Review Article

Cadaveric Study of Diameter of Brachial Artery

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Abstract

Upper limb is supplied by Brachial Artery (BA) and its branches. Brachial Artery (BA) is an important structure as diagnostic as well as therapeutic procedures can be done and is important to surgeons, orthopedicians, physicians, radiologists and interventionists. **Aim:** 1. The Diameter (D) of the Brachial Artery (BA) at its origin. 2. The Diameter (D) of the Brachial Artery (BA) at its termination. **Results:** Average diameter (Mean) of the BA at its origin was found to be 4.40 mm and 4.29 mm on right and left side respectively. Minimum diameter on right side was 3.5 mm and maximum was 5.5 mm. Minimum diameter on left side was 3.5 mm and maximum was 5 mm. The mean diameter of the brachial artery at its termination was found to be 4.07 mm and 0.39 cm on right and left side respectively. Minimum diameter on right side was 3.1 mm and maximum diameter was 5 mm. Minimum diameter on left side was 3.1 mm and maximum was 4.7 mm.

Keywords

Mean diameter; Flow Mediated Dilation (FMD); Artery–vein fistula; Intra-Aortic Balloon (IAB)

Introduction

Brachion is a Greek word meaning shorter; brachium means arm. Upper limb is supplied by brachial artery & its branches.

Brachial artery begins as the continuation of axillary and terminates by dividing into the radial and ulnar arteries in the cubital fossa at the level of neck of radius.

Brachial artery has numerous important anastomoses with radial and ulnar arteries, which ensures blood circulation in case of an obstructed blood flow during elbow flexion. [1-10]

Brachial artery is an important structure as diagnostic as well as therapeutic approaches can be proposed and is important to surgeons, orthopedicians, physicians, radiologists and interventionists.

Balloon insertion (IAB) through the brachial artery is effective as well as safe in patients with vascular disease who goes through coronary artery bypass surgery.

Variations may lead to damage during common surgical procedures. During vene puncture of the median cubital vein, superficial ulnar artery can get penetrated. [11-19]

Intra-arterial injection of drug leads to amputation of the forearm or finger. [20-25] The brachial artery is also used in prediction of late In-Stent Coronary Restenosis (ISR). [26-29]

Knowledge of the artery is of importance in the reparative surgery in the arm, forearm and hand. [30-32]

Femoral artery is usually used for Endovascular diagnostic and therapeutic and when access to femoral artery is difficult or contraindicated, brachial artery can be used. [33-38]

The brachial artery is also of use in treatment of Chronic Renal Failure (CRF) and is selected for dialysis.

The brachial artery-brachial vein fistula is an option for hemodialysis access. The brachial artery is a safe and reliable route for obtaining arterial blood gas analysis. [39-45]

So this study will help in preventing and avoiding procedural complications and will be helpful for therapeutics well as diagnostic procedures. This study is undertaken to note the diameter brachial artery in human cadavers. [46-50]

Subjects and Methods

60 embalmed cadavers were utilized in this study. Out of 60, 56 cadavers were of males and 4 cadavers were of females. There was no evidence of previous surgery in any of the limbs.

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Dissection was carried out

Incision was taken of the skin, skin was reflected. Superficial fascia and deep fascia also reflected to expose the arm and front of the forearm till the cubital fossa. Bicipital aponeurosis was incised. Brachial artery was dissected and traced till cubital fossa and its branches were traced till termination. [51-54] with the help of the following formula, diameters of these arteries were

Calculated:

Circumference=2 π r

= π d (d=2r)

d=circumference ÷ π

Where, r-radius of artery, d-diameter of artery, π=3.14

The data was analyzed to calculate the range, mean, standard deviation [Figures 1 and 2].

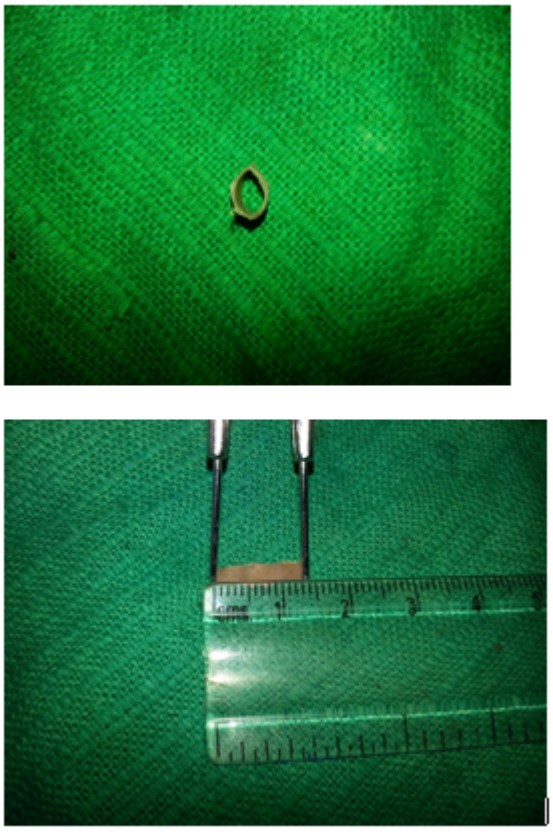

Figure 1: Measurement of diameter of brachial artery.

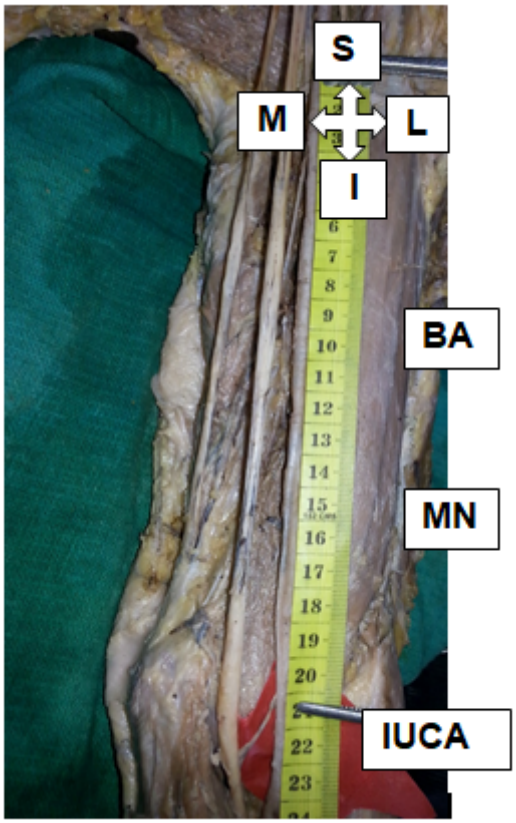

Figure 2: Dissected left brachial artery (left sided brachial artery viewed from anterior aspect).

Results

In 1 cadaver, brachial artery was absent on the right side. Average diameter of the BA at its origin was found to be 4.40 mm and 4.29 mm on right and left side respectively. Minimum diameter on right side was found to be 3.5 mm and maximum diameter as 5.5 mm.

Minimum diameters on left side was 0.35 cm and maximum diameter was 5 mm [Table 1].On the right side, 24 out of 59 cases showed the diameter at origin was between 4.1 and 4.5 mm. whereas on the left side 33.33% of cases, the diameter of artery at its origin was between 4.6 and 5 mm [Table 2].

In 1 cadaver, brachial artery was absent in the right arm. The Mean Diameter (MDA) of the BA at termination was found to be 0.4 cm and 0.39 cm on right and left side respectively. Minimum on right side was 0.31 cm and maximum was 5 mm. Minimum diameter on left side was 0.31 cm and maximum diameter was 0.47 cm [Table 3].

On the right side, 32 out of 59 cases showed the diameter of the artery at its termination was between 4 and 4.9 mm. Whereas on the left side 51.66% of cases, the diameter of the at its termination was between 4 and 4.9 mm [Table 4].

Table1: Mean diameter of the BA at its origin.

Side	Number	Range (mm)	Average (mm)	Standard deviation
Right	59*	3.5-5.5	4.4	0.5
Left	60	3.5-5	4.29	0.41

Table 2: Mean diameter of the BA at its origin.

Range (in mm)	Right side	Percentage	Left side	Percentage
3.5-4	12	20.33	16	26.66
4.1-4.5	24	40.67	24	40
4.6-5	20	33.89	20	33.33
5.1-5.5	3	5.08	0	0
Total	59	100	60	100

Table 3: Mean diameter of the BA at its termination.

Side	Number	Range (mm)	Average (mm)	Standard deviation
Right	59*	3.1- 5	4.07	0.48
Left	60	3.1- 4.7	3.98	0.44

Table 4: Mean diameter of the BA at its termination.

Range (in mm)	Right side	Percentage	Left side	Percentage
3-3.9	25	42.37	29	48.33
4-4.9	32	54.23	31	51.66
≥4	2	3.38	0	0
Total	59	100	60	100

Table 5: Parameter's and diameters calculations.

Parameters/Studies	Diameter of the BA (in mm)	Diameter of the BA at origin (in mm)	Diameter of the BA at termination (in mm)
Shoemaker JK, et al. (1997) (echo and doppler combined)	4.2		
Kullo IJ, et al. (2002-2004) (sonographic)	3.71 ± 0.70		
Arnold JM, et al. (1991) (doppler)	4.07+0.10 (study group)		
	4.53+0.09 (control group)		
Present study-R		4.40 ± 0.50	4.29 ± 0.41
Present study-L		4.07 ± 0.48	3.98 ± 0.43

Discussion

Arnold et al. in 1991 studied 45 patients of Congestive Heart Failure (CHF). It then compared measurements of brachial artery diameter, flow, and pulse wave velocity with 22 normal controls of similar age. Mean arterial pressure was lower than in controls in CHF, as were brachial artery diameter, flow, compliance, and conductance. Secondly, Limb vascular resistance and pulse wave velocity were found to be on higher side than in controls. Brachial artery diameter was lower than in controls as severity of CHF increased. Expected was that the lower arterial pressure and flow might will passively reduce the diameter, and this would be connected with a reduced pulse velocity and improvement of arterial compliance, but the opposite was seen in Table 5.Shoemaker et al. in 1997 studied the response of the arteries during dynamic exercise. So the measured the change in artery diameter as well as quantitative blood flow, from rest to rhythmic exercise in 7 young and healthy men. Noninvasive techniques were used to see the changes during dynamic exercises. Arterial diameter was reduced following exercise while returned to rest levels by 30 seconds. After

increase in the contraction rat, artery diameter of the active arm was greater than at. Blood velocity and blood flow were increased in active limb but were reduced in the inactive arm. They concluded that brachial artery responses were dependent upon the rate of exercise and position of the arm. The activity of the skeletal muscle may contribute for the change in the dimensions of the artery. Kullo et al. conducted a study on 441 participants. Brachial artery diameter was measured by high-resolution ultrasound. The average diameter of the artery was found to be 3.71 nm ± 0.70 mm.

Conclusions

The brachial artery situated in the arm has been of great interest to the surgeons, vascular surgeons, physicians, orthopedicians and radiologists. Knowledge of morphometric data can be of help for diagnostic and therapeutic interventions.

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