



# Unilateral variation of extensor carpi radialis longus muscle: a case report

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Phalguni SRIMANI<sup>+</sup>  
Rudradev MEYUR  
Alpana De BOSE  
Anirban SADHU

Department of Anatomy, R. G. Kar Medical College, Kolkata,  
INDIA.



<sup>+</sup> Dr. Phalguni Srimani  
Department of Anatomy  
R. G. Kar Medical College  
West Bengal—700004, INDIA.  
☎ +91 9830479835  
✉ [falgunisreemani@yahoo.co.in](mailto:falgunisreemani@yahoo.co.in)

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## Abstract

Morphological variations of muscles in the extensor compartment of forearm have been reported by several authors. Those include presence of additional bellies with tendons of existing muscles or presence of additional muscle in unusual location. One such variation was observed during routine dissection in the department of Anatomy, R. G. Kar Medical College, Kolkata, showing additional extensor carpi radialis longus muscle with separate tendon on right forearm of an approximately 70-year-old female cadaver. No such variation was observed on the left side. Reviewing related literature, anatomical knowledge of such possible variation can be considered clinically noteworthy both during preoperative diagnosis and also for proper planning of reconstructive hand surgery.

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**Key words** [extensor carpi radialis longus] [extensor retinaculum] [metacarpal bone]

## Introduction

Extensor carpi radialis longus (ECRL) and extensor carpi radialis brevis (ECRB) muscles are considered as the chief radial extensors, of which ECRL is most powerful. ECRL takes its origin from lower one-third of lateral supracondylar ridge of humerus, adjacent lateral intermuscular septum and lateral epicondyle of humerus. It then passes through the second compartment underneath the extensor retinaculum lodging in the groove dorsal to radial styloid process, to be inserted finally on the radial side of the dorsal surface of base of second metacarpal with few slips to either first or third metacarpal bones [1]. Reported morphological variations related to ECR muscles include accessory ECR brevis, ECR intermedius, and ECR accessorius [2–4].

The aim of the present study is to present a report of unilateral (right) additional ECRL muscle with its tendon present in the extensor compartment of forearm.

## Case Report

During routine dissection of upper limb involving extensor compartment of arm, forearm and dorsum of hand of an approximately 70-year-old female cadaver for first year MBBS

students in the Department of Anatomy, R. G. Kar Medical College, Kolkata, we observed the following unusual finding.

An additional belly of muscle having common origin with ECRL muscle was found on the medial side of ECRL muscle. When traced distally, it was quite distinct from the belly of ECRL having a long tendon which started from the small belly of the muscle. On its further course, the additional tendon passed deep to abductor pollicis longus and extensor pollicis brevis, and entered into the second compartment of extensor retinaculum where it was medial to main tendon but lateral to ECRB tendon to appear in the dorsum. Finally it ended by getting inserted into the upper and medial aspect of dorsal surface of base of second metacarpal bone. ECRB tendon was seen inserted separately on the dorsal aspect of base of third metacarpal bone (Figure 1).

While dissecting the flexor compartment of the same arm and forearm, radial nerve was seen passing through the space between brachioradialis and common ECRL laterally, and brachialis medially before dividing into superficial and deep terminal branches. As no separate nerve supply was noted for additional belly of ECRL except the usual branch supplying common ECRL, it was thought that radial nerve was supplying both the muscles by one common branch. However, nerve



**Figure 1.** Photograph of dorsal aspect of forearm and wrist (right) showing additional *extensor carpi radialis longus* (**ECRL**) muscle (\*) with its common origin with main *ECRL*, continued distally as separate tendon (\*\*) and finally inserted on the base of second metacarpal bone (**B2M**). (**APL**: abductor pollicis longus; **EPB**: extensor pollicis brevis; **EPL**: extensor pollicis longus; **ECRB**: extensor carpi radialis brevis)

supply to brachioradialis and brachialis were usual. No such variation was observed on the left side.

### Discussion

Variations in *ECRL* are not uncommon. According to Albright and Linburg [5], additional radial wrist extensors were present in 24% cases, which originated either from *ECRL* or *ECRB*. Sawant in his study got 11% variations with absent *ECRB* and *ECRL* provided two tendons which were inserted into the adjacent sides of second and third metacarpals with few fibers into medial side of second metacarpal bone [6]. Unlike the above-mentioned findings, *ECRL* having its usual origin was reported to be blended with digital fibrous sheath of medial three fingers for insertion after its entry into the flexor compartment of forearm [7]. Variations in the form of laminar disposition of the muscle was observed by Yoshida [8] in which *ECRL* was found to be comprising of 5 layers (A to E variants) with C forming the main muscle and others as additional slips. But in the present study, additional *ECRL* was present without absent *ECRB* and inserted into the dorsal surface of base of second metacarpal bone similar to earlier report [9]. But, Rao et al. mentioned unilateral (left) additional belly of *ECRL* though taking common origin with primary muscle continued distally as separate tendon and got merged with tendon of main *ECRL* [4]. Also, *ECR* accessorius, interconnecting tendon between *ECRL* and *ECRB* have been described in other studies [10, 11]. However, we did not come across such communication during our dissection.

Variant tendon may create diagnostic confusion among clinicians while dealing with differential diagnosis of dorsal hand masses and moreover, extra tendon passing through the same compartment of extensor retinaculum along with usual tendons may lead to chronic dorsal wrist pain by causing direct or indirect nerve compression [9]. Knowledge of possible variation may also help clinicians to avoid unwanted complications during corticosteroid injections and surgical correction of tennis elbow [6]. Further significance may lie in the ability of *ECRL* tendon to be utilized as one of the best at achieving effective tendon transfer during opponens plasty for median nerve palsy [12] and presence of an additional tendon may help surgeons planning for correcting finger deformity without splitting of parent tendon [13]. Moreover, extension-abduction is considered as anti-gravity movement; therefore *ECRL* and *ECRB* are the two extensor muscles provided in the radial side to increase the power of wrist joint [14], so presence of additional *ECRL* may improve the strength of extension and abduction by supplementing the action of principal *ECRL*. Unilateral presence of such variation may be due to functional adaptation in people who present excessive physical activity.

Such anatomical variations can be explained on developmental ground of upper limb muscles. Muscles of extensor compartment of upper limb develop from myogenic precursor cells arising from differentiated dorsal muscle mass which are segmental earlier, but later on different layers of muscle primordia fuse to form a single muscle with loss of some muscle primordia through cell death during differentiation

under control of a family of transcription factors, called myogenic regulatory factors. Thus, altered signaling between mesenchymal cells resulting into persistence of cells not undergoing into the process of cell-death may account for an additional muscle slip [6].

Though minor differences have been observed between present study and earlier reports related to ECRL, knowledge

from the present study would definitely supplement the understanding of muscular variation of antebrachial and carpal regions.

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