

## ORIGINAL RESEARCH

### **Study of parameters of radial artery in south Indian cadavers to assist angiography through anatomical snuff box**

**<sup>1</sup>Dr. Swetha B, <sup>2</sup>Dr. Vidya KS, <sup>3</sup>Dr. Hema N**

MBBS, MD, Associate Professor<sup>1</sup>, Professor<sup>2</sup>, Department of Anatomy, BGS Global Institute of Medical Sciences, Bengaluru, Karnataka, India

<sup>3</sup>MBBS, MD Associate Professor, Department of Anatomy, ESIC medical college and PGIMSR, Rajajinagar, Bengaluru, Karnataka, India

#### **Corresponding author**

Dr. Swetha B

MBBS, MD, Associate Professor, Department of Anatomy, BGS Global Institute of Medical Sciences, Bengaluru, Karnataka, India

**Email:** [swethadhananjay90@gmail.com](mailto:swethadhananjay90@gmail.com)

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#### **ABSTRACT**

**Of late, radial artery is commonly used for angiography compared to transfemoral or trans brachial route as this procedure yields less post operative hospital stay for the patients. So here is an effort to give various data on radial artery to support their various procedures.**

**Material & Methods:** Radial artery parameters were collected and studied from 56 south-Indian upper limbs of both sexes and both sides by Dissection Method. Statistical analysis used to measure Average, median, mode, standard deviation and unpaired T test were calculated using Microsoft Excel.

**Results:** Radial artery takes origin from inter epicondylar line at a mean distance of 2.31 cms. respectively. Mean total length of the radial artery from origin to styloid process is 24.58cm. Its mean luminal diameter at its origin is 0.48 cm. Mean luminal diameter at its termination in the anatomical snuff box is 0.47 cm. Differences in the measurement of both sexes and various other parameters described in detail in the article.

**Variations like Radioulnar loops seen in one specimen. Distal 1/3 of forearm tortuosity in 7 specimens and full-length tortuosity in 3 specimens**

**Conclusions:** From our study, we conclude that the parameters we obtained are similar to earlier studies published. The anomalies in the course of Radial artery are very minimal with radioulnar loops in 1.8 %, full length tortuosity in 5.4 % and distal 1/3<sup>rd</sup> tortuosity in 12.5 % only. This concludes that radial artery can be considered as the safer and useful route for various coronary interventions surgeries

**Key-words:** Radial artery, anatomical snuff box, Angioplasty

#### **INTRODUCTION**

Earlier, Angioplasty was conducted using trans femoral or trans brachial approaches. Cardio surgeons have noted several incidence of adverse cardiac events during angiography. Occlusion, myocardial infarction were significantly lower in radial artery procedures when compared with Saphenous vein<sup>1</sup>. During Covid period, radial arteries were used commonly for transcatheter coronary interventions (angioplasty) due to less risk complications and less

hospital stay for the patients, also radial artery being superficial in the anatomical snuff box, haemostasis can be easily achieved just by local compression and no major structures were related to the site of procedure. There is relatively lack of local complications compared to Femoral<sup>2</sup>. Hand Ischaemia is also a rare complication as there is collateral circulation through palmar arches<sup>3</sup>Radial artery, a terminal branch of the Brachial artery arises normally at the level of neck of radius in the cubital fossa. Its course is superficial compared to Ulnar artery and is accompanied by a pair of venae comitantes. It gives radial recurrent branch proximally which involves in the anastomosis around elbow. It runs along with radial nerve in the forearm. Distally It winds dorsally beneath the tendons of abductor pollicis longus and extensor pollicis brevis and runs as a content in the anatomical snuff Box. It leaves the wrist through a triangular gap between the two heads of first dorsal interosseous muscle and enters the palm where it completes the palmar arches along with the ulnar artery<sup>4</sup>. Basic knowledge on morphology and variations are very important for cardio surgeons to perform with precision procedures on radial artery. Therefore present study was conducted to know the various parameters among south Indian population.

### SUBJECTS AND METHODS

Fifty six (56) radial artery specimens were studied on donated embalmed bodies out of which, 20 adult males & 8 adult females collected from anatomy department and are with an average age of 35 to 60 years old. These specimens were collected during tenure 2013-2022. Dissection method preferred using Cunningham's Manual<sup>5</sup> to trace the radial artery from origin till its termination in the anatomical snuff box. After the dissection, the distance between the origin and the interepicondylar line measured with the help of scale (Fig 1). The length of the radial artery measured from its origin to the distal end (2cm proximal to styloid process of the radius just above the wrist) using slide callipers (Fig 2). Later the Luminal diameter of the radial artery at the origin and at the distal end (in anatomical snuff box) were noted using callipers in centimetres. Various anomalies like tortuosity, radioulnar loops were noted (Fig3). All the measurements and observations were recorded. Tabulated measurements were entered in Microsoft excel . It was later computerised and analysed using Statistical Package for Social Science (SPSS 16<sup>th</sup> version). Average, median, mode and standard deviation were calculated.

### RESULTS

Radial artery takes origin from inter epicondylar line at a mean distance of 2.31 cms, ranges from 0.7-5.7 cms and standard deviation of 0.99 cms (Table 1).

**Table 1: Radial artery measurements of 56 specimens- Statistical analysis**

Radial artery parameters	N	Minimum (in cms)	Maximum (in cms)	Mean (in cms)	Std. Deviation (in cms)
Total length from origin to wrist	56	19	42	24.58	5.31
Origin from inter epicondylar line	56	0.7	5.7	2.31	0.99
Mean diameter at the origin	56	0.2	0.7	0.48	0.10
Mean terminal diameter (in A S Box)	56	0.3	0.8	0.47	0.10

In females its measurement ranges from 3.4 cm to 0.7 cms with an average measurement of 2.17 cm on both sides (Table 2)

**Table 2: Radial artery measurements in female specimens**

Radial artery parameters in females	N	Minimum	Maximum	Mean	SD
Total length from origin to wrist	16	19	42	22.51	5.43
Origin from inter epicondylar line	16	0.7	3.4	2.17	0.76
Mean diameter at the origin	16	0.2	0.7	0.45	0.10
Mean terminal diameter (in A S Box)	16	0.3	0.8	0.48	0.12

and on left side, its average measurement of 2.41 cm and on right 1.93 cms (Table 3).

**Table 4: Radial artery measurements in male specimens**

Radial artery parameters in males	N	Minimum	Maximum	Mean	SD*
Total length from origin to wrist	40	20	42	25.41	5.10
Origin from inter epicondylar line	40	0.7	5.7	2.36	1.08
Mean diameter at the origin	40	0.3	0.7	0.49	0.10
Mean terminal diameter (in A S Box)	40	0.3	0.6	0.47	0.09

In males its measurement ranges from 0.7 cm to 5.7 cms with an average measurement of 2.36 cms on both sides (Table 4) and on left side,

**Table 3: Comparison between left & right Radial artery parameters of females using unpaired 't' test**

Radial Artery parameters in females	Side	N	Mean	SD*	SE#	t	p-value
Length from Origin to wrist	Left	8	21.38	1.98	0.70	0.83	0.421
	Right	8	23.65	7.50	2.65		
Origin from Inter epicondylar line	Left	8	2.41	0.73	0.26	1.323	0.207
	Right	8	1.93	0.75	0.26		
Diameter at Origin	Left	8	0.48	0.10	0.04	0.966	0.35
	Right	8	0.43	0.10	0.04		
Terminal diameter (in A S Box)	Left	8	0.50	0.13	0.05	0.6	0.558
	Right	8	0.46	0.12	0.04		

SD\* – Standard deviation SE # – Standard Error

its average measurement of 2.62 cm and on right 2.11 cms (Table 5).

**Table 5: Comparison between left & right Radial artery parameters of males using unpaired 't' test**

Radial Artery parameters of males	Side	N	Mean	SD*	SE #	t	p-value
Length from Origin to wrist	Left	20	24.05	3.06	0.68	1.737	0.094
	Right	20	26.78	6.33	1.42		
Origin from Inter epicondylar line	Left	20	2.62	1.03	0.23	1.538	0.132
	Right	20	2.11	1.09	0.24		
Diameter at Origin	Left	20	0.50	0.09	0.02	0.473	0.639
	Right	20	0.48	0.11	0.02		
Terminal diameter (in A S Box)	Left	20	0.48		0.02	0.366	0.716
	Right	20	0.47	0.09	0.02		

SD\* – Standard deviation SE# – Standard Error

Mean total length of the radial artery from origin to styloid process is 24.58cms, ranges from 19 - 42 cms and standard deviation of 5.31cms (Table 1). In females its measurement ranges from 3.4 cm to 0.7 cms with an average measurement of 2.17 cm on both sides (Table 2) and on left side, its average measurement of 2.41 cm and on right 1.93 cm (Table 3). In males its measurement ranges from 20 cm to 42 cms with an average measurement of 25.41 cms on both sides (Table 4) and on left side, its average measurement of 24.05 cms and on right 26.78 cms (Table 5). It mean luminal diameter at its origin is 0.48 cm, ranges from 0.2 to 0.7 cm and standard deviation of 0.1 cms (Table 1). In females its measurement ranges from 0.2cms to 0.7 cms with an average measurement of 0.45 cms on both sides (Table 2) and on left side, its average measurement of 0.48 cm and on right 0.43 cms (Table 3). In males its measurement ranges from 0.3 cm to 0.7 cms with an average measurement of 0.49 cms on both sides (Table 4) and on left side, its average measurement of 0.50 cm and on right 0.48 cms (Table 5). Mean luminal diameter at its termination in the anatomical snuff box is 0.47 cms, ranges from 0.3 to 0.83 cm and standard deviation of 0.1 cm (Table 1). In females its measurement ranges from 0.3cms to 0.8 cms with an average measurement of 0.48 cms on both sides (Table 2) and on left side, its average measurement of 0.50 cm and on right 0.46 cms (Table 3). In males its measurement ranges from 0.3 cm to 0.6 cms with an average measurement of 0.47 cms on both sides (Table 4) and on left side, its average measurement of 0.48 cms and on right 0.47 cms (Table 5). Comparison between left & right Radial artery parameters of females were observed using unpaired 't' test. No significant mean difference was observed between left & right radial artery parameters in females (Table.3). Comparison between left & right Radial artery parameters of males using unpaired 't' test. No significant difference was observed between left & right radial artery parameters of males (Table.5).

Anamolies: Radioulnar loops seen in one specimen.

Tortuosity seen in distal 1/3 of forearm in 7 specimens and full length tortuosity in 3 specimens

Fig. 1 Radial artery origin noted from intercondylar line



Fig 2. Length of radial artery measured using slide callipers



Fig3. Tortuosity observed in radial artery whereas ulnar artery found to be normal



## DISCUSSION

In this study, 56 specimens were studied by dissection method to know various parameters on origin, length, intraluminal diameters at both ends. Rodriguez- Niedenfuhr et al <sup>6</sup> observed high origin of radial artery from axillary artery and upper 1/3 of brachial artery in 23 cases out of 150 cases, we also noticed high origin of radial artery in 5 specimens. Remaining specimens we saw radial artery arising from Brachial artery at or below the elbow which has also been mentioned by VA Jebara , C Acar et al <sup>7</sup>. Poteat WL <sup>8</sup>& Charles JJ <sup>9</sup> has reported absent radial artery in their studies which we didn't observe. M Rodriguez *et al* explained the embryological reasons for the different arterial pattern observed in upper Limb. total length of Radial artery from its origin to wrist joint is in the same range as the previous literatures, measurement of distance from origin to intercondylar line is around 1 cm less than previous studies and the diameters of radial artery at origin and anatomical snuff box are 0.1 cms more than the previous studies. Naoyuki Yokoyama *et al*, Keimeneij F et al<sup>10</sup> recommended radial artery for angioplasty as it has high success rate with less stenotic changes. Complications at site is nil and major complications like myocardial infarction leading to death totally avoided. Hence selecting radial artery approach by Cardiothoracic surgeons for angioplasty during Covid era place a significant role in terms of patient safety

**CONCLUSION**

From our study, we conclude that the parameters we obtained are almost in the same range as the previous studies. Origin of the radial artery takes usually from the brachial artery at or just below the elbow. The anomalies found in the course of Radial artery is very minimal concludes that radial artery can be considered as a safe and useful route for various coronary interventions surgery. The comparison of the values between the sexes and the right and left limb parameters of radial artery will be useful information for the cardio surgeons.

**CONFLICT OF INTEREST**

We declare that this piece of work is free from all conflict of interest.

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