



UNILATERAL PERSISTENT MEDIAN ARTERY – A CASE REPORT

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ABSTRACT

The Persistent median artery (PMA) is one of the transitory vessels that represents the primitive arterial architecture in the forearm. Its reported frequency, ranges from 0.6% to 44.2%. During routine anatomical dissection in the Department of Rachana Sharir, SDMT'S Ayurvedic Medical College, Terdal, we observed presence of Unilateral Persistent Median Artery in left forearm of 55-year-old male human cadaver. It originated from the Ulnar Artery, About 5-6cm distal to the division of the brachial artery, deep to the Pronator Teres muscle. In the forearm, it was passing superficial to the median nerve and seen crossing the nerve anteriorly directed towards post axial or ulnar aspect of forearm, further extending down under the deep surface of Flexor Digitorum Superficialis muscle. In the wrist, it was running deep to carpal tunnel along with median nerve under the flexor retinaculum and terminated into small branches. The ulnar artery, after giving the PMA, Anterior Interosseous artery(AIA), Posterior Interosseous Artery(PIA) branches, directly continued as the Ulnar Artery proper (UAP). The usual common interosseous artery was absent. No muscular or other arterial or nerve variations were observed in this cadaver. The embryological interpretation of this variation could be failure in the differentiation, degeneration or regression of parts of the initial network blood vessels. The awareness of this type of arterial variations are important to the physicians, Orthopaedic surgeons and Radiologists during the diagnosis and management of forearm or hand disorders. This report presents a case of unilateral palmar pattern of PMA with unique branching pattern of ulnar artery, origin and termination of persistent median artery and absent of common interosseous artery with its clinical significance

KEYWORDS: Ulnar Artery, Persistent Median Artery, Palmar Type, Median Nerve, Carpal Tunnel Syndrome.

INTRODUCTION

Anomalies of the arterial tree in the forelimb are fairly common: there are several potential causes. The arteries have multiple and plexiform sources; the principal arteries, anastomoses and periarticular networks emerge according to a temporal sequence; and some paths that are initially functionally dominant subsequently regress.^[1] M. Rodriguez-Niedenfuhr et al. suggested that the arterial variations arise through the persistence, enlargement and differentiation of parts of the initial network which would normally remain as capillaries or may even regress. The Persistent median artery is one of the transitory vessel that represents the primitive arterial architecture in forearm.^[2] It was first reported by Sir Richard Quain(1816-1898) as a small artery arising in cubital fossa from brachial artery and running along with Median Nerve.^[3] After the eighth week of gestation due the development and dominance of radial and ulnar arteries, the median artery normally undergoes degeneration, but the proximal part of artery will remain patent as slender branch to supply the median nerve. Due

to the failure of the regression, artery will remain in adult life and may act as potent blood supply to the hand by forming part in superficial palmar arch or digital branches.

The reported incidence of PMA variation observed during Anatomical dissection or surgical procedure were ranging from 0.6% to 44.2% as per literature review. K. Natsis et al. described the occurrence of Persistent Median artery in two forms in adulthood. The first type is antebrachial type, arising from anterior interosseous artery and ending in forearm is considered as normal. The second type is palmar type or embryonic type, that may arise from any of the forearm arteries and runs along with median nerve into the wrist. The palmar type of PMA is large, long, and reaches the palm by terminating as superficial arch or the main blood supplier to the index and long fingers. The presence of a PMA may result in numerous clinical and surgical conditions such as carpal tunnel syndrome, pronator syndrome and anterior interosseous nerve syndrome.^[4,5] In the present

observation, the reported variation is a case of palmar type of Persistent Median Artery with its clinical significance, found during the cadaver dissection in left forearm.

CASE REPORT

A Palmar pattern of Persistent Median Artery was observed in a male cadaver, aged 55years during routine dissection for undergraduates in Department of Rachana Sharir, Sidramappa Danigond Memorial Trust's Ayurvedic Medical College, Terdal. This variation was identified in left forearm, as a direct branch arising from Ulnar artery. A vertical incision was made from cubital fossa to the proximal margin of flexor retinaculum to expose the muscles of forearm. The superficial flexor muscles were identified and noted their origin from medial epicondyle of humerus and their respective insertion in forearm and palmar aspect of hand. A horizontal incision was made across the origin point and these muscles were reflected towards the wrist to expose underlying neurovascular structures. The termination of brachial artery into Ulnar and Radial were identified in the cubital fossa. The radial artery was running downwards with a lateral convexity to the wrist without any anomalies. The Ulnar artery was identified as passing obliquely under the heads of pronator teres and descending vertically along with ulnar nerve to the hand. The branching pattern of ulnar artery is quite different in this case as compared to usual pattern. The first branch was observed in cubital fossa, about a distance of 1cm from termination of brachial artery. It was ascending anteriorly towards the elbow and identified as Anterior Ulnar Recurrent Artery. The second branch was seen at a distance of 3cm below the termination of brachial artery. It was coursing upwards and backwards along medial border of elbow and identified as Posterior Ulnar Recurrent Artery(Fig.1). About 5 cm distal to the division of the brachial artery, deep to the pronator teres muscle, ulnar artery was found trifurcated into three branches. A long and large branch descending downwards and vertically with medial convexity in forearm to the hand along with ulnar nerve was identified as continuation of ulnar artery and named as Ulnar artery proper(UAP). An additional long branch was observed originating from the ulnar artery, lateral to the UAP

coursing towards the wrist along with median nerve, under the deep surface of flexor digitorum superficialis, was identified as Persistent median artery(PMA)(Figure 1). In the upper one third of forearm, this artery was superficial to median nerve after emerging from pronator teres muscle and running on the surface of Flexor Digitorum Profundus. In lower two third of forearm, the artery was descending downwards from anterior to medial side of the nerve in between tendons of flexor carpi radialis laterally and flexor digitorum superficialis medially and on the flexor digitorum Profundus. At the wrist, The PMA was passing into carpal tunnel along with median nerve under the flexor retinaculum and terminated into small branches to the median nerve and surrounding muscles(Figure 2,3). About 3-4cm above the wrist, the artery was seen crossing the nerve again from medial to anterior side of the nerve.

A small branch was seen arising from ulnar artery, lateral to PMA descending along with anterior interosseous nerve on the interosseous membrane, in between FDP and FPL, was identified as Anterior interosseous artery(AIA). Another branch was seen originated from ulnar artery opposite to AIA, was passing upwards, above the upper border of interosseous membrane to the back of forearm and was identified as Posterior interosseous artery. It was noted that the common interosseous artery was absent and the terminal branches were directly originated from the ulnar artery. Other than this, variations such as high division of median nerve or a bifid nerve configuration associated with PMA was not observed in present study. In right upper limb the course of Brachial artery, its termination along with terminal branches, ulnar artery and its branches were normal and the PMA was absent. The anomalous artery described and specimen was photographed. [Figures 1-4].

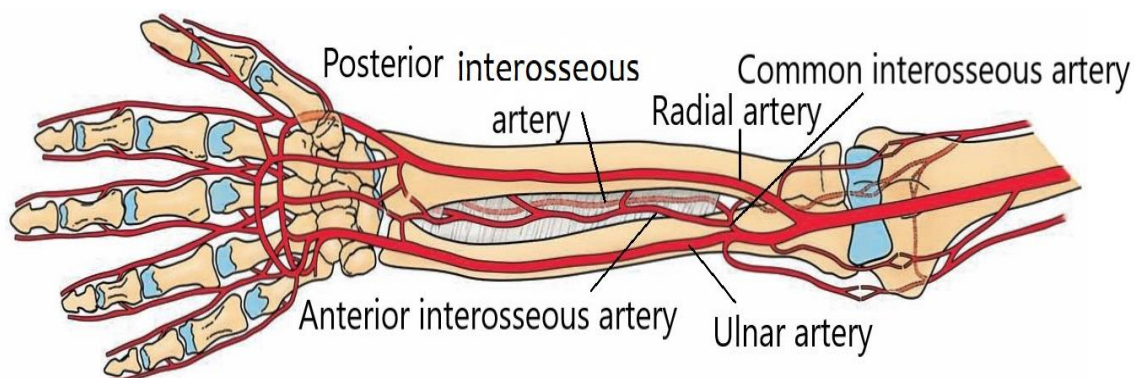


Fig. 1: Normal branching pattern of Ulnar artery in forearm.

[Credit: Grant's Atlas's-2009 ed.]



Fig. 2: Origin of Persistent Median Artery in the left forearm.



Fig. 3: Termination of Persistent Median Artery in the left forearm.

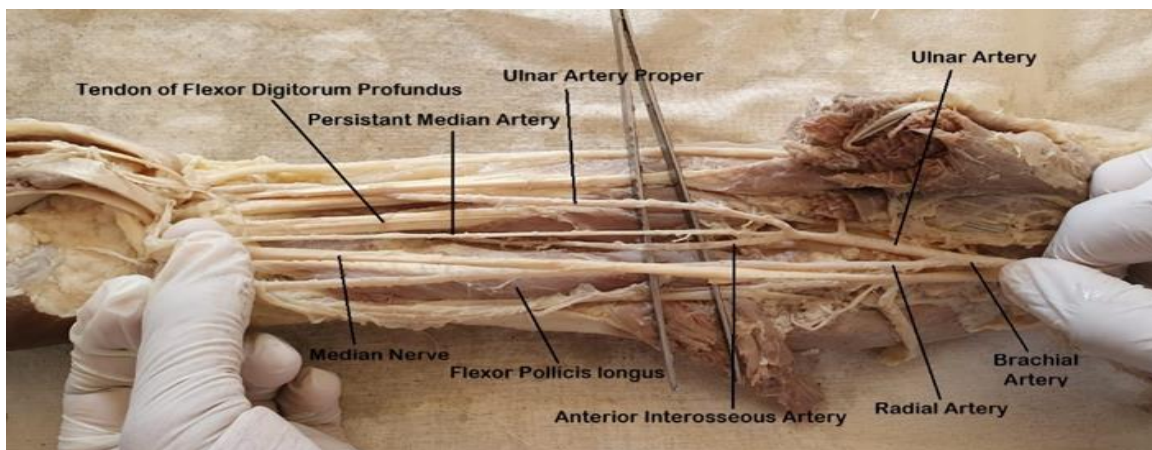


Fig. 4: Course and relation of Unilateral Persistent Median Artery in the left forearm.

DISCUSSION

The axis artery of the upper limb is derived from seventh cervical intersegmental (subclavian) artery. This artery grows distally along the ventral axial line and terminates in a palmar capillary plexus in hand. Main trunk of axis artery forms axillary artery, brachial artery, anterior interosseous artery, and deep palmar arch. The digital arteries of the hand arise from the palmar capillary plexus. The median artery develops later from the anterior interosseous artery and grows distally to communicate with the palmar capillary plexus.^[6] Several studies reported that, the origin of the median artery may be from the ulnar or anterior interosseous or common

interosseous or from the caudal angle between the ulnar and common interosseous or from the radial arteries.^[7] During the first trimester of pregnancy, the median artery normally undergoes degeneration, but the proximal part of artery will remain patent as slender branch to supply the median nerve. Due to the failure in differentiation, degeneration or regression, the median artery will remain into two forms in adult life.^[2] M. Rodriguez-Niedenfuhr et al studied in 120 cadavers and stated two different patterns of persistence of median artery. The large and long branch, accompanying the median nerve in the forearm and extending to the palm is palmar type. The second pattern is antebrachial type, which is short,

slender and terminated before reaching the hand.^[7] The variation found in the present case belongs to palmar type of PMA, originated from the ulnar artery. The incidence of this type of arterial pattern were reported between 1.5% to 13.3%. The overall incidence of PMA cases from any of the forearm arteries observed during anatomical dissection or surgical procedure are ranging from 0.6% to 44.2% in adults.^[4] According to Carry et al, the racial differences may influence the incidence of PMA and their study supported the relation between race and prevalence of PMA. The African Americans were significantly more likely to present with a persistent median artery than non-African Americans.^[8] Several reports and reviews suggest that, the PMA can occur unilaterally or bilaterally. Katrikh AZ and Stark E, considered the occurrence of bilateral PMA as rare, based on their observation.^[9] In one of the study Gassner et al reported that 63% of unilateral PMA were associated with anatomical variation of median nerve like high division or a bifid nerve configuration in the carpal tunnel.^[10] The identified PMA in our case is unilateral, but associated median nerve variation was not found in relation with PMA. The course of the PMA in relation to the median nerve in the forearm and hand is variable.

Published case reports and literature review shows that the PMA may descend anterior or posterior, ulnar or radial to the Median Nerve in forearm and anterior or anterolateral or anteromedial in the hand.^[3,5,7,11,12] The course of the PMA in the present case was anterior and ulnar (medial) in forearm and anterior in hand in relation to median nerve. The palmar type of Persistent median artery may terminate in hand in two forms, either ending as the 1st, 2nd or 1st and 2nd common digital arteries, or by forming complete or incomplete superficial palmar arch.^[13] When the PMA is extending into the carpal tunnel, it may join the superficial volar arch, and may supply the digits without arch, or may end as a thrombosed thread.^[10] But as per study conducted by Rajan Kumar Singla et al, in 3 cases, palmar type of PMA was found simply accompanying median nerve up to the palm and did not contribute blood supply to the hand, which was seen supportive to the present study,^[14] though the diameter of PMA in the present study was not measured, in some articles it is reported that median artery having large diameter have significant role in the Carpal tunnel syndrome. Gassner et al reported two cases of PMA with a diameter of 3mm produced Carpal tunnel syndrome and 13 cases with a diameter of 0.5 to 1.7 mm were asymptomatic. This shows the association between diameter of MA and its effect at the wrist.^[10] The PMA has long course from forearm to wrist and associated with Median nerve, Anterior interosseous nerve and flexor muscles. These close relations with PMA may produce clinical conditions like carpal tunnel syndrome, pronator syndrome, anterior interosseous nerve syndrome due to abnormal pathology of the artery in the form of calcification, thromboses, atherosclerosis, dilatation or trauma.^[14]

CONCLUSION

The PMA is not a rare vascular variation, its presence may cause syndromes like Pronator Syndrome, Anterior Interosseous Nerve Syndromes in forearm and Carpal Tunnel Syndrome in the wrist. The present case has highlighted the unique pattern of branching of ulnar artery, origin and termination of persistent median artery and absence of common interosseous artery. The awareness of this type of arterial variations are important to the physicians, orthopaedic surgeons and radiologist during the diagnosis and management of forearm or hand disorders. we also suggest patients should undergo preoperative ultrasonography of forearm or hand before surgical procedure of limbs to avoid iatrogenic injuries.

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