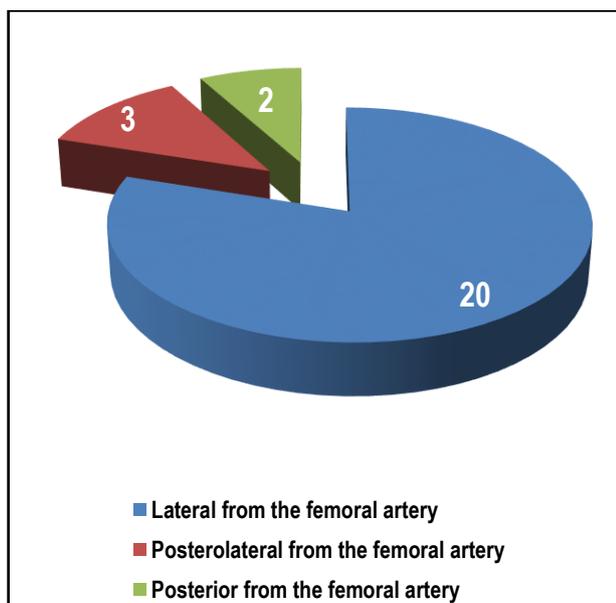


Chart 5: Origin of the profunda femoris artery

RESULTS

Parameters of femoral artery and its patterns for branching were studied by conventional dissection method & all the results were noted. In this study, among the 25 specimens, 19 specimens we found that origin of femoral artery coincided with the mid inguinal point & in 3 specimens the origin of femoral artery is lateral to the mid inguinal point, more towards midpoint of inguinal ligament. In the rest 3 specimens the origin of femoral artery was medial to mid inguinal point. The superficial circumflex iliac artery was seen arising as a separate trunk from the lateral side of the femoral artery in 24 specimens. In residual 1 specimen, the superficial circumflex iliac artery was absent. The superficial external pudendal artery was seen originated from the femoral artery as a single trunk only in 23 adult specimen's and in remaining 2 specimens superficial external pudendal artery arose as a common trunk with superficial epigastric artery from the femoral artery. In this study, double trunk of origin of superficial external pudendal artery was not seen. In this study we showed the superficial epigastric artery was seen arising as a single trunk

from the anterior aspect of the femoral artery in 23 specimens but in 2 specimens we found the superficial epigastric artery was seen arising as a common trunk with superficial external pudendal artery. In our study, all specimens the deep external pudendal artery originated from the medial side of the femoral artery and passes medially through the pectineus anterior to adductor longus, posterior to femoral vein covered by fascia lata. Out of 25 specimens, in 20 specimens, profunda femoris artery arises laterally from the femoral artery, whereas in 3 remaining specimens profunda femoris artery arose posterolaterally from the femoral artery. In 2 cases profunda femoris artery arise posteriorly. In the present study found that the origin of lateral circumflex femoral artery from femoral artery in 2 cases rather than in 3 cases, the origin of medial circumflex femoral artery from femoral artery.

DISCUSSION

The origin of femoral artery has been reported by Henry Gray (1858), Sir John Bruce, Robert Wamsley, James A Ross (1964), Barry J et al (1971), Richard S Snell (1973) & Keith L Moore (1980) to be in between anterior superior iliac spine and pubic symphysis.⁵⁻⁹ The surface marking of the femoral artery and deep inguinal ring has been reported to be closer to the mid-inguinal point than the midpoint of the inguinal ligament by Scott P et al (2005).¹⁰ The superficial circumflex iliac artery has been found by Buchanan's (1906) and Hollinshed (1958) to originate as a discrete branch just below the superficial epigastric.^{11,12} The superficial circumflex iliac artery has been reported to arise as a common trunk with the superficial epigastric artery by Taylor et al (1975) and Buchanan's (1906).^{11,13} The superficial circumflex iliac artery has been reported to originate from the profunda femoris artery in 17% cases while superficial circumflex artery has been found to be absent in 25% cases from the 20 operated cases by Taylor.¹³ The superficial external pudendal artery was found to originate medially from the femoral artery close to the superficial circumflex iliac artery by Tanyeli E (2006).¹⁴ On the other hand, the deep external pudendal artery has been found to originate from the medial surface of the femoral artery Bruce J et al (1964).⁶ PFA was reported to arise 4 cm distal to inguinal ligament by Sir John Bruce, Robert Wamsley, James A Ross (1964), while Buchanan's (1906), Hollinshed (1958) reported it to originate at a distance of 3.75 to 5 cm.^{6,11,12} PFA has been shown to arise laterally from the femoral artery by Henry Gray (1858), Buchannans (1906), John Bruce (1964), Snell R (1973) while it was reported to arise from the posterolateral part by Dixit D et al (2001).^{6,8,11,15,16} On the other hand, it has been specifically reported by Dixit D (2001) that PFA arose rarely from the posterior aspect of the femoral artery.¹⁶ The deep femoral artery has also been reported to arise anteriorly from the femoral artery in a male cadaver by Tanyeli E et al (2006).¹⁵ The medial circumflex femoral artery has been found to originate from the medial or posteromedial aspect of PFA and also from the femoral artery by Keen (1961), Vazquez MT (2006) and Baptist M (2007).¹⁷⁻¹⁹

CONCLUSION

It was found in the present study that the origin of the femoral artery has a complex variation as well as its branching patterns. It can be suggested by this study that the branching pattern of the

femoral artery as reported will be definitely useful to the cardiologists, radiologists, plastic surgeons and vascular surgeons in their future endeavors.

REFERENCES

1. Standring S. Pelvic girdle, gluteal region and hip joint, Profunda femoris artery. In: Gray's Anatomy, The anatomical basis of clinical practice. 40th ,2008: 1379-1380.
2. Kaplan JL, Allen RJ. A cost based comparison between perforator flaps and TRAM flaps. *Plast Reconstr Surg* 2000;105(3):943-948.
3. Langer R, Langer M, Scholz A, Astinet F, Schwetlick G, Felix R. Femoral head perfusion in patients with femoral neck fracture and femoral head necrosis. *J Belge Rad*, 1993;76:145-149.
4. Gautier E, Ganz K, Krügel N, Gill T, Ganz R, Anatomy of the medial femoral circumflex artery and its surgical implications. *Journal of Bone and Joint Surgery. Br.* 2000;82(5):679-683.
5. Henry Gray. The femoral artery is the continuation of external iliac artery. *Grays Anatomy*, 39th edition. 1858.
6. Sir John Bruce, Robert Wamsley & James A Ross in *Manual of Surgical Anatomy* 1964.
7. BarryJ Anson & Chester B McVay in his book- *Anatomy* 1971; pages 1118-1121.
8. Richard S Snell in *Clinical Anatomy for Medical students- 5th edition* pages 1973 530-533.
9. Keith L Moore & Arthur F Dalley in his book *clinically oriented anatomy* 4th edition 1980 page no. 545-546.
10. Dr Scott PD & PLT William in a study of surface markings of the inguinal region in *Clinical Anatomy*; 2005 vol. 4 (3) pages 216-222.
11. Buchannan's in *Buchannan Manual of Anatomy* 1906 page no. 581-587.
12. Henry Hollinshed W. In *Anatomy for surgeons vol III* 2nd edition 1958 page no. 725-731.
13. Taylor the *Anatomy of several free flap donor sites / Plastic and Reconstructive surgery* 1975; 56:243-246.
14. E Tanyeli, Mehmet Yildirim, Mehmet Uzel & Feridun Vural in *Surgical and Radiological Anatomy*; 2006 vol. 20 (2) pages 211-213.
15. Henry Gray. The femoral artery is the continuation of external iliac artery. *Gray's Anatomy*, 39th edition 1858.
16. Dixit, DP Mehta & Kothari ML -*Journal of Anatomical Society of India*(2001) 50 (1); page no. 6-7.
17. 25. Keen JA a study of the arterial variations of the limbs, *American Journal of Anatomy* vol. 108 March 1961; page no. 254-256. page no. 455-459.
18. Varquez M T, J Murillo, E Maravillo, I Parkin & J Sanudo in *Clinical Anatomy* ; (2006) vol. 20 (2), pages 180-185.
19. Marina Baptist, Ferdose Sultana & Tassaduq Hussain in *Professional Medicine Journal*; (2007) vol. 14(3), 523-527.

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