

Multiple Variations of Extensor Muscles of Forearm in Relation to the Radial Nerve: a Case Report and Review

Múltiples Variaciones de los Músculos Extensores del Antebrazo en Relación con el Nervio Radial: Reporte de Caso y Revisión

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SUMMARY: During routine dissection in the Department of Anatomy, multiple variations of forearm muscles in relation to the radial nerve and its branches were observed on the right side of a 34 year old male cadaver. Brachioradialis close to its origin was receiving muscle fibers from the brachialis and the radial nerve was passing in between them. Extensor carpi radialis brevis was absent and the extensor carpi radialis longus was giving two tendons in the second compartment of extensor retinaculum before its insertion while passing deep to the abductor pollicis longus. Absence of extensor carpi radialis brevis can be explained with the arrangement in lower mammals, where the two extensores carpi radiales are represented by one muscle. Ontogeny repeats phylogeny and anatomical variations have developmental basis. Hence, the pattern of muscular arrangement in this case can be said to be less evolved than the usual arrangement. The course of radial nerve between the two heads of brachioradialis makes it highly vulnerable to compression and injury, which may manifest as wrist drop (radial nerve palsy) or radial tunnel syndrome (compression of posterior interosseous nerve).

KEY WORDS: Anatomical variations; Development; Extensor carpi radialis longus and brevis muscles; Forearm; Radial nerve.

INTRODUCTION

Marked variations from the normal are rarely seen in superficial group of extensors (Hollinshead, 1969). Occasionally, aberrant muscle slips are present among the superficial group of extensors (Hollinshead). The course of radial nerve in the lower part of arm lies between the brachialis and the brachioradialis and extensor carpi radialis longus muscles and this position gives off the nerves to these muscles (Anson & McVay, 1971; Hollinshead). The radial tunnel is described as a 5-cm long furrow bounded by brachialis and the biceps tendon medially and the mobile extensor muscles anterolaterally, beginning just proximal to the radiocapitellar joint and ending at the distal edge of supinator. After the point of bifurcation of the radial nerve, the posterior interosseous nerve (PIN) travels through the radial tunnel (Loh *et al.*, 2004). Prasartritha *et al.* (1993) dissected sixty fresh cadaveric upper extremities and suggested the course of the radial nerve in the radial tunnel, an area that varies but begins in the furrow between the brachioradialis and brachialis in the distal arm and ends at the distal edge of the supinator muscle in the proximal

forearm. Ferdinand *et al.* (2006) concluded that the most common MRI (magnetic resonance imaging) finding in radial tunnel syndrome are muscle denervation edema or atrophy along the distribution of the PIN.

CASE REPORT

The following variations were observed on the right side during routine dissection in an adult 34 year old male cadaver. Brachialis was giving additional head of origin for brachioradialis close to its bony origin from humerus; thus making the radial nerve more vulnerable to compression proximal to and through its course in the radial tunnel (Fig. 1). Extensor carpi radialis brevis (ECRB) was absent, whereas extensor carpi radialis longus (ECRL) was giving two tendons in the second compartment of extensor retinaculum before its insertion while passing deep to the abductor pollicis longus (Fig. 2).

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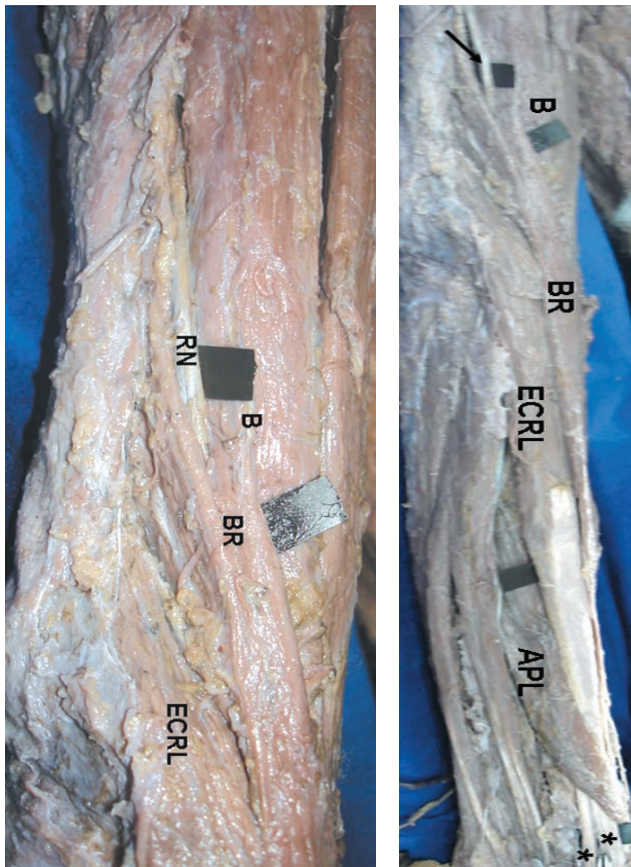


Fig. 1. RN. Radial nerve; B. Brachialis muscle; BR. Brachioradialis muscle; ECRL. Extensor carpi radialis longus muscle.

Fig. 2. Arrow: Radial nerve; B. Brachialis muscle; BR. Brachioradialis muscle; ECRL. Extensor carpi radialis longus muscle; APL. Abductor pollicis longus muscle; Stars: Tendons of extensor carpi radialis longus muscle.

DISCUSSION

While dissecting the body of an 80-year-old female Claassen & Wree (2002) described variation of ECRL, which gave origin to an accessory head. The tendon of this accessory head passed through a separate tunnel in the extensor retinaculum and inserted in the middle of the first metacarpal bone (Claassen & Wree). On the contrary in the present case ECRL was passing as two tendons in the second compartment of extensor retinaculum before its insertion. Caetano *et al.* (2004) analyzed the anatomical variations of the ECRL and ECRB in sixty male adults cadaver upper limbs and reported that the supernumerary tendons were found in 3 hands (all in relation to the ECRL tendon), whereas the presence of an accessory tendon making the union between the tendons of ECRL and ECRB was registered in 4 dissected hands

(Caetano *et al.*). Whereas in the present case, the ECRL received an additional head of origin from brachialis and divided into two tendons before insertion.

Sixty upper limbs from 30 Turkish subjects (18 males and 12 females) were dissected to reveal the course of the PIN and to examine possible compression sites at the proximal and distal edges of the supinator muscle, and the exit of the nerve from the ECRB (Kirici & Irmak, 2004). An anatomic study of 45 upper limbs, from 40 cadavers, was performed to analyse the relations between the medial edge of the ECRB and the PIN and Laulan *et al.* (1994) suggested that the ECRB is a possible cause of PIN entrapment. Hence, the absence of ECRB in our case further increased the chances of PIN entrapment

Embryological hypothesis and phylogenetic correlation: In lower mammals the two extensores carpi radiales are represented by one muscle (Bergman *et al.*, 1988). Anatomical variations always have underlying cause as developmental arrest in the different stages of gestation. Ontogeny repeats phylogeny hence, the pattern of muscular arrangement in this case can be said to be less evolved than the usual arrangement.

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RESUMEN: Durante una disección de rutina en el Departamento de Anatomía, se observaron múltiples variaciones de los músculos del antebrazo, en relación con el nervio radial y sus ramos, en el lado derecho de un cadáver de 34 años de edad, de sexo masculino. Cerca de su origen el músculo braquioradial recibía fibras del músculo braquial y el nervio radial cruzaba entre ellos. El músculo extensor radial corto del carpo se encontraba ausente y el músculo extensor radial largo del carpo se continuaba con dos tendones en el segundo compartimiento del retináculo extensor, bajo el músculo abductor largo de pulgar, antes de su inserción. La ausencia del músculo extensor radial corto del carpo se puede explicar en mamíferos inferiores, donde los dos músculos extensores radiales están representados por un sólo músculo. La ontogenia repite la filogenia y las variaciones anatómicas inciden en su desarrollo. Por lo tanto, de acuerdo al patrón muscular se puede afirmar que en este caso existe menos evolución que lo habitual. El curso del nervio radial entre las dos cabezas del músculo braquioradial, lo hace muy vulnerable a la compresión y las lesiones, que pueden manifestarse son, caída de la muñeca (parálisis del nervio radial) o el síndrome del túnel radial (compresión del nervio interóseo posterior).

PALABRAS CLAVE: Variación anatómica; Desarrollo; Músculos extensores radiales largo y corto; Antebrazo; Nervio radial.

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