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Extensor carpi radialis accessorius inserting into the abductor pollicis brevis

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Summary

A tendinous slip originating from the extensor carpi radialis brevis was found bilaterally in a male cadaver. It passed through an independent compartment under the extensor retinaculum, located ventral to its first compartment, before becoming a muscle belly and inserting into the abductor pollicis brevis. The superficial branch of the radial nerve passed superficial to the tendinous slip.

Key Words: Muscular variations - Extensor carpi radialis muscles - Forearm muscles - Wrist extensor muscles

Introduction

Variations of the extensor carpi radialis muscles involve not only the tendons but also the muscle bellies. Those affecting the tendons have been described as clefts within the tendons which insert into their normal sites, or as additional tendinous slips passing from one to the other extensor carpi radialis muscle (Kosugi, 1987a; Kosugi, 1987b; Wood, 1988; Yoshida, 1994; Young et al., 1998). Those variations involving the muscle bellies have been described: as connecting bundles between the wrist extensors or between them and brachioradialis (Wood, 1865; Gümüsalan et al., 1997); as fusion of muscle bellies (Macalister, 1864-66; Macalister, 1875); or as supernumerary muscles, namely, extensor carpi radialis accessorius (Wood, 1864) and extensor carpi radialis intermedius (Wood, 1867a, b).

The rarest of these variations, with an incidence of 0.5% (Kosugi, 1987a) is the extensor carpi radialis accessorius, which has been described as a separate muscle arising from the supracondylar ridge of the humerus (Wood, 1864), above the extensor carpi radialis longus (Kaneff, 1969) or between the two wrist extensors (Khaledpour and Schindelmeiser, 1994). It has been described as inserting into: the first (Wood, 1864) or first and second metacarpal bones (Khaledpour and Schindelmeiser, 1994); abductor pollicis brevis or additional muscle bundles of it (Wood, 1864; Gruber, 1877); phalanx of the thumb (Macalister, 1866-69); styloid process of the radius (Gruber, 1887); or os trapezium (Kaneff, 1969).

This paper presents a bilateral accessory extensor carpi radialis brevis tendinous slip, which shows some new features as well as combining several of the separately described ones.

Material and Methods

The variation was found in both forearms of a 79-years-old male cadaver during routine dissection by Cambridge preclinical medical students. The total sample consisted of 24 male and 24 female embalmed cadavers with an age at death ranging from 56 to 103 years.

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Results

An additional tendinous slip from the extensor carpi radialis brevis was observed bilaterally. It originated from the extensor carpi radialis brevis muscle belly and ran between the bellies of the extensor carpi radialis longus and brevis,to emerge between them in the middle of the forearm (Fig. 1). At the proximal border of the abductor pollicis longus, the tendon crossed over extensor carpi radialis longus and brachioradialis tendons to lie on the ventral side of the abductor pollicis longus tendon and follow its course towards the thenar region. The additional tendinous slip coursed through an independent extensor retinaculum compartment, located ventral to the first dorsal wrist compartment where the normal abductor pollicis longus and extensor pollicis brevis tendons lay (Fig. 1). This anomalous tendinous slip became a muscle belly three centimetres proximal to its insertion into the abductor pollicis brevis muscle belly (Fig. 1).

At the point where the additional tendinous slip crossed over the brachioradialis, the superficial branch of the radial nerve emerged from under the latter muscle and crossed over the anomalous tendinous slip, which showed the same morphological features on both sides. However, the tendons of the extensor carpi radialis longus and brevis showed other variations that differed on each side.

On the right, the extensor carpi radialis longus tendon behaved as normal but the extensor carpi radialis brevis, in addition to the tendinous slip described, showed a division of its tendon. A superficial part ran to the second metacarpal bone while the deeper one inserted normally into the third metacarpal.

On the left side, the extensor carpi radialis longus showed a division of its tendon into lateral and medial parts. The lateral one ran under the medial one to become inserted into the lateral side of the extensor carpi radialis brevis tendon at the third metacarpal. Moreover, the extensor carpi radialis brevis also showed two tendons, a superficial and a deep one. The superficial one, coursing over the lateral tendon of the extensor carpi radialis longus, inserted into the second metacarpal, while the deep one again divided into two tendons, which inserted normally into the third metacarpal.

Fig. 1.- Lateral view of the right forearm. Note the origin of the tendinous slip from the extensor carpi radialis brevis muscle (eb) and its course under the superficial branch of the radial nerve (r) and through an independent compartment at the wrist (arrowhead).
el: extensor carpi radialis longus muscle; br: brachioradialis muscle; ra: radial artery; rr: radial recurrent artery.

Discussion

A separate supernumerary muscle originating from the supracondylar ridge of the humerus, together with extensor carpi radialis longus, and inserting into the first metacarpal was first described by Wood (1864) and later named extensor carpi radialis accessorius (Wood, 1865; Wood, 1867a, b, c; Wood, 1868). This case does not completely fit within this description. It resembles an extensor carpi radialis accessorius, but rather than originating as an independent supernumerary muscle belly it originated from the extensor carpi radialis brevis muscle belly as an additional tendinous slip. This present case is not exactly the same as some of the previously described extensor carpi radialis accessorius muscles because of the absence of a proximal muscle belly. However, its distal morphological features closely resemble those of other previously reported extensor carpi radialis accessorius muscles. Such a pattern has

been considered as a transitional form of the muscle (Wood, 1868), and this case may be considered as such.

In the present case, the tendinous slip originated from the extensor carpi radialis brevis rather than from the extensor carpi radialis longus (Wood, 1868; Kosugi, 1987a), and ran between the two extensor muscles, as in previous cases where the extensor carpi radialis accessorius originated between both wrist extensors (Khaledpour and Schindelmeiser, 1994). This course is obviously different from previous cases in which the tendon originated from the extensor carpi radialis longus and then ran between the latter and the brachioradialis (Kaneff, 1969).

A tendon similar to extensor carpi radialis accessorius has been described but inserting with the brachioradialis into the styloid process of the radius and named supinator longus II s. accessorius (Gruber, 1887). The fact that this muscle cannot extend the wrist makes it impossible to consider it as a wrist extensor and it should rather be considered as a variation of the brachioradialis.

Previously reported extensor carpi radialis accessorius muscles ran distally under the abductor pollicis longus and extensor pollicis brevis to pass through the second dorsal wrist compartment (Wood, 1868; Khaledpour and Schindelmeiser, 1994). In our case, the tendon, rather than coursing as described, at the proximal border of the abductor pollicis longus took an oblique course over the brachioradialis to run alongside the abductor pollicis longus tendon (Kaneff, 1969). The additional tendinous slip mimicking the latter case (Kaneff, 1969) coursed under the extensor retinaculum in an independent dorsal wrist compartment located ventral to the first dorsal wrist compartment. However, courses through the first dorsal wrist compartment or superficial to the extensor retinaculum have also been described (Wood, 1864; Wood, 1867a; Gruber, 1877; Horrocks et al., 1884; Valenti, 1910; Valenti, 1912).

Cases passing through the second dorsal wrist compartment have been described as inserting into the dorsal aspect of the first metacarpal or first dorsal interosseous muscle (Wood, 1868) as well as into the first and second metacarpal bones (Khaledpour and Schindelmeiser, 1994). Cases passing through the first dorsal wrist compartment or additional compartment have been described as inserting as a single tendon into the phalanx of the thumb (Macalister, 1866-69), the abductor pollicis longus tendon (Gruber, 1877), or the os trapezium (Kaneff, 1969). Our case, rather than inserting as a tendon became a muscle belly before inserting only into the abductor pollicis brevis, similar to previous cases which had fleshy insertions into the phalanx of the thumb (Macalister, 1866-69; Horrocks et al., 1884; Testut, 1884) or into the latter and the abductor pollicis brevis (Valenti, 1910; Valenti, 1912). An insertion into an additional muscle belly of the abductor pollicis brevis has also been reported (Wood, 1867a; Gruber, 1877). Nonetheless, the insertion seen in our case should not be confused with a previous case in which the extensor carpi radialis accessorius inserted as a double tendon into the second and first metacarpals, the abductor pollicis brevis having an additional origin from the latter tendon (Khaledpour and Schindelmeiser, 1994).

The superficial branch of the radial nerve emerged from under the brachioradialis at its normal site and crossed over the additional tendinous slip (Horrocks et al., 1884). This relationship was not mentioned in many previous reports (Wood, 1864; Gruber, 1877; Valenti, 1910; Valenti, 1912; Khaledpour and Schindelmeiser, 1994), although it may be clinically important as a possible compression site, as in cases where the nerve emerged from between a split brachioradialis tendon (Turkof et al., 1994).

The extensor carpi radialis accessorius, beside its function as a wrist extensor, has also been considered to act as an abductor of the hand and has been named abductor manus muscle (Kaneff, 1969).

The present case has been considered as a transitional form between a well-developed extensor carpi radialis accessorius muscle and the total absence of such a supernumerary muscle in the normal human adult (Wood, 1868). It could be explained by an anomalous joining of two independent blastematous layers (Cihak, 1972): humero-radial group (Straus, 1941a, b) or superficial stratum-radial sector (Lewis, 1989) which gives rise to the brachioradialis, supinator and extensor carpi radialis muscles, and the superficial layer of the thenar blastema which gives rise to the abductor pollicis brevis (Cihak, 1972).

Finally, the variations observed in the tendons of both extensor carpi radialis muscles and described as tendinous slips do not differ from previous reported ones (Lauth, 1830; Cruveilhier, 1851; Macalister, 1864-66; Calori, 1868; Bankart et al., 1869; Pye-Smith et al., 1870; Curnow, 1873; Curnow, 1876; Welcker, 1876; Shepherd, 1880; Testut, 1884; Debierre, 1888; LeDouble, 1897; Turner, 1897; Frohse and Fränkel, 1908; Wagenseil, 1937; Albright and Linburg, 1978; Nyssen-Behets et al., 1986; Kosugi et al., 1987a; Kosugi et al., 1987b; Bergman et al., 1988; Wood, 1988; Tountas and Bergman, 1993; Yoshida, 1994; Young et al., 1998; Bergman et al., 1999).

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