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ANATOMICAL VARIATIONS;

THE ORIGIN OF PROFUNDA FEMORIS ARTERY, ITS BRANCHES AND DIAMETER OF THE FEMORAL ARTERY.

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ABSTRACT… marinalamuel@hotmail.com Profunda femoris artery and its circumflex branches are encountered during cannulation of femoral artery for various clinical and diagnostic techniques. **Objectives:** To study the variations in the origin of the profunda femoris artery and its circumflex branches along with measurement of internal diameter of femoral artery. **Design:** Cadaveric studies. **Setting:** Anatomy Departments of Fatima Jinnah Medical College and Services Institute of Medical Sciences, Lahore. **Period:** From 04-08-06 to 30-06-07. **Material Methods:** In 20 adult male cadavers, 40 femoral triangles were dissected and femoral artery, profunda femoris artery and its branches were exposed. The distance of origin of the profunda femoris artery from the mid point of inguinal ligament and the origin of the circumflex arteries from the profunda femoris were measured by a scale and radial caliper. The internal diameter of femoral artery was recorded with radial caliper after injecting it with gelatin and undiluted Indian ink. **Results:** In 12 to 14 cases the origin of the profunda femoris artery was located between 20-40 mm from mid point of the inguinal ligament. In 6-8 cases profunda femoris originated lower down in the thigh than the common location. Only in one case the medial circumflex artery was seen emerging from the femoral artery at the level of origin of profunda femoris artery. In one case lateral circumflex artery originated directly from the femoral artery unilaterally. The internal diameter of the femoral artery ranged between 6-10 mm.

Key words: Profunda femoris, circumflex femoral artery, femoral artery diameter

INTRODUCTION

The big horizon of interventional radiology opens new avenues for the study of variations of the course of the profunda femoris artery. This vessel is useful for the doppler imaging, ultrasound, arteriography, and angiography and also magnetic resonance imaging. Since the advent of interventional radiology, the methods of investigation of the cardiac patients have taken a big leap towards this end. The Judkins technique is undertaken in this clinical procedure in which the femoral artery is approached by puncturing the vessel 1 to 3 cm below the inguinal ligament. Using the Seldinger technique an 18 gauge thin walled needle is inserted at 30° – 45° angle in the femoral artery and 0.035 inch or

0.038 inch (0.883 mm to 0.965 mm) J tip Teflon coated guide wire is advanced into the artery. Femoral arteriography is the main line for investigation in peripheral occlusive arterial diseases and in diagnosis of suspected congenital anomalies. As the femoral arteries are commonly used for these procedures therefore, the internal diameter and as well as the origin of the profunda femoris artery and its branches in front of the thigh are of clinical significance in the procedures of Judkins and Seldinger techniques used for diagnosis[1].

During femoral artery catheterization, the catheter is guided by a fluoroscopic view along the external and common iliac arteries into the abdominal aorta. This catheter can also be seen passing into inferior mesenteric, superior mesenteric and celiac arteries. The contrast media can be injected into femoral artery; permanent records are obtained during radiography. The pressure records can also be obtained by guiding the catheter through the aortic valve into the left ventricle[2].

The Femoral artery enters the thigh by passing at a point midway between anterior superior iliac spine and the pubic symphysis. This is the point where its pulsations can be felt. This location is also used for the femoral catheterization[3]. As femoral artery emerges from the femoral sheath, it enters the adductor canal. The profunda femoris, a branch of the femoral artery is the chief artery of the thigh and it supplies all the muscles of the thigh compartment. The profunda femoris arises mainly from the lateral side of the femoral artery about 3 – 4 cm distal to the inguinal ligament, from where it passes down deep to it. The branches given off from this vessel are mainly muscular and perforating arteries. It also gives off large lateral and medial circumflex arteries.

The lateral circumflex femoral artery usually arises from the lateral side of the profunda femoris, sometimes it may arise directly from femoral artery. It further splits into three branches namely, an ascending branch which takes part in trochanteric anastomosis, a transverse branch which takes part in cruciate anastomosis and the descending branch which ends by sending twigs to the anastomosis around the knee joint.

The medial circumflex artery arises from the medial side of the profunda femoris and also in some cases directly from the femoral artery. It gives two branches, an ascending branch to the trochanteric anastomosis and horizontal branch which takes part in the cruciate anastomosis.

MATERIAL AND METHODS

In 20 adult male human cadavers, 40 femoral triangles were dissected. The incision was given in the skin, which was reflected to clean the superficial fascia. The superficial inguinal lymph nodes, superficial lymph vessels and nerves were dissected by fine dissection. The fascia lata was incised and femoral triangles were exposed. The femoral sheath and its contents including femoral artery were identified. The profunda femoris vessel and its medial and lateral circumflex arteries were dissected and identified. Damaged femoral arteries and the profunda femoris and its branches were excluded in this procedure. Only the properly preserved and intact vessels were considered for study purposes. Male cadavers were taken as these were only available.

The distance of the origin of profunda femoris was measured from the mid point of inguinal ligament with the help of a Scale and Radial Calipers. The sites of the origin of medial and lateral circumflex arteries from the origin of profunda femoris were measured in millimeters (mm)[4].

The internal diameter of femoral artery was recorded by injecting gelatin and undiluted Indian ink into the femoral artery with the help of a syringe and on setting of the gelatin internal diameter of femoral artery was measured with the Radial Calipers[5].

OBSERVATIONS

The site of the profunda femoris was observed originating from the posterolateral aspect of the femoral artery. The distance of origin of profunda femoris from the femoral artery was measured from the mid point of the inguinal ligament. On the right side, in 40 % cases it was observed to be 30 - 40 mm (fig. 1).

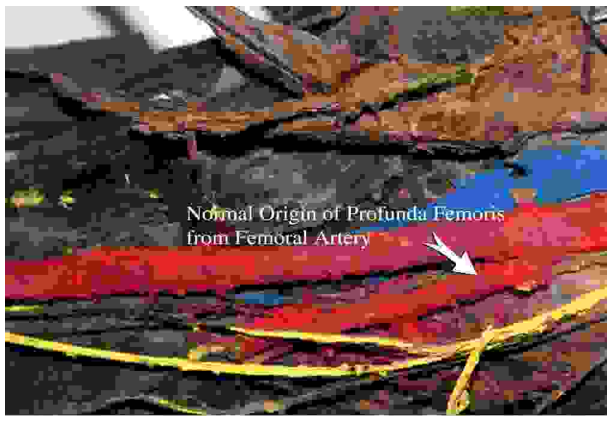

Fig-1. Normal relationships of the origin of rofunda femoris on the left side

In 30% cases it was noted to be 20 – 30 mm. Interestingly in 10% cases a variation was observed and the location was recorded to be 60 – 70 mm in the thigh from the mid point of inguinal ligament (Table I). Similarly the distance of origin of the vessel on the left side was also measured. In 35% cases the average distance was observed to be 30-40 mm. A variation on the left side was observed in 15% cases, which was 50-60 mm (Table I).

Table-I. Distance of origin of profunda femoris from the mid point of inguinal ligamnet

Range in millimeter	No of cases	
	Right side	Left side
20-30	6	5
30-40	8	7
40-50	2	3
50-60	2	3
60-70	2	2

The origin of lateral circumflex artery was recorded from the point of origin of the profunda femoris artery. On the right side 35% of the vessels were between 20 – 30 mm and only in 10% cases a range as high as 10 mm and as low as 50 mm from the origin of the profunda feroris artery were recorded (Table II and fig. 2). On the left side the distance of origin was recorded in the range of 20-30 mm in 40% cases. In 10% cases the distance was observed to be as high as 10mm (Table II).

Fig-2. Low origin of lateral circumflex arising from the profunda femoris artery on the right side

Table-II. Distance of Origin of Lateral Circumflex from origin of Profunda Femoris

Range in millimeter	No of cases	
	Right side	Left side
39091	2	2
39405	5	6
21-30	7	8
31-40	3	2
41-50	2	2
51-60	1	-

In one case (2.5%) medial circumflex artery on the right side was seen originating directly from the femoral artery at the same level as profunda femoris artery (fig. 3 & 4). The observation recorded in measuring the distance of the origin of the medial circumflex artery was noted to be 20 – 40 mm in 60% cases. On the left side in 10% cases the distance was measured as high as 0 – 10 mm. On the right side no observation was recorded as low as 60

mm, but on the left side only one case was noted (Table III).

Fig-3. High origin of the medial circumflex artery on the right side

Fig-4. Common stem of origin of medical circumflex and profunda femoris on the right side

The internal diameter of the femoral artery on the right and left side were also recorded and on both sides it was 5.1 – 6.0 mm in 5% cases. On the left side 70% cases were in the range of 7.1 to 8.0 and in just one case i.e. 5% 10mm (1cm) was measured. In 75% cases on the right side were in the range of 7.1- 8.0 mm and none with 10 mm (1 cm) was noted (Table IV).

Table-III. Distance of Origin of Medial Circumflex from origin of Profunda Femoris

Range in millimeter	No of cases	
	Right side	Left side
39091	1	2
39405	6	7
21-30	7	5
31-40	5	5
41-50	1	-
51-60	-	1

Table-IV. Internal Diameter in Millimeters of Femoral Artery

Range in millimeter	No of cases	
	Right side	Left side
4.0-5.0	-	-
5.1-6.0	1	1
6.1-7.0	2	2
7.1-8.0	15	14
8.1-9.0	2	2
9.1-10.0	-	1

DISCUSSION

The injury caused by percutaneous femoral artery for cannulation can case pseudo aneurysms. This usually happens when the puncture site is the profunda femoris artery or the femoral artery distal to the origin of the profunda femoris artery. The different anatomical relationships and the lack of knowledge of variations of these vessels make the hemostasis difficult to manage[6].

The average distance of the origin of the profunda femoris artery from the mid point of inguinal ligament was recorded between 30 – 40 mm, which is in accordance to the value mentioned in the literature as 35 to 40 mm[7]. The studies in our project revealed slight variations only in 10% cases where the distance of origin of profunda femoris from the mid point of inguinal ligament was

observed to be 60 – 70 mm. The other iatrogenic results in this project revealed the origin of medial circumflex artery from the femoral artery at the level of the origin of profunda femoris artery in 2.5% cases. Due to its high position it can be damaged when the femoral artery is punctured for various cardiac interventional procedures.

These results are also comparable with the data given earlier[4] in which they observed an average distance of origin of profunda femoris from the mid inguinal point between 32 – 41 mm.

The average internal diameter of the femoral artery recorded in this project both on the left and the right side ranged between 6 – 10 mm which is in accordance to the findings obtained by contrast angiographic technique of the blood vessels when the arterial catheter is passed in the femoral artery the average diameter is cited as 6 – 10 mm these blood vessels are visualized in the Infrainguinal Occlusive Diseases which are indicated in peripheral vascular diseases, chronic arterial femoropopliteal occlusive diseases[8].

Minami T et al carried out ultrasound studies and concluded that female patients have significantly smaller femoral and radial arteries than male patients even when controlled for age and mass of body index[9].

CONCLUSION

These variations of the origin of profunda femoris artery from the femoral artery and its branches along with internal diameter of the femoral artery needs to be taken into account and considered in all the surgical and interventional procedures.

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