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Study of the Diameter of the Ulnar Artery in Human Cadavers and Its Clinical Significance

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ABSTRACT

Introduction: The ulnar artery is one of the major arteries supplying the forearm and hand and plays an important role in forming the superficial palmar arch. Knowledge of its diameter and anatomical variations is crucial for vascular surgeries, reconstructive procedures, and interventional radiology. **AIM:** The present cadaveric study aimed to measure the diameter of the ulnar artery in human cadavers and to analyze its clinical significance.

Material and Methods: A total of 160 upper limbs from adult human cadavers were dissected in the Department of Anatomy. The external diameter of the ulnar artery was measured using a digital vernier caliper at the level of the wrist.

Results: The mean diameter observed in the present study on the right side was 4.29 ± 0.37 mm, whereas on the left side it was 4.30 ± 0.36 mm.

Conclusion: Understanding the morphometric characteristics of the ulnar artery can help surgeons avoid complications during procedures such as arterial cannulation, flap surgeries, and vascular grafting.

Keywords: Ulnar artery, cadaveric study, arterial diameter, forearm anatomy, clinical correlation.

INTRODUCTION

The arterial supply of the upper limb is primarily provided by the brachial artery, which divides into the radial and ulnar arteries in the cubital fossa. (1) The ulnar artery is usually the larger terminal branch and contributes significantly to the superficial palmar arch of the hand. Variations in the diameter and course of the ulnar artery are clinically significant during surgical procedures involving the forearm and hand. Morphometric studies of arteries in cadavers provide important anatomical data that guide clinicians in surgical planning and interventional procedures. (2) The diameter of the ulnar artery has gained importance in procedures such as coronary artery bypass grafting, arterial cannulation, and reconstructive microsurgery. Accurate anatomical knowledge is also essential to avoid iatrogenic injuries during procedures such as carpal tunnel release, vascular access, and forearm surgeries. (3) Therefore, studying the diameter of the ulnar artery in cadavers helps provide valuable information for clinicians.

MATERIALS AND METHODS

This descriptive cadaveric study was conducted on 160 upper limbs (80 right and 80 left upper limbs) obtained from embalmed adult human cadavers in the Department of Anatomy of the Index Medical College & Research Centre, Indore. The upper limbs were dissected according to standard anatomical dissection procedures. Skin, superficial fascia, and deep fascia were removed to expose the forearm structures. The ulnar artery was identified along its course in the forearm till the wrist. The diameter of the ulnar artery was measured using a digital vernier caliper at the level of the wrist joint. Each measurement was recorded in millimetres.

INCLUSION CRITERIA

- Well-preserved adult cadavers
- Cadavers without trauma or deformities in the upper limb

EXCLUSION CRITERIA

- Damaged upper limbs
- Congenital anomalies of the upper limb

OBSERVATIONS AND RESULTS

The diameter of the ulnar artery was studied in 160 upper limb specimens (80 right and left) belonging to human cadavers.

Parameter	Side	N	Mean±SD		Between group comparison 'Independence t-test'
			Mean	SD	
Diameter of ulnar artery at level of wrist	Right	80	4.29	0.37	t= -0.244 p value= 0.597
	Left	80	4.30	0.36	

Table-1. Showing the diameter of the right & left ulnar artery at the wrist level.

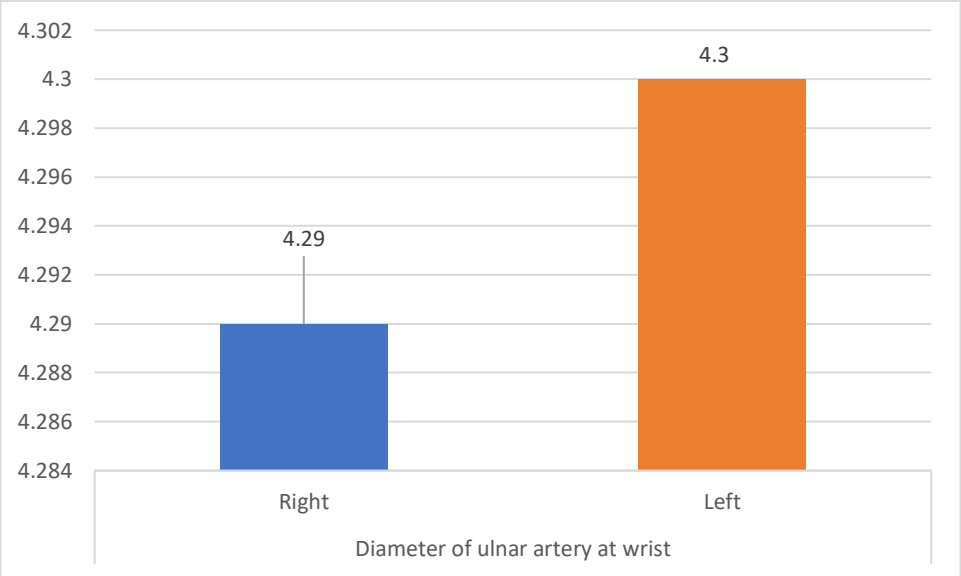

Table showing the comparison of the diameter of the ulnar artery at the wrist level between the right and left sides. A total of 80 observations were analysed for each side. The mean diameter of the ulnar artery on the right side was 4.29 ± 0.37 mm, whereas on the left side it was 4.30 ± 0.36 mm. The mean difference between the two sides was 0.01 mm, indicating an almost identical arterial diameter bilaterally. An independent samples t-test was performed to evaluate the statistical significance of the observed difference. The analysis yielded a t-value

of -0.244 with a p-value of 0.597. Since the p-value is greater than the conventional level of significance ($p > 0.05$), the difference between the right and left ulnar artery diameters is not statistically significant. The standard deviations for both sides are nearly equal (0.37 mm on the right and 0.36 mm on the left), suggesting similar variability and a consistent distribution of ulnar artery diameters on both sides within the present study.

Discussion

The ulnar artery, the larger terminal branch of the brachial artery, originates in the cubital fossa at the level of the neck of the radius. It travels down the anterior compartment of the forearm and enters the palm anterior to the flexor retinaculum, accompanied by the ulnar nerve. In the palm, it terminates by forming the superficial palmar arch, usually joining with the superficial palmar branch of the radial artery. (4) Several variations of the ulnar artery have been documented, such as a high origin from the axillary artery or from the brachial artery in the arm, and the presence of a superficial course in the arm and forearm. (5,6) Variations in the vascular pattern of the upper limb arise from the growth or regression of the plexus buds during embryonic development. (7,8)

Therefore, abnormalities during the embryonic development of the vascular plexus in the upper limb buds can lead to diverse variations in the origin and course of the major upper limb arteries. (9) Several studies have reported that the ulnar artery has an average diameter of 4.3 mm at its origin. (10-13) The mean internal diameter of the ulnar artery was reported to be 2.4 mm on the right side and 2.3 mm on the left side at its origin, while at the wrist it measured 2.5 mm and 2.4 mm, respectively. In general, the internal diameter of the ulnar artery at the elbow region was found to be 3.6 mm. (13) Claassen et al. reported that the external diameter of the ulnar artery varies between 4.5 and 6.5 mm in the proximal region and between 2.5 and 4 mm in the distal region. (14) Al Talawah et al. reported that the mean external diameter of the ulnar artery was 3.02 mm on the left side and 3.07 in right side, and the mean internal diameter was 2.65 and 2.64 mm in males. whereas the mean external diameter of the ulnar artery was 2.64 mm on the left side and 2.53 in right side, and the right and left side of mean internal diameters of the ulnar artery was 2.31 and 2.19 mm in females. (3) In the current study, we found the diameter of the ulnar artery was 4.29 mm on the right side and 4.30 mm in left side. The findings of the present study are consistent with those reported in previous studies.

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