

Case Report

BILATERAL PERSISTENCE OF MEDIAN ARTERY WITH ABSENT PALMARIS LONGUS – A CASE REPORT

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ABSTRACT

A persistent median artery usually originates from the anterior interosseous artery in proximal one-third of the forearm and accompanies the median nerve. The median artery may regress in the forearm or enter palm through the carpal tunnel deep to flexor retinaculum of wrist and supply the palm by anastomosing with the superficial palmar arch. During routine dissection, the median artery was discovered accompanying the median nerve and was traced to its origin and termination in both the upper limbs. It was found that the persistent median artery originated from the common trunk of the ulnar artery along with the absence of superficial palmar arch and absent palmaris longus bilaterally. Knowledge of unusual variations enables in proper diagnosis of disorders of the median nerve. Presence of persistent median artery is usually asymptomatic but can cause symptoms of carpal tunnel syndrome or pronator teres syndrome when subjected to compression.

Keywords: Median nerve, Persistent Median artery, Anterior Interosseous artery, Palmaris Longus

INTRODUCTION

Variations in vascular patterns are commonly encountered which results mainly due to developmental anomalies during angiogenesis and vasculogenesis. A persistent median artery usually originates from the anterior interosseous artery in the proximal one-third of the forearm and accompanies the median nerve. The median artery may regress in the forearm or enter the palm through the carpal tunnel deep to flexor retinaculum and supply the palm by completing the superficial palmar arch with ulnar or radial arteries. It develops from the axis artery which represents axillary, brachial and anterior interosseous arteries. The median & anterior interosseous arteries form the primary source of blood supply to the hand during the first trimester of development. The median artery regresses after the ulnar and radial arteries develops and supplies the forearm and hand Rodriguez *et al.*, (1999). The median artery might also arise from common interosseous, ulnar or radial arteries.

The presence of a persistent median artery in the adult forearm is due to failure in normal regression of vasculature during gestation. The median artery normally undergoes retrogression following the first trimester of pregnancy into a small vessel that supplies the median nerve Rodriguez *et al.*, (2001). A failure of apoptosis results in a persistent median artery that travels through the carpal tunnel with the associated nerve and most commonly anastomoses with the superficial palmar arch.

The palmaris longus muscle in the forearm is one of the most variable muscles in the body. The typical palmaris longus muscle originates at the common flexor tendon of the medial epicondyle and has a tendinous insertion on the palmar aponeurosis. The most common variation to the muscle is agenesis, with a study showing an overall prevalence of absence in 26.6% of cases Kose *et al.*, (2009).

CASES

The body of a 50-year-old formalin fixed male was dissected as instructed in Cunningham's Manual of Practical Anatomy in the Department of Anatomy. By blunt dissection the median artery accompanying the median nerve was traced to its origin and termination in both the upper limbs (Figure 1) The variation encountered here was the presence of a persistent median artery which originated from the common trunk of the ulnar artery along with absent superficial palmar arch and absent palmaris longus on both sides. In the upper one third of forearm, median artery pierced the median nerve from posterior to anterior and ran

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along with the median nerve in the forearm and passed deep to flexor retinaculum and reached the palm where it gave off two common palmar digital branches and supplied lateral two and half fingers (Figure 2).

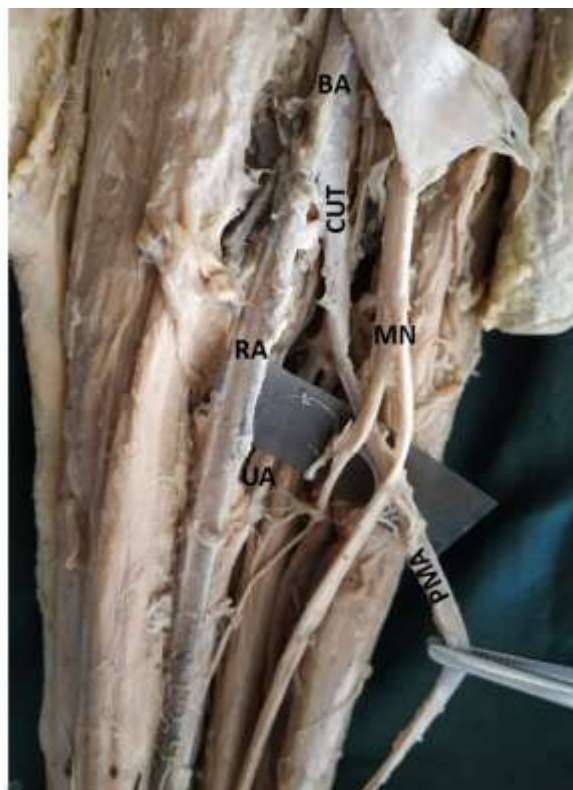


Figure 1 : Showing the origin of Right persistent median artery. (BA -Brachial artery, RA - Radial artery, CUT- Common ulnar trunk, MN- Median nerve, UA- Ulnar artery, PMA- Persistent median artery piercing the median nerve)

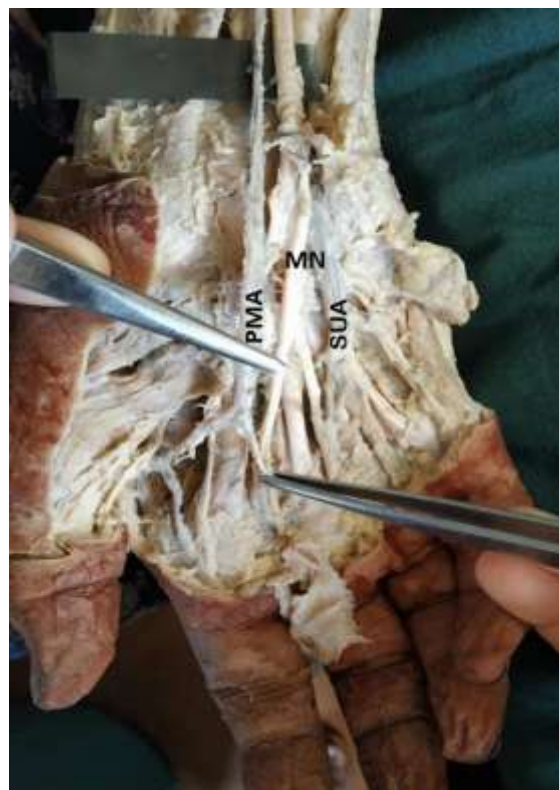


Figure 2: Showing the Right persistent median artery in the palm (MN - Median nerve, PMA- Persistent median artery, SUA- Superficial branch of ulnar artery)

DISCUSSION

The existence of a persistent median artery is not uncommon and has been reported in various previous studies, where the incidence has been found to between 1.5%-27.1% Sañudo *et al.*, (1994). The median artery is the axis artery of the superior extremity during early embryonic life. It helps to maintain the superficial palmar arch while the radial and ulnar arteries are developing. The persistence of the median artery in humans has been considered as the retention of a primitive arterial pattern while the antebrachial pattern is under development. It terminates before entering the wrist represents its partial regression. (Standring 2005, Fumiere *et al.*, 2002).

Pecket has described three different types of median artery vascularization: (a) radial and ulnar arteries forming superficial and deep palmar arches with the median nerve supplied by superficial palmar arch and by the anastomoses formed by radial and ulnar and by the forearm muscular branches (70%). (b) Either trifurcation of brachial artery into radial, ulnar and median artery or bifurcation of brachial into the radial and ulnar arteries. The median artery travels superficially to the median nerve and branches out at

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the palm to feed second, third and fourth digits (10%). (c) The median artery is related with the superficial palmar arch (20%). The presence of the median artery is not so uncommon, ranging from 1.5 to 27.1% and its presence in human adults shows the primitive arterial pattern which was existent in the fetal period (Pecket *et al.*, 1973).

There are various causes for anomalies of blood vessels. These causes are: a) Incomplete development b) The persistence of vessels normally obliterated c) The disappearance of vessels normally retained d) The choice of unusual paths in the primitive vascular plexuses. e) Fusion and absorption of the parts usually distinct (Natsis *et al.*, 2009).

The palmaris longus muscle is one of the flexor muscles of the forearm that originates from the medial epicondyle of the humerus, terminates on the flexor retinaculum and contributes to the palmar fascia. This muscle helps with wrist flexion. It is one of the most variable muscles of the body. Various anatomical variations of the muscle have been reported such as absence (2.68%); reversed palmaris longus coexisting with an additional abductor digiti minimi muscle (0.89%); digastric (0.89%); palmaris longus with intermediate muscle belly (1.79%) and duplication (1.79%) (Georgiev *et al.*, 2017a).

A recent study conducted by Georgiev *et al.*, (2017b) classifies variations in the muscle as belonging to two anatomical categories. The first describes any change in the normal position or the existence of an accessory muscle belly. The second category consists of variations to the tendon or an accessory muscle. In this case, in addition to complete absence, the palmaris longus muscle can be duplicate or triplicate. Similarly, the tendon can bifurcate or trifurcate and insert into the same or different sites.

In a study done by Keith, the palmaris longus shows a higher degree of degeneration in apes and monkeys than in man and is present only in 25% of gorillas. The functions of the palmaris longus are different among various animals Keith (2009). In some animals it participates in the exposure of their claws. In certain animals such as orangutans the muscle is used actively to grab things while climbing. In other primates like the chimpanzee and gorilla, do not actively employ the muscle. With evolution, the thumb apparatus in primates began to evolve especially the thenar muscles and subsequently the palmaris longus became vestigial (Thejodhar *et al.*, 2008).

Palmaris longus, originates from the mesoderm of the myotomes of the somites. Hypaxial myoblasts fuse to form multi-nucleated myotubes, which migrate to the periphery and form the cells of the striated skeletal muscle tissue, which form the appendicular muscles and this process is controlled by environmental and intrinsic signals. During early embryogenesis the absence of such signals in the ectoderm leads to premature differentiation of the precursors, which in turn may cause agenesis or incomplete genesis of the respective muscles (Amthor *et al.*, 1999).

Of all these variations, PLM agenesis is the most frequent variation. (Kapoor *et al.*, 2008, Standring 2005) According to other literature data, there is prevalence of the absence of around 15%, although it is well known that there are differences in the occurrence of PLM absence between different ethnic groups (Kapoor *et al.*, 2008).

Although in the upper limbs the function of the palmaris longus is considered insignificant, in the event of tendon grafting, it is considerably important. In the anatomical and surgical texts, occurrence of absence of the said muscle is reported to be about 15%. It is frequently used as tendon grafts in reconstructive surgery and also in various procedures such as lip augmentation, ptosis correction and management of facial paralysis (Kapoor *et al.*, 2008, Standring 2005).

According to surgeons, the palmaris longus tendon is the first choice as a donor tendon because it fulfils the necessary requirements of length, diameter, availability, and can be used without producing any functional deformity. It is often described as one of the most variable muscles in the human body and is classified as a phylogenetically retrogressive muscle i.e. a short belly with a long tendon. In vertebrates it is found only in mammals and is best developed in those where the forelimb is used for ambulation (Sañudo *et al.*, 1994, Kose *et al.*, 2004).

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CONCLUSION

Knowledge of a persistent median artery enables in accurate planning and better performance of surgical procedures in the forearm. Presence of persistent median artery is usually asymptomatic but may cause symptoms of carpal tunnel syndrome, pronator teres syndrome or other compressive neuropathies. Considering the possibility of the presence of a persistent median artery with the median nerve would be helpful in the evaluation of all patients with carpal tunnel syndrome. Angiography of the hand will also be beneficial before any invasive or microsurgical procedures to determine any variations to avoid any undesired consequences.

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