

## Case Report :

# Musculo-vascular variations of upper limb

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### Abstract:

Musculo-vascular variations must be of substantial interest to orthopedic surgeon, plastic surgeon, radiologist and anatomist. We present here a case of high up origin of ulnar artery (UA) at the lower 1/3<sup>rd</sup> of the arm from Brachial artery(BA), along with its superficial course both in forearm and palm which can be regarded as superficial ulnar artery. In its course after entering to the palm, superficial to flexor retinaculum it curves and forms superficial palmer arch(SPA) with direct contribution from the superficial branch of radial artery(RA). From this arch, common digital arteries arise. Distal to the origin of superficial ulnar artery, radial artery artery descend into the cubital fossa & gives off common interosseous artery(CIA) and continuous further as Radial artery proper. Displaying the muscular stratum we found variation in deep flexor muscles as an accessory belly of flexor pollicis longus(FPL). This accessory belly of flexor pollicis longus has a tendinous insertion into indices slip of flexor digitorum profundus muscle(FDP).

### Key words:

Superficial ulnar artery, superficial palmer arch, additional belly and tendon of flexor pollicis longus muscle.

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### Introduction:

The largest terminal branch of brachial artery is ulner artery and it arises in the cubital fossa. Then it passes obliquely downward and medially in upper third of the forearm, but vertical in lower third. In the upper half, the artery is covered by the common flexors. In the lower half, the artery is only covered by skin and superficial fascia<sup>(1)</sup>. The artery ends superficial to the flexor retinaculum by dividing into two terminal branches. The superficial one forms the superficial palmer arch (SPA) with a contribution from the superficial branch of the radial artery and issues four digital arteries. Although variation of upper limb pattern are common, the presence of an ulnar artery of high origin is considered rare anatomical variation with clinical significance<sup>(2)(3)</sup>. Unilateral SUA arising from the BA along with its embryological explanation has been reported by many authors (4). The frequency ranges from .17% to 2% and its clinical importance should not be underestimated as several cases of intra arterial injection of drugs and subsequent amputations have been reported.

Flexor pollicis longus (FPL) is a muscle that flexes the thumb. It lies in the same plane of flexor digitorum profundus (FDP) muscle. Flexor pollicis longus originates from the middle 2/4 of the volar surface of the radius and the adjacent interosseus membrane. The fibres and in a flattend tendon which passes beneath the flexor retinaculum of the hand through carpal tunnel & lodges between the lateral head of flexor pollicis brevis and oblique part of the adductor pollicis and entering an osseoponurotic canal similar to those for the flexor tendons of the fingers, is inserted into the base of the distal phalanx of the thumb (6). Sometimes an accessory belly may arise from the flexor pollicis muscle proper at the medial aspect and forms a separate tendon and inserted into the index finger<sup>(7)</sup>. Usually this accessory muscles are asymptomatic and they are found incidentally during surgery or imaging. However in some cases the accessory muscle and its tendon produce clinical symptoms due to compression.

### Case Report :

During routine dissection of a 50 year old male cadaver in R.G.Kar Medical College in Kolkata, India, we found muscular variations as well as vascular pattern of right forearm and hand. However, the opposite limb showed no such variations. Here ulnar artery arose from brachial artery (BA) at the level of lower third of the arm (Fig 1) coursed downwards and slightly medially, superficial to the forearm flexors in close proximity with the UN (Fig 1). The artery then passed superficial to the flexor retinaculum where it is divided into two terminal branches. The superficial one formed the superficial palmar arch (SPA) with direct contribution from superficial branch of radial artery while the deep branch enter into the hypothenar muscle (Fig 2). Distal to the origin of superficial ulnar artery (SUA) radial artery descends into cubital-fossa where gives off common interosseous artery and continuous as radial artery. Displaying the muscular stratum we found no variation in superficial flexors but in the deep stratum an accessory belly of flexor pollicis longus muscle (FPL) diverging from its medial side and runs along Flexor digitorum profundus muscle (FDP) was observed. Further dissection reveals such additional belly of Flexor pollicis longus has a tendinous insertion into indices slip of flexor digitorum profundus muscle. (Fig3)

### Discussion:

Variations in the vascular patterns are the result of blood flow gradient during the formation of blood vessels in any part of the body. This may be of various type, such as variations in the mode of origin or branching pattern, occurrence of unusual tissue planes and unexpected relationships with surrounding structures<sup>(9)</sup>. High up origin & superficial course of UA describe here is at risk during trauma and intravenous cannulation. This arterial course could also lead to intra arterial injection and difficulties in angiographic procedures<sup>(10)</sup>. Typically when the ulnar artery has a high origin, its course is always superficial to the forearm flexors<sup>(11)</sup>. Mc Cormak et al<sup>(12)</sup> stated high origin of UA as superficial ulnar artery found in 2.26% cases and was also observed by Adachi in 1928<sup>(13)</sup>.

Keen categories superficial brachial artery (found in 12.3% dissections) into 3 types: (a) Those superficial Brachial arteries which continue in cubital fossa and bifurcate as usual into Radial and ulnar arteries (3.6%) (b) Superficial Brachial artery continues as Radial artery (5.9%) (c) Superficial brachial artery continues as ulnar artery (2.8%). The superficial brachial artery continues as ulnar artery and known as 'High origin of ulnar artery' (2.8%)<sup>(14)</sup>. The superficial course of ulnar artery described here is important in the following clinical/surgical interventions:

1. Inadvertent intra arterial injection as it closely related to medial cubital vein & Basilic vein.
2. Difficulties in angiographic procedure.
3. High risk of damage during forearm surgery.
4. Free forearm flap based on radial artery may damage the SUA causing ischemia of the hand.
5. Importance of this variants is also growing with the increasing use of radial artery as conduits in coronary bypass.

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Regarding musculature of the forearm, the muscles can be divided into two set i.e. superficial & deep set. The deep set of the muscles are the flexor digitorum profundus (FDP), the Flexor pollicis longus (FPL) and pronator quadratus(PQ).The flexor muscle of the forearm that develops from flexor mass divided into two layers, superficial & deep. The Flexor digitorum profundus and flexor pollicis longus originates from deep layer. In case an incomplete differentiation, accessory muscles are formed <sup>(15, 16)</sup> . Accessory muscles arising from FDP or FDS (Gantzer's muscle) can compress the anterior interosseous nerve causing square pinch deformity thus interfere with the function of precision handling (Finger-Thumb prehension) and powerful grip as FPL acts as a stabilizer of the flexed phalanx of the thumb <sup>(17)</sup> . In our case accessory tendon of FPL as join with the index finger by means of indices slip helps in better co-ordination thus finger thumb prehension can said as further specialization. Anatomical variations are important in order to define the anatomical structures in relation to clinical diagnosis and for surgical procedure. Hemmady has stated that the accessory muscle belly are to be born in mind during decompression fasciotomy for the compartment syndrome of the forearm and during anterior surgical approaches of the forearm. <sup>(18)</sup> In most of the cases accessory muscle belly & its tendons are asymptomatic and they are found incidentally during surgery or imaging or during dissection. However, in some cases, the accessory muscles may produce clinical symptoms due to the compression of the neurovascular structures especially in the fibro osseous tunnels as in case of carpal tunnel syndrome,<sup>(19)</sup> due to inflammation with subsequent oedema of soft tissue, which leads to compression in the carpal tunnel, occur in certain cases, these tendon of accessory muscle belly can also produce the carpal tunnel syndrome due to overcrowding in the fibro osseous tunnels <sup>(19)</sup>. Ganglion of accessory tendon of flexor pollicis longus tendons may cause carpal tunnel syndrome. Frequent tenosynovitis of such tendon may occur & orthopedic surgeon should be aware of it.

**Conclusion:**

The knowledge of such muscular as well as vascular variations helps radiologist to identify such conditions helps orthopedicians and plastic surgeons for the proper planning of operations.



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