

A Study on the Diameter of the Femoral Artery.

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Abstract

Background-The arterial variations of the lower limb, especially the femoral artery and its branches have gained popularity recently because of its close association with femoral hernia repair and in coronary angiographies. The diameter of the femoral artery is important to diagnose diseases like aneurysms. The correct placement of large bore catheters plays an important role in the management of hemodialysis patients.

Material and methods- The study material consists of 50 adult lower limb specimens from the Institute of Anatomy, Madras Medical College, Chennai and

Adult 64 slice computerized tomographic scans from 20 clinical cases from the Bernard Institute of Radiology, Government General Hospital, Chennai.

The aim of this study was to determine the diameter of femoral artery by direct dissection method, by silicone gel method and by observing 64 slice computerized tomography so that complications of attempted cannulation of the femoral vessels could be minimized.

Observations- The mean diameter of femoral artery by all three methods was 7.6mm and it is 8.3 mm in males and 7.08mm in females.

Conclusion-The knowledge of the internal diameter of the femoral artery helps in avoiding iatrogenic femoral arteriovenous fistula or severe secondary haemorrhage, while performing femoral arterial puncture. Therefore this study will be useful to the clinicians to enlighten the knowledge about the diameter of the femoral artery which in turn will help in better patient management.

Keywords-femoral artery; diameter; aneurysms.

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I. Introduction

The arterial variations of the lower limb, especially the femoral artery and its branches have gained popularity recently because of its close association with femoral hernia repair and in coronary angiographies. The diameter of the femoral artery is important to diagnose diseases like aneurysms. The femoral artery is one of the most common sites of aneurysms formation and the femoral artery aneurysms are often bilateral. Angioaccess is essential for the performance of hemodialysis. The correct placement of large bore catheters plays an important role in the management of hemodialysis patients. For these reasons we have made an attempt to study the diameter of femoral artery by various methods.

II. Aims And Objectives

The aim of this study was to determine the diameter of femoral artery by direct dissection method, by silicone gel method and by observing 64 slice computerized tomography so that complications of attempted cannulation of the femoral vessels could be minimized.

III. Materials And Methods

The study material consists of 50 adult lower limb specimens from 25 cadavers of age group between 50 - 80- years allotted for dissection to the I MBBS students in the Institute of Anatomy, Madras Medical College, Chennai and

Adult 64 slice computerized tomographic scans from 20 clinical cases from the Bernard Institute of Radiology, Government General Hospital, Chennai.

Measurement of the diameter of the femoral artery was done by the following methods:

[i] by direct dissection method

[ii] by silicone gel method in 20 lower limbs

[iii] by observation of the 64 slice computerized tomography in 20 lower limbs.

Methods of study:

[i] **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 superficial fascia was reflected. The femoral artery was identified and traced. The diameter of the femoral artery was measured at the level 1 cm below the inguinal ligament with the use of vernier calipers in 30 adult specimens. Initially the vernier calipers was checked for zero error with the jaws closed. The jaws of the calipers were placed on the inner side of the vessel wall with a firm pressure on the artery. When both the locking screws of the calipers were tightened the caliper was removed from the artery and the measurement in the main scale of the calipers was read to the nearest tenth of a centimeter.

[ii] **By Silicone Gel Method :** The diameter of the femoral artery was measured in 20 lower limb specimens by preparing moulds of silicone gel by the following method. The femoral artery was tied 3 cm below the inguinal ligament. Another tie was made in the external iliac artery, proximal to the origin of the femoral artery. A small niche was made near the proximal tie, to allow the nozzle of the silicone gel filled syringe to pass through. The nozzle of the silicone gel filled syringe was inserted through the niche made near the proximal end. The silicone gel was injected into the tied segment and was left undisturbed for 24 hours. After a period of 24 hours the femoral artery was cut 1 cm below the inguinal ligament and was marked 'T' and another cut was made at the level of distal tie. Now the walls of the femoral artery were dissected out and the diameter of the moulds of the femoral artery was measured by measuring the diameter of the mould at the proximal end marked T by using vernier calipers to the nearest tenth of the centimeter.

[iii] **By observation of adult 64 slice computerized tomographic study:** Adult 64 slice computerized tomographic scans of pelvis of 20 cases were observed in the Bernard Institute of Radiology, Government General Hospital, Chennai and studied.

IV. Observation

In the present study the diameter of the femoral artery observed was 7.7mm; 7.5 mm and 7.6 mm by direct dissection method; by silicone gel method and by observation of the 64 slice computerised tomographs respectively. The range of the diameter of the femoral artery and the comparison of the diameter of the femoral artery in males and females are tabulated in Table.no.1. Also it is clearly evident that the diameter of the femoral artery is less in females than that in males.

Table.No.1-The Diameter Of Femoral Artery By Various Methods In The Present Study

s.no	Method of study	Mean diameter of the femoral artery	Range of diameter of femoral artery	Mean diameter in males	Mean diameter in females
1.	Direct dissection method	7.7 mm	7-9.5 mm	8.25 mm males	7.25 mm in females
2.	By silicone moulds	7.5 mm	6.8 to 8.2 mm	8 mm in males	7 mm in females
3.	By 64 slice computerised tomography	7.6 mm	6.8 to 11 mm	8.7 mm in males	7 mm in females
4.	Mean diameter of femoral artery by all three methods	7.6mm		8.3 mm in males	7.08mm in females

Figure-1. Measurement of the diameter of femoral artery by silicone gel method



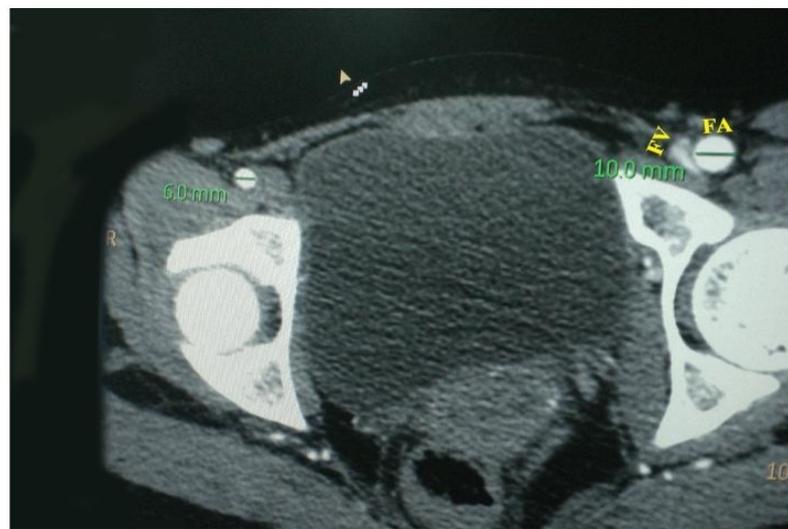
V. Discussion

Schnyder et al [1] demonstrated that the mean diameter of the femoral artery as assessed by quantitative femoral angiography. They found the diameter of the femoral artery in men to be 6.0 +/- 1.0 mm vs 7.5 +/- 1.2 mm; and in women to be 5.1 +/- 1.1 mm vs 6.3 +/- 1.0 mm. In the present study the mean diameter of the femoral artery was 8.25 mm in males and 7.25 mm in females which is greater than that found by Schnyder et al.

Kenneth S. Spector [2] done an analysis of 60 consecutive peripheral angiograms revealed data on the average diameter of the femoral artery. They found that the average femoral artery diameter as 6.6 mm. The range found them was 7.6 mm which is greater than that found by Kenneth et al.

Sandgren [3] et al measured the diameter of the femoral artery in 122 healthy volunteers with echo tracking B mode ultrasound scan and found that the mean diameter of the femoral artery were 9.7 mm in males and 8.2 mm in females. In the present study the mean diameter of the femoral artery was 8.25 mm in males and 7.25mm in females which is less than that found by Sandgren et al

Figure-2 : Measurement of the diameter of femoral artery by observation of adult 64 slice computerized tomographs



Sabnis A.S. [4] et al dissected 60 lower limbs of embalmed cadavers and found the diameter of the femoral artery to be 10 cm. Radegran. G; Saltin .B. [5] found the diameter of femoral artery to be 10.6 +/- 0.4 mm. Swetha B; Amarappa Nagalika [6] dissected 20 embalmed cadavers and found that the mean diameter of the femoral artery was 8.5 mm. In the present study the mean diameter of the femoral artery was found to be 7.6 mm which is less than that found by Sabnis et al; Radegran et al and Swetha et al.

Mahasin F.Ali [7] et al done a clinical study to establish the normal values of femoral artery diameter by using Multi Detector Computed Tomography. They found that the diameter of the femoral artery in males as 8.25 mm and that of females as 7.39mm. In the present study the mean diameter of the femoral artery was 8.25 mm in males and 7.25 mm in females which is nearly equal to that found by Mahasin et al.

Marina Baptist et al [8] dissected 20 adult cadavers and the internal diameter of the femoral artery was measured with the radial callipers after injecting it with gelatine and undiluted Indian ink in 40 femoral triangles and found that the internal diameter of the femoral artery ranged between 6-10mm.

Shiny Vinila BH, Sridevi N [9] et al dissected 40 lower limbs of adult cadavers irrespective of sex. The internal diameter of femoral arteries was measured by the radial callipers were taken in millimetres. The internal diameter of femoral artery was observed as 7.02 +/- 0.85 mm. Jai prakash [10] et al studied the diameter of the femoral artery by ultrasonography in patients with acute renal failure and chronic renal failure. They found that the mean diameter of the femoral artery was 7.77 +/- 1.57 mm on the left side and 7.64 +/- 1.45 mm on the right side. In the present study the mean diameter of the femoral artery was 7.6 mm which is nearly equal to that found by Marina Baptist and Shiny vinila et al. Therefore the present study coincides with the study of Marina Baptist; Shiny Vinila et al and Jai prakash et al.

E.P.Souza Neto [11] et al evaluated 142 children by two dimensional ultrasound. They enrolled the paediatric patients according to the age; 0-1 month; 1 month to 2 years old; 2-6 yr old; 6-12 yr old and 12-18 year old and found the femoral artery diameter as 2.8; 3.1 ; 5.0; 5.9 and 7.4 respectively. The present study was done on adult cadavers and not related to the paediatric age group.

P.Hughes [12] studied the femoral artery diameter in fifty patients admitted to general or neurosurgical intensive units by using a portable ultrasound machine were studied. They found the diameter of the femoral artery as 0.9; 0.8 and 0.7 mm at the level of inguinal ligament; 2 cm below the inguinal ligament and 4 cm below the inguinal ligament respectively. In the present study the mean diameter of the femoral artery was 7.6 mm, 1cm below the inguinal ligament which is lesser than the finding of P.Hughes et al.

Schnyder et al; Sandgren et al and Mahasin F.Ali et al in their studies found that the diameter of the femoral artery is less in females than that in males. In the present study the mean diameter of the femoral artery was 8.25 mm in males and 7.25 mm in females. In the present study also the mean diameter of the femoral artery is less in females than that in males. So the present study coincides with the study of Schnyder et al, Sandgren et al and Mahasin F.Ali et al.

VI. Conclusion

The femoral vessels are an important site for both arterial and venous access in radiology, cardiology, intensive care medicine, nephrology, anaesthesia and paediatrics. The femoral artery is usually the site of choice for arterial puncture. Arterial puncture can be complicated by peri arterial hematoma formation, arterio venous fistulas, pseudoaneurysms, thrombosis and haemorrhage. Knowledge of normal diameter of femoral artery and its variant is vital for safe clinical practice.

The knowledge of the internal diameter of the femoral artery is useful to surgeons and interventional radiologists as this artery is used in certain clinical procedures like cardiac catheterisation, transarterial chemo embolization in the treatment of malignancy, arteriography in peripheral vascular diseases. The knowledge of the internal diameter of the femoral artery helps in avoiding iatrogenic femoral arteriovenous fistula or severe secondary haemorrhage, while performing femoral arterial puncture. Therefore this study will be useful to the clinicians to enlighten the knowledge about the diameter of the femoral artery which in turn will help in better patient management.

ABBREVIATIONS

FA-Femoral artery

FV- Femoral vein

T-Top

Conflict of interest : none.

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