

**Research Article****The Morphology of Common Interosseous Artery and its Clinical Significance**Waseem Al Talalwah<sup>1\*</sup>, Dereje Getachew<sup>2</sup> and Roger Soames<sup>3</sup><sup>1</sup>King Abdullah International Medical Research Center / King Saud bin Abdulaziz University for Health Sciences, College of Medicine, Department of Basic Medical Sciences Hospital – NGHA, Riyadh, P.O. Box 3660, Riyadh<sup>2</sup>Anatomy Department, College of Medicine and Health sciences, Hawassa University, Awassa, 1560<sup>3</sup>Centre for Anatomy and Human Identification, College of Art, Science and Engineering, University of Dundee Dundee, DD1 5EH, UK**\*Corresponding author**

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**Abstract:** The common interosseous artery is main branch the ulnar artery which divides into anterior and posterior interosseous branches. The current study investigates common interosseous artery and its branch to provide detailed information regarding the morphology which would be of use to clinicians, orthopaedic surgeons, plastic surgeons and anatomists. Routine dissections of the right and left upper limb of 34 adult cadavers (20 male and 14 female: mean age 78.9 year) were undertaken. The common interosseous artery presents in 67.6% whereas it is congenital absence in 32.4%. The origin distance of bifurcation of common interosseous from the ulnar artery origin is between 33.11 and 33.45 mm. The anterior and posterior interosseous arteries present in 98.5% and 92.9% whereas they are congenital absence in 1.5% and 7.1% respectively in total cases. Further, the anterior and posterior interosseous arteries present in 92.9% whereas they are congenital absence in 7.1% in female. The external diameters of the common, anterior and posterior interosseous arteries at their origin ranged from 1.39-1.86 mm, 1.59-1.80 mm and 1.80-1.95 mm respectively. Understanding the variability of common interosseous artery and its branch may help the clinicians and surgeon for clinical use in heart, carotid and flap transplantations.**Keywords:** Ulnar artery, Common interosseous artery, Posterior interosseous artery, Anterior interosseous artery diameter, Wall thickness.

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**INTRODUCTION**

The common interosseous artery is a terminal branch the ulnar artery dividing into anterior and posterior digitorum profundus and flexor pollicis longus, supplying each: perforating branches pierce the interosseous membrane to supply the deep extensor muscles. It also has a small branch, which contributes to the vascular network around the carpal bones and joints. Both radius and ulna receive nutrient vessels. At the level of upper border of pronator quadratus the anterior interosseous artery passes through the interosseous membrane posteriorly. The posterior interosseous artery supplies the posterior compartment of the forearm, passing dorsally over the proximal margin of the interosseous artery. The posterior interosseous artery vanished near the back of interosseous space proximal to the upper end of the interosseous membrane but distal to the oblique cord [1].

The general objective of this study is to understand the morphology of common interosseous artery. Consequently, it is importance to know the internal diameter, external diameter, wall thickness and

distance of bifurcation of the common interosseous artery from the origin of the ulnar artery as well as the internal diameter, external diameter and wall thickness of the anterior and posterior interosseous arteries. With a variability of common interosseous artery, there is a conflict in surgical transplantations which may end with iatrogenic fault and failure.

**MATERIALS AND METHODS**

This study was undertaken in the anatomy laboratory of Centre for Anatomy and Human Identification at the University of Dundee. The procedures used were in line with approved protocols for the anatomy laboratory of Centre for Anatomy and Human Identification. This was dissection-based study of 68 upper limbs (34 rights, 34 left) of 14 adult female and 20 male cadavers (age range 37-96 years) in which the common interosseous artery and its branches were exposed. The origin level of common interosseous artery from the level of brachial artery bifurcation was taken. Further, the internal and external diameters of the common, anterior and posterior interosseous arteries at specified levels were measured using vernier calliper,

ruler and a protractor. The materials used in the measurement programme includes vernier calliper to measure the internal and external diameter, ruler to measure the position of the bifurcation of the brachial artery and length of the common interosseous artery, and a protractor to measure the angles of origin. The data were collected over a period of three consecutive months which includes mean and standard deviation. T-tests were performed to assess differences in arterial diameter between females and males and right and left sides, as well as along the length of individual vessels. In addition, the correlation between different aspects of the same vessel or between similar aspects of different vessels was also performed.

### RESULTS

The data were collected from both limbs of 34 cadavers (14 female and 20 male): the mean male and female ages were  $81 \pm 7.2$  and  $75.9 \pm 16.3$  respectively. The combined mean age is 78.9 with standard deviation of 11.9 years. The range of ages of all cadavers was 37 to 96 years. The common interosseous artery presents in

67.6% whereas it is congenital absence in 32.4%. The common interosseous artery presents in 50% whereas it is congenital absence in 50% in male and female. The origin distance of bifurcation of common interosseous from the ulnar artery origin is between 33.11 and 33.45 mm. The anterior and posterior interosseous artery presents in 98.5% and 92.9% whereas they are congenital absence in 1.5% and 7.1% respectively in total cases. Further, the anterior and posterior interosseous arteries present in 95% and 92.9% whereas they are congenital absence in 5% and 7.1% in male and female respectively. In investigation of the internal and external diameter of common, anterior and posterior interosseous arteries, there is a significant ( $p < 0.05$ ) difference between some male and female values as well as between the left and right sides (Table 1). In investigation of the mean, standard deviation and the range of values of the distance between the bifurcation of common interosseous artery and the origin of ulnar artery, the male distance is significantly ( $p < 0.05$ ) larger than the female value (Table 2).



Fig. 1: The common interosseous artery is main branch the ulnar artery. B: Brachial artery, U: Ulnar artery, R: Radial artery, C: Common interosseous artery.

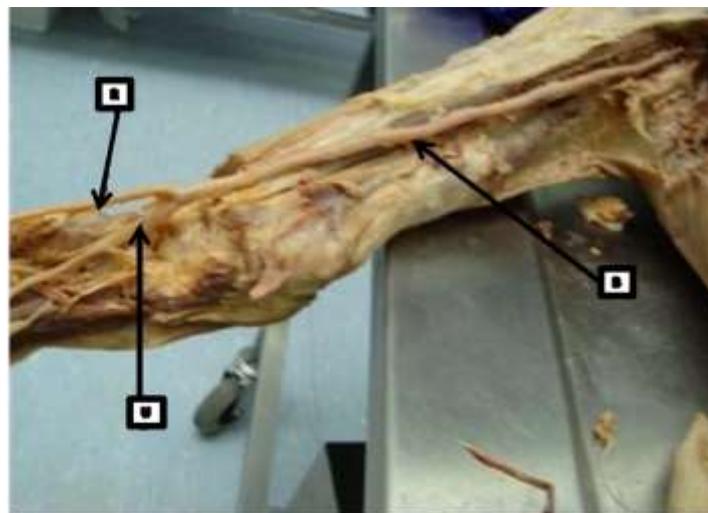


Fig. 2: Congenital absence of common interosseous artery; B: Brachial artery, U: Ulnar artery, R: Radial artery

**Table 1: Means and associated standard deviations (mm) of the external (Ext) and internal (Int) diameters and thickness of the common (CIA), anterior (AIA) and posterior (PIA) interosseous arteries (At) their origin in males and females, as well as for the combined group.**

Artery	Male					
	Left			Right		
	Ext	Int	Thickness	Ext	Int	Thickness
	Mean (SD)			Mean (SD)		
CIA	2.13(1.20)^	1.87(1.10)^	0.13(0.05)*	1.22(1.32)	0.90(1.06)	0.16(0.13)
AIA	1.86(0.80)*	1.55(1.19)	0.15(0.01)	2.03(0.54)*	1.74(0.53)*	0.14(0.01)
PIA	2.04(0.73)*	1.70(0.68)*	0.17(0.03)	2.07(0.78)	1.69(0.56)	0.19(0.11)
	Female					
	Mean (SD)			Mean (SD)		
	Left			Right		
	Ext	Int	Thickness	Ext	Int	Thickness
CIA	1.49(1.25)	1.31(1.10)	0.09(0.07)	1.63(1.13)	1.46(1.07)	0.08(0.03)
AIA	1.22(0.59)	0.93(0.56)	0.14(0.01)	1.49(0.36)	1.16(0.40)	0.16 (-0.02)
PIA	1.47(0.75)	1.20(0.65)	0.13(0.05)	1.77(0.53)	1.45(0.45)	0.16(0.04)
	Total Cases					
	Mean (SD)			Mean (SD)		
	Left			Right		
	Ext	Int	Thickness	Ext	Int	Thickness
CI	1.86(1.24)	1.64(1.12)	0.11(0.06)	1.39(1.24)	1.14(1.08)	0.12(0.08)
AI	1.59(0.78)	1.29(0.76)	0.15(0.01)	1.80(0.54)	1.50(0.56)	0.15(-0.01)
PI	1.80(0.78)	1.50(0.70)	0.15(0.04)	1.95(0.69)	1.59(0.53)	0.18(0.08)

\*Significantly (p<0.05) larger than corresponding female value; ^ Significantly (p<0.05) larger than corresponding right side value

**Table 2: Distance (mm) of the origin of the common interosseous artery from the origin of ulnar artery**

Male	Left	Right
Mean	34.67	35.57
Standard Deviation	5.55	6.48
Range	24-45	20-45
Female	Left	Right
Mean	31.71	29.6
SD	5.22	7.72
Range	21.66-41	15-42
Total cases	Left	Right
Mean	33.45	33.11
Standard deviation	5.53	7.52
Range	21.66-45	15-45

**DISCUSSION**

The variability of vascular upper limb has been recorded in series studies and found to be between 9% and 34.7% occurrence rate [2-13]. Embryologically, the axillary, brachial, and interosseous arteries develop from the primitive axial artery [11]. Therefore, the anatomical variation occurred is due to a fault in growth or regression of buds plexus [6,9,11, 14-22]. Learning the anatomical vascular variations may have a clinical benefit [22, 23]. Therefore, it is important for clinicians to realize the thickness, diameter and the variability of the common interossus artery and its branches because many surgical procedures have done in the cubital region [24] to provide a vascular replacement for carotid and coronary arteries and flap transplantation. Therefore, study the morphological features of common interosseous artery and its anterior and posterior branches may help surgeon to select the appropriate

artery for surgical intervention and increase rate of successful with minimize of iatrogenic fault.

The common interosseous artery usually arise from ulnar artery and splits into anterior and posterior interosseous branches. In few report studies, the common arterial trunk refereed as radio-ulnar-interosseous trunk found to be a branch of the axillary [4] and brachial [21, 25- 31] and described as a high origin of the common interosseous artery [32]. On series studies, it arose from radial artery [33-36] or deep branch of ulnar artery [37] instead or regular origin. Further, it may become a replacement regular origin of ulnar artery [10,11, 21, 30, 31, 38, 39] in case of high origin of ulnar artery [11, 30, 32, 38]. In present study, the common interosseous artery found to be a branch of the ulnar artery in 67.6%. The presence and absence of the common interosseous artery has no difference in

male and female. On the other hand, it found to be congenital absent [40, 41] which occur in 32.4% in present study. The catheterisation of small artery is under a great risk of rupture for possible use in different procedures such as the coronary artery disease, the aortic and peripheral vascular disease, and chronic renal failure [42] especially in high brachial artery bifurcation associated with high failure rate of arteriovenous fistula [43]. Therefore, the mean and associated standard deviations of the external and internal diameters and thickness of the common interosseous artery is mandatory to obtain sufficient data prior to any procedures. In current study, the mean and associated standard deviations of the external and internal diameters and thickness of the common interosseous artery found to be greater in male than in female as well as greater in left than in right in total cases. Further, the mean, standard deviation and the range of values of the distance between the bifurcation of common interosseous artery and the origin of ulnar artery found to be more significant ( $p < 0.05$ ) in male distance than the female value (Table 2). Variations in the origin of common interosseous artery have to be considered in invasive and non-invasive investigative procedures, reconstructive orthopedic and surgical procedures. Therefore Clinicians should be aware of vascular anatomy and the variations [42].

The anterior interosseous artery usually arises from the common interosseous artery. Infrequently, it may become a branch of ulnar artery [41]. On series studies, there is no incidence rate of presence and absence of anterior interosseous artery [6, 44-49] it found to be in 98.5% and congenital absence in 1.5% of total cases in current study. Furthermore, the anterior interosseous artery presents in 95% whereas it is congenital absence in 5% in male. The posterior interosseous artery usually arises from the common interosseous artery in 82% whereas it arises infrequently from the ulnar artery [41] in 18% [50]. In current study, the posterior interosseous artery presents in 92.9% and congenital absence in 7.1% respectively in total cases. Further, the posterior interosseous arteries present 92.9% whereas it is congenital absence in 7.1% in female. In forearm, external diameter of the posterior interosseous artery is 1.7 mm ranging from 1.2 mm to 2.6 mm whereas it is more than 1.85 mm ranging from 1.80 to 1.95 mm in current study. According to Tubbs *et al.* [51] the mean proximal and distal diameters for the anterior interosseous artery were 2 mm and 1 mm, respectively. Therefore, the right anterior interosseous artery will be appropriate choice for carotid branches replacement in male in current studies. However, the posterior interosseous artery will be appropriate choice than the anterior one for carotid branches replacement in male in current studies (Table 1).

## CONCLUSION

In general, morphological study of upper limb artery gives clear picture about the vessels to reduce

clinical complication in the region. In our findings most of the artery courses normal anatomical position except anomalies happens in the cases of common, anterior and posterior interosseous artery. Clinician, surgeons and radiologist should be aware that the arterial diameter (both internal and external), wall thickness, distances of bifurcation and angle of bifurcation of the arteries to improve the service of medication worldwide.

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