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Anomalous composition of musculature of the first dorsal fibro-osseous compartment of the wrist

Ruchi Dhuria[1], MSc, *Vandana Mehta*[1], MD, *Rajesh Kumar Suri*[1], MD, *Gayatri Rath*[1], MD

ABSTRACT The anomalous orientation of musculature of the first dorsal fibro-osseous compartment of the wrist is clinically relevant to De Quervian's stenosing tenosynovitis and reconstructive surgeries. Split insertion of the abductor pollicis longus (APL) is commonly found in chimpanzees, gorillas and gibbons. A comparable identical pattern of anomalous slips in humans is of anthropological and phylogenetic importance and could be a result of atavism. This case report describes an unusual fused muscle belly of the APL and extensor pollicis brevis (EPB), which split into three slips – medial, intermediate and lateral. Further, the medial slip was seen to divide into two tendons, inserting on the base of the first metacarpal along with the intermediate slip. The lateral slip divided into three tendons, inserting into the base of the proximal phalanx, base of the first metacarpal and abductor pollicis brevis muscle. The fusion and unusual insertion pattern of the APL and EPB merits documentation for reconstructive procedures such as tendon transfer and interposition arthroplasty.

Keywords: abductor pollicis longus, accessory tendon, De Quervian's disease, extensor pollicis brevis, first extensor compartment
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INTRODUCTION

The abductor pollicis longus (APL) and extensor pollicis brevis (EPB) are two of the three outcropping muscles located in the dorsal carpal region. The APL arises proximally from the posterior surface of the middle one-third of the radius, ulna and the adjoining interosseous membrane. It descends laterally and becomes superficial in the distal forearm, where it usually splits into two slips, one of which is attached to the radial side of the base of the first metacarpal and the other, to the trapezium.[1] The EPB is attached to the posterior surface of the radius and the adjacent interosseous membrane distal to the APL. Distally, it becomes tendinous and reaches the dorsolateral base of the proximal phalanx of the thumb.[1]

De Quervian's disease is a condition in which pain occurs in the radial styloid process due to stenosing tenosynovitis of the APL and EPB tendons in the first extensor compartment of the wrist. Variations in the number, length, thickness and insertion pattern of the first dorsal compartment of the wrist have been well-recognised in the literature and is known to have a significant role in the aetiology of De Quervian's stenosing tenosynovitis.[2] Therefore, awareness of such variations in this region is useful to surgeons while performing plastic reconstructive surgeries.[3] The present study aimed to illustrate the fused muscle bellies of the first extensor compartment of the wrist and their multiple tendons with a remarkable insertion pattern, along with its clinical and functional implications. Such fused muscles could modify the movements of the thumb at the first carpometacarpal joint by indistinct pull of the muscle.[4]

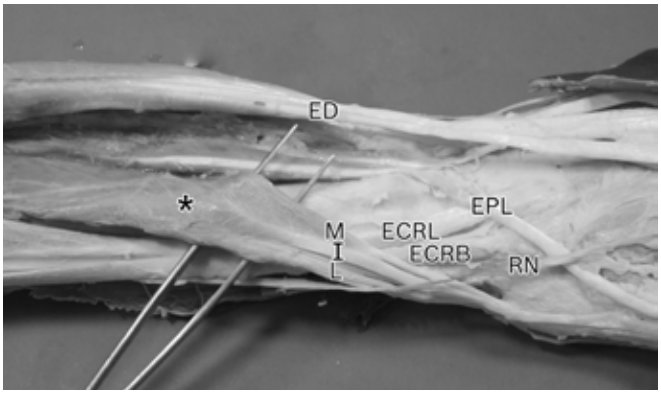

Fig. 1 Photograph shows the left forearm in a pronated position. *denotes fused muscle belly of the abductor pollicis longus and extensor pollicis brevis, ED: extensor digitorum; EPL: extensor pollicis longus; RN: radial nerve; ECRL: extensor carpi radialis longus; ECRB: extensor carpi radialis brevis; M: medial slip of fused muscle belly; I: intermediate slip of fused muscle belly; L: lateral slip of fused muscle belly

CASE REPORT

During routine dissection of the left upper limb in a 63-year-old female cadaver, a fused muscle belly of the APL and EPB was noted in the first dorsal fibro-osseous compartment of the wrist. This fused belly trifurcated into an intermediate tendinous (I), and the lateral (L) and medial (M) muscular slips (Fig. 1). This trifurcation was 5.8 cm proximal to the base of the first metacarpal. The intermediate tendinous slip was 6 cm in length and was attached to the medial side of the base of the first metacarpal. The broader medial muscular slip was 1.9 cm long and had bifurcated into two tendinous slips, each measuring 3.8 cm

[1]Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi, India.
Correspondence: Dr Ruchi Dhuria, Senior Resident, Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi 110029, India. ruchidhuria22@yahoo.com

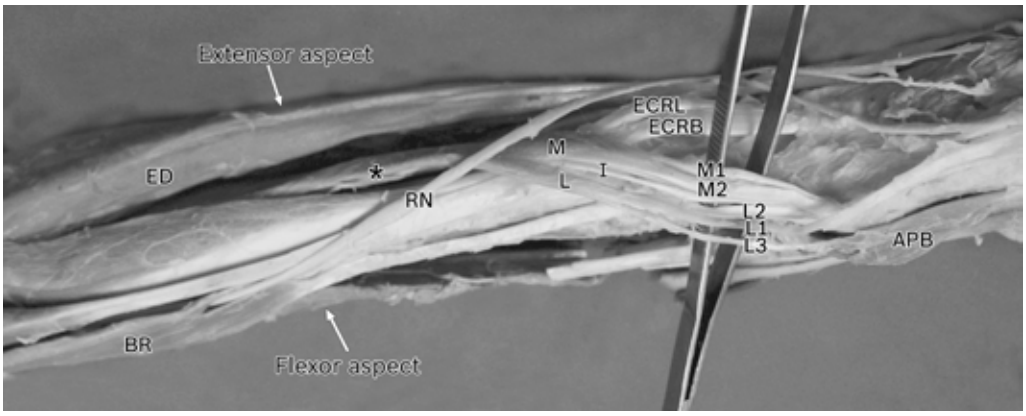

Fig. 2 Photograph shows the left forearm in a mid-prone position. *denotes fused muscle belly of the abductor pollicis longus and extensor pollicis brevis, ED: extensor digitorum; BR: brachioradialis muscle; RN: radial nerve; ECRL: extensor carpi radialis longus; ECRB: extensor carpi radialis brevis; M: medial slip of fused muscle belly; M1: first tendon of medial slip; M2: second tendon of medial slip; I: intermediate slip of fused muscle belly; L: lateral slip of fused muscle belly; L1: first tendon of lateral slip; L2: second tendon of lateral slip; L3: third tendon of lateral slip; APB: abductor pollicis brevis muscle

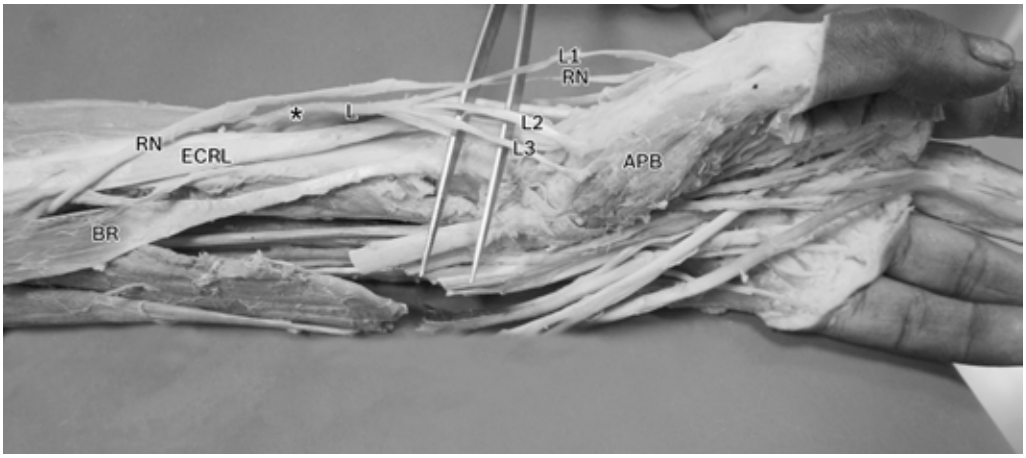

Fig. 3 Photograph shows the left forearm in a supinated position. *denotes fused muscle belly of the abductor pollicis longus and extensor pollicis brevis, L: lateral slip of fused muscle belly; L1: medial tendon of lateral slip inserting in the base of proximal phalanx; L2: middle tendon of lateral slip inserting in the base of first metacarpal; L3: lateral tendon of lateral slip emerging with abductor pollicis brevis; APB: abductor pollicis brevis muscle; RN: radial nerve; ECRL: extensor carpi radialis longus; BR: brachioradialis muscle

in length. Both these tendons, similar to the intermediate slip, gained attachment to the medial side of the base of the first metacarpal (Fig. 2). The lateral muscular slip was observed to split into three tendons. Among them, the lateral tendon (L3) measured 5.2 cm in length and merged with the abductor pollicis brevis (APB) muscle. The middle tendon (L2), measuring 4.5 cm in length, was attached to the lateral aspect of the base of the first metacarpal. The medial tendon (L1) was the longest and measured 8.8 cm in length. It inserted into the dorsal digital expansion of the proximal phalanx of the thumb (Fig. 3). The innervation to this fused muscle belly of the APL and EPB was, as usual, from the posterior interosseous nerve. The rest of the musculature in the region of the wrist and hand did not display any anomalous attachment, and no neurovascular variation was observed. The contralateral-sided APL and EPB of the forearm were found to be normal.

DISCUSSION

Various reports elucidating multiple insertion slips of the APL, representing a type of atavism, have been documented in the literature. The APL has been seen to divide into three,[2] four,[5] five[6] and seven slips of insertion.[7] A rare case of nine slips has also been described in the literature.[8] Such supernumerary slips of the APL are of immense clinical relevance. Being an important muscle of dexterity, thorough knowledge of its muscular variations is important in reconstructive surgeries.[9] Accessory slips of the APL may be utilised for tendon transfer, tendon translocation and interposition arthroplasty. Prior knowledge of these accessory slips may prove useful while performing such procedures.[10] Additional tendinous slips of the APL may serve as a substitute for the extensor pollicis longus (EPL) and may also be used in the reconstruction of the first dorsal interosseous muscle.[11] A previous study has reported double or more tendons of the APL in 94% of cases and double tendons of the EPB in 3% of cases.[12]

Such multiple slips represent a type of atavism, and are generally described in primates such as chimpanzees, gorillas and gibbons. These anomalous slips in humans are of anthropological

and phylogenetic importance, as they are reminiscent of lower forms of muscle insertion.[2,3,5,7] From a phylogenetic point of view, the APL and EPB are known to differentiate from a common muscle mass. Complete separation of the EPB is visualised only in humans. Reports of its absence or fusion with the EPL have been described. However, to the best of our knowledge, the fusion of the APL and EPB is yet to be elucidated. The incidence of duplication of the EPB has been reported in several studies as 1%, 2% and 8.3%.[13] The unique nature of the insertion of the APL and EPB observed in the present study may be traced to its embryological development. The differentiating APL tendon is seen to divide into three slips: the middle one inserts into the trapezium, the dorsal slip into the first metacarpal and the palmar slip blends with the APB muscle. New connections are established between the palmar slip and the adjacent APB. Therefore, the multiplicity of the tendon may be reminiscent of the foetal tendinous pattern of development.[5]

The most important clinical condition in which anomalies of the APL and EPB should be considered is De Quervian's stenosing tenosynovitis. Multiplicity of the APL and EPB tendons has also been associated with De Quervian tenosynovitis.[14] This condition arises due to thickening and inflammation of the tendons of the APL and EPB, resulting in pain and swelling in the first fibro-osseous extensor compartment of the wrist. Thumb movement aggravates the pain and makes the tendons more amenable to trauma.[15] Surgical release of the tendons within the fibro-osseous canal is a curative measure for De Quervian tenosynovitis. Therefore, thorough knowledge of the possibility of tendinous anomalies is mandatory before any reconstruction or surgical correction in tendinopathies is planned.

In conclusion, an unusual fusion of the APL and EPB, concomitant with a variant insertion pattern, is the highlight of the current case report. Our case shows that these additional tendons may prove to be biomechanically advantageous. Moreover, these tendons may be effectively used for reconstructive surgeries.

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