

## CASE REPORT

## Additional Tendon Slip of the Extensor Carpi Radialis Longus Muscle: A Case Report with Clinical Application

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### Abstract

Additional tendon slips of the extensor carpi radialis longus muscle are uncommon anatomical variants, with incidence ranging from 12-35%. While this anatomical variant is typically benign, it is clinically important as it can contribute to neuromusculoskeletal

dysfunction. Medical providers should be aware of wrist extensor muscle variations during surgeries involving the forearm and wrist. The presence of additional tendons may cause confusion when interpreting imaging findings. This case report details findings of an additional wrist extensor tendon identified during a cadaveric dissection lab in a physical therapist education program.

**Key Words:** *Additional tendon slip; Extensor carpi radialis longus muscle; Anatomical variation; Clinical significance*

### Introduction

Two primary wrist extensor muscles are located on the radial side of the wrist, specifically the extensor carpi radialis longus (ECRL) muscle and extensor carpi radialis brevis (ECRB) muscle. The ECRL originates along the lateral supra-epicondylar ridge of the humerus, inserts onto the dorsal aspect of the second metacarpal base, and is innervated by the radial nerve. In comparison, the ECRB originates at

the lateral epicondyle of the humerus at the common extensor origin, inserts onto the dorsal aspect of the third metacarpal base, and is also innervated by the radial nerve. The ECRL and ECRB both act as wrist extensors. The ECRL also serves to radially deviate the wrist. As the ECRL courses distally in the forearm and is situated posterior to the brachioradialis muscle. At the musculotendinous junction, the ECRL and ECRB travel deep to the abductor pollicis longus, extensor pollicis brevis, and extensor

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pollicis longus muscles and tendons in the hand. The ECRB is slightly shorter than the ECRL and is covered by the ECRL as it courses distally. At the wrist, the ECRL and ECRB travel through the second dorsal compartment created by the extensor retinaculum (ER) [1].

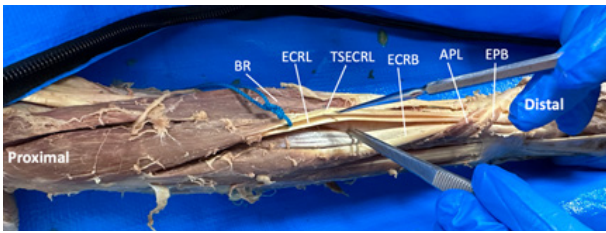
Four variant accessory radial wrist extensor muscles have been described in the literature: extensor carpi radialis intermedius (ECRI) muscle, extensor carpi radialis tertius (ECRT) muscle, extensor carpi radialis accessorius (ECRA) muscle, and additional tendon slips of the ECRL or ECRB [2,3]. These variant accessory radial wrist extensors are believed to be present in 12%-35% of the population [2-4]. Additional tendon slips of the ECRL and ECRB have been shown to have a 20%-33% incidence rate [2]. Yoshida conducted a large study in Japan that included the dissection of 490 upper limbs and concluded that the majority of limbs had normal ECRL and ECRB anatomy; however, 20-33% had additional slips. The additional tendon slips were described as ECRL or ECRB tendons splitting into two or three slips prior to inserting on the second, third, or even fourth metacarpals [2].

Variants of the radial wrist extensors are clinically relevant in the causation, diagnosis, and treatment of upper limb dysfunctions. Additional tendon slips within the dorsal compartments may increase the risk of tendon impingement and tenosynovitis within the compartment. Knowledge of muscle variants is also important for correctly interpreting imaging studies. Therefore, clinicians and surgeons must be aware of these anatomical variations to avoid misinterpreting findings and ensure appropriate treatment. The purpose of this report is to describe a case of an additional tendon slip of an ECRL found in a cadaver lab during a Doctor of Physical Therapy anatomy course at Samford University. This case reported did not require Institute Review Board review or approval.

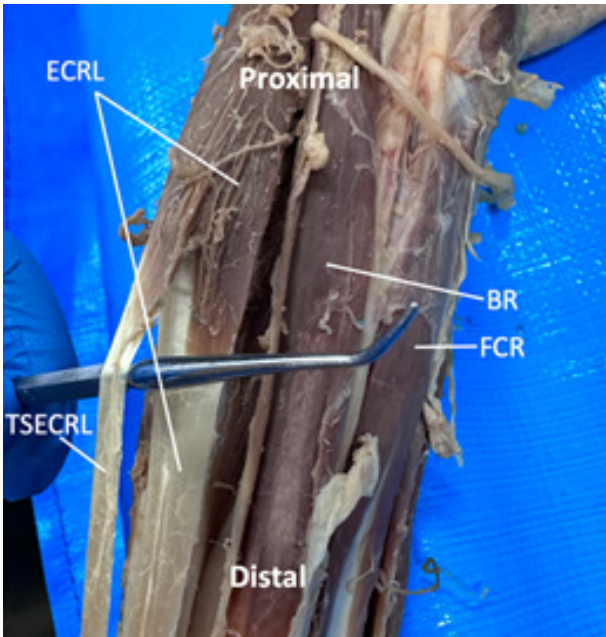
## Case Report

An 88-year-old White female cadaver with a listed cause of death of “cardiac arrest” was obtained by Samford University in Birmingham, Alabama for cadaveric dissection during the summer of 2023. Upon postmortem examination, the cadaver exhibited no significant surgical history and presented with unremarkable height and weight. It is unknown if the additional tendon slip of the ECRL was known to the subject or if she experienced any symptoms associated with this accessory muscle.

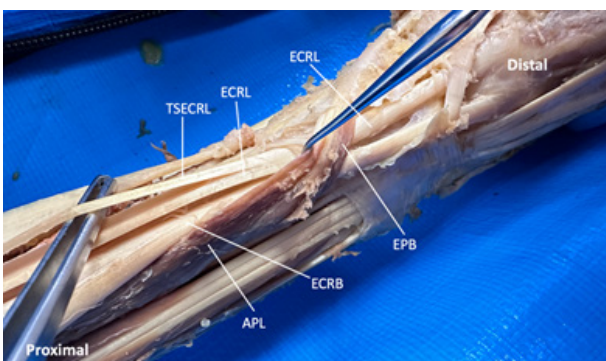
An additional tendon slip of the ECRL was discovered during dissection of the forearm’s extensor region and dorsum of the hand with the cadaver in the supine position. The skin was removed from the right upper limb, and blunt dissection was used to remove the superficial fascia from the posterior forearm and dorsum of the hand. The dorsal wrist compartments of the ER were identified and preserved. Next, the brachioradialis, ECRL, ECRB, and extensor digitorum (ED) muscles were identified and cleaned. The wrist extensor musculature was followed proximally to the common extensor tendon at the lateral epicondyle of the humerus. Further, the ECRL and ECRB were followed distally to the bases of the second and third metacarpals, respectively. The radial nerve was also identified and cleaned between the brachioradialis and brachialis muscles. While tracing the superficial branch of the radial nerve, an additional tendon slip of an ECRL was discovered (Figure 1). This additional tendon slip originated as a muscular slip from the ECRL, traveled just superficial to the ECRL tendon, and rejoined the ECRL tendon just proximal to the abductor pollicis longus (APL) muscle and extensor pollicis brevis (EPB) muscle outcropping muscle bellies (Figures 2-5). The tendons of the ECRL then traveled distally under the APL and EPB muscles, coursed through the second dorsal wrist compartment, and inserted onto the second metacarpal base, consistent with previous descriptions of additional tendon slips of the wrist radial extensors [2,5].



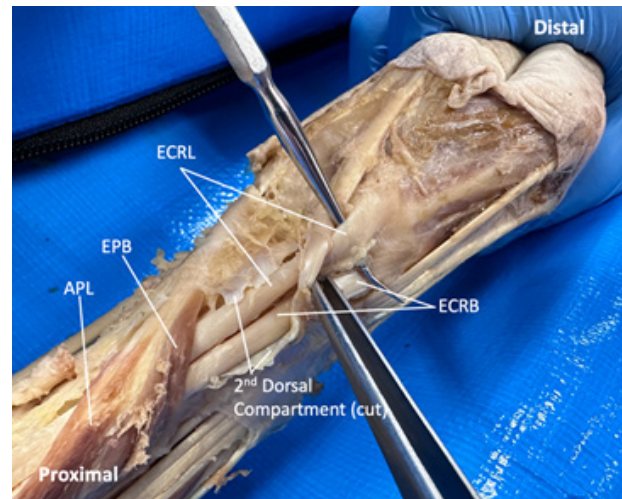
**Figure 1)** Dissection of right radial forearm highlighting Brachioradialis (BR), Extensor Carpi Radialis Longus (ECRL), tendon slip of Extensor Carpi Radialis Longus (TSECRL), Extensor Carpi Radialis Brevis (ECRB), Abductor Pollicis Longus (APL), and Extensor Pollicis Brevis (EPB). Proximal and distal ends of the limb are labeled.



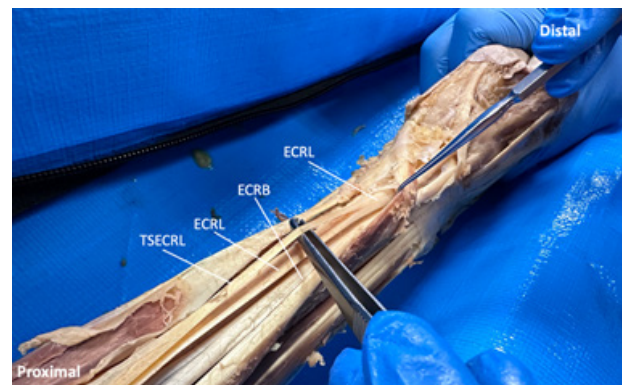
**Figure 2)** Dissection of right radial forearm highlighting tendon slip of Extensor Carpi Radialis Longus (TSECRL) originating as a muscular slip from Extensor Carpi Radialis Longus (ECRL). Brachioradialis (BR) and Flexor Carpi Radialis (FCR) are also highlighted. Proximal and distal ends of the limb are labeled.



**Figure 3)** Dissection of right radial wrist highlighting tendon slip of Extensor Carpi Radialis Longus (TSECRL) rejoining the tendon of the Extensor Carpi Radialis Longus (ECRL) just proximal to the Abductor Pollicis Longus (APL) and Extensor Pollicis Brevis (EPB) muscle bellies. Extensor Carpi Radialis Brevis (ECRB) is also highlighted. Proximal and distal ends of the limb are labeled.



**Figure 4)** Dissection of right radial wrist highlighting Extensor Carpi Radialis Longus (ECRL) traveling through 2nd dorsal compartment and inserting onto base of 2nd metacarpal. Abductor Pollicis Longus (APL), Extensor Pollicis Brevis (EPB), and Extensor Carpi Radialis Brevis (ECRB) are also highlighted. Proximal and distal ends of the limb are labeled.



**Figure 5)** Dissection of the right radial forearm and wrist highlighting the tendon slip of Extensor Carpi Radialis Longus (TSECRL) coursing superficial to the tendon of the Extensor Carpi Radialis Longus (ECRL) and then rejoining the ECRL tendon. Extensor Carpi Radialis Brevis (ECRB) is also highlighted. Proximal and distal ends of the limb are labeled.

## Discussion

The purpose of this case report is to describe a variant accessory radial wrist extensor muscle, an additional tendon slip of an ECRL found during cadaveric dissection. The presence of an additional tendon slip of an ECRL has several clinical and surgical implications for health professionals. First, this tendon slip may play a role in radial nerve entrapment in the forearm. Radial nerve entrapment is a relatively uncommon diagnosis believed to be under-

recognized [6]. Compression of the radial nerve can occur at any location along its path from a terminal branch of the brachial plexus into the arm and forearm. The most common location of entrapment, however, occurs at the proximal forearm near the supinator muscle [6]. An additional tendon slip of an ECRL may congest the proximal forearm musculature and contribute to entrapment of the radial nerve and, therefore, should be considered in patients presenting with radial nerve pain and paresthesia.

Additional considerations for the presence of an additional tendon slip of an ECRL include its involvement in tendon conditions of the elbow and wrist. Lateral epicondylopathy is one of the most common reasons for medical consultation for non-traumatic elbow dysfunction [7] and involves chronic symptomatic degeneration of the common extensor tendon at the lateral epicondyle of the humerus. In most cases of lateral epicondylopathy, the ECRB is the primary muscle affected, but no obvious underlying causes have been identified [8]. Lateral epicondylopathy is more prevalent in the dominant limb [9] and the common extensor tendon tends to be thicker in the dominant upper limb [10]. Therefore, an additional tendon slip of a radial wrist extensor with an attachment on or near the lateral epicondyle and common extensor tendon may increase the risk of lateral epicondylopathy due to the potential increase in thickness and/or workload of the radial wrist extensors with an additional tendon. The additional tendon slip of an ECRL may also contribute to the development of intersection syndrome. Intersection syndrome is a tenosynovitis of the EPL tendon as it crosses superficial to the ECRL and ECRB tendons. An extra tendon slip may increase the risk for friction or tenosynovitis of these tendons.

Finally, clinicians and surgeons must be aware of the implications of an additional tendon slip of an ECRL on imaging and surgical technique. Variations of normal wrist extensor anatomy may also be mistaken on imaging studies for mass lesions, split tears in ECRL or ECRB, error in tendon identification during surgical procedures, and tendon sheath effusions [11]. Accessory tendons provide surgeons with options during surgical procedures. For example, a surgeon may utilize accessory tendons during radial wrist extensor tendon transfers for treating paralytic disorders of the hand [4].

## Conclusion

Four different variations of the radial wrist extensor muscles have been described in the literature [2,3], and these variations have an incidence rate of 12%-35% [2-4]. Since these variations are not rare, knowledge of these radial wrist extensor variations is important for both surgeons and non-operative clinicians as they can contribute to neuromuscular dysfunction including nerve entrapment, lateral epicondylopathy, and intersection syndrome. Future research should explore the incidence rates of radial wrist extensor muscle variations in different geographic regions and the imaging techniques to be used to view these variations in clinical populations.

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