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CASE REPORT

Flexor Carpi Radialis Brevis: A Case Report

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Abstract

Objective: The flexor carpi radialis brevis is a rare anatomical anomaly, with incidence ranging from 1.6-7.5%. While this anatomical anomaly is typically benign, it is clinically important as it can contribute to neurovascular and musculoskeletal dysfunction. Surgeons should be made aware of this variation during distal radius volar plating procedures and carpal tunnel releases. The presence of a flexor carpi radialis brevis muscle may cause confusion when interpreting imaging results. We report a rare case of bilateral flexor carpi radialis brevis muscles that travel through the carpal tunnel found during a cadaveric dissection lab in a physical therapy graduate program. To our knowledge, this is the first reported instance of the median nerve traveling through a bifurcation of the FCRB tendon.

Key Words: *Flexor carpi radialis brevis; Anatomic variation; Clinical significance*

Introduction

The flexor carpi radialis (FCR) is a long, superficial, and relatively thin muscle of the anterior compartment of the forearm. It originates on the medial epicondyle of the humerus, through the common flexor tendon and surrounding antebrachial fascia. From the medial epicondyle, the FCR courses obliquely, crossing from the ulnar to radial part of the forearm, giving off a long tendon at the lower third of the forearm. The tendon of the FCR travels below the flexor retinaculum into the palmar surface of the hand, through its own synovial sheath. The tendon then crosses the palmar surface of the scaphoid and traverses in a groove on the trapezium, to insert onto the palmar surface of the base of the 2nd metacarpal bones. The FCR is innervated by the median nerve, receives blood supply from the recurrent ulnar arteries proximally and radial artery distally, and functions to flex and radially deviate the wrist [1].

Many anatomical variants of muscle and

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tendinous structures are present around the wrist and are often found by chance during magnetic resonance imaging (MRI) or other imaging studies, surgical procedures, or cadaveric dissections. The flexor carpi radialis brevis (FCRB) muscle is a rare variant muscle, with incidence ranging from 1.6-7.5% [2-7]. The FCRB was first described in 1851 and was given the name flexor carpi radialis brevis vel profundus [8]. The FCRB consists of a fusiform muscle belly with a short tendon [3,4]. The muscle belly of the FCRB is located in the distal, anterior forearm, where neurovascular structures and tendons are predominant. Previous reports in the literature state that FCRB originates from the volar-radial border of the radius between the radial insertion of the pronator quadratus (PQ) and the origin of the flexor pollicus longus (FPL) [3,5,7]. The insertion of the FCRB is noted to have frequent variations and may be into the bases of the 2-4th metacarpals or a radial sided carpal bone [3,7,9,10]. The FCRB is reported entering the hand via a special osteofibrous tunnel of the FCR, which is separate from the carpal tunnel [10,11]; however, Nakahashi and Izumi [5] report a case where the FCRB passes through the carpal tunnel. It is innervated by the anterior interosseous nerve, and it's primary function is to flex the wrist, consistent with the function of the FCR [3,5,9]**.**

We report here a case of a bilateral FCRB muscles found during cadaveric dissection in a physical therapy graduate program. This is a novel case with tendons of both FCRBs traveling through the carpal tunnel, and the tendon of one FCRB splitting with the median nerve traveling between this tendinous split. This is to our knowledge the second published example of FCRB traveling through the carpal tunnel and the first published example of a bifurcated FCRB tendon. This case report included a single cadaver and did not require Institute Review Board review or approval.

Case Report

A male, Caucasian cadaver, with unknown age and cause of death, was obtained by Samford University for cadaveric dissection during the summer 2022 semester in Birmingham, Alabama. The Cadaver exhibited no significant surgical history and presented with unremarkable height and weight upon postmortem examination. It is unknown if these anomalies were known to the subject, or if there were any symptoms associated with them. There was no evidence of scars in the area of these anomalies.

Right Flexor Carpi Radialis Brevis

The presence of a muscle with characteristic features of the FCRB was discovered during anterior forearm dissection of the right (R) upper extremity. While dissecting and viewing the deep layer of flexor muscles in the anterior, distal forearm, the FPL was identified on the radial side. The FPL showed normal anatomy with a proximal attachment on the anterior surface of the radius and interosseus membrane and attaching distally at the distal phalanx of the thumb. The FPL was then retracted to view the PQ running transversely from the ulna to the radius. The R FCRB was observed originating on the anterior radius, just distal to the FPL, and coursing obliquely to the mid carpal region (Figure 1). Dissection of the transverse carpal ligament (TCL) revealed the tendon of the R FCRB traveling through the carpal tunnel (Figure 2). The median nerve was observed traveling between the R FCRB and the tendons of the flexor digitorum profundus (FDP) (Figure 2). The insertion of the R FCRB could not be determined. When dissecting to find the insertion, the tendon of the R FCRB may have been cut.

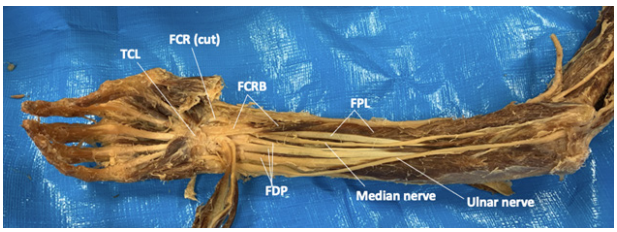

Figure 1) *Dissection of the right anterior forearm highlighting the ulnar nerve, median nerve, Flexor Pollicus Longus (FPL), Flexor Digitorum Profundus (FDP), Flexor Carpi Radialis Brevis (FCRB), Flexor Carpi Radialis (FCR), and Transverse Carpal Ligament (TCL).*

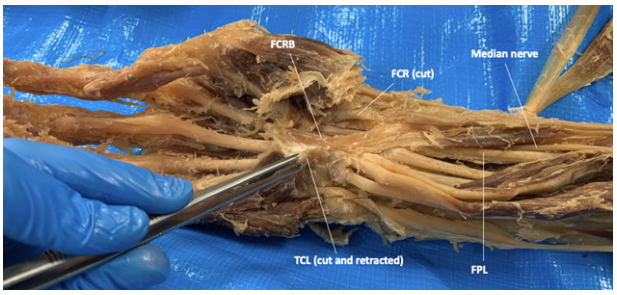

Figure 2) *Dissection of the right anterior wrist highlighting the median nerve, Flexor Pollicus Longus (FPL), Flexor Carpi Radialis Brevis (FCRB), Flexor Carpi Radialis (FCR), and Transverse Carpal Ligament (TCL).*

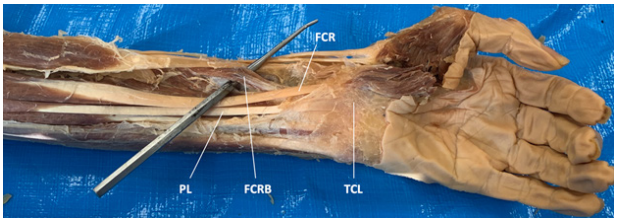

Figure 3) *Dissection of the left anterior forearm highlighting the Palmaris Longus (PL), Flexor Carpi Radialis Brevis (FCRB), Flexor Carpi Radialis (FCR), and Transverse Carpal Ligament (TCL).*

Left Flexor Carpi Radialis Brevis

The left (L) upper extremity was then dissected, with the goal of determining if the FCRB was bilateral. During dissection of the deep flexor muscles of the L anterior, distal forearm, the L FCRB was observed originating on the anterior radius, distal to the FPL. This was similar to the origin of the R FCRB. The tendon of the L FCRB traveled obliquely in the direction of the TCL (Figure 3). The tendon bifurcated about 3cm before the TCL, with the median nerve traveled through this bifurcation (Figure 4). The radial tendon slip of the L FCRB inserted onto the TCL (Figure 5), while the ulnar tendon slip travels through the carpal tunnel and inserted on to the palmar fascia (Figure 6).

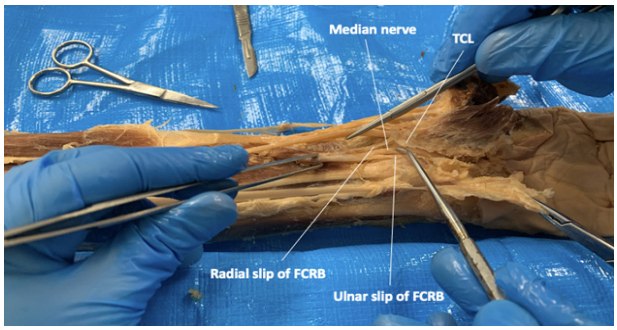

Figure 4) *Dissection of the left anterior forearm highlighting the radial slip of Flexor Carpi Radialis Brevis (FCRB), ulnar slip of Flexor Carpi Radialis Brevis (FCRB), Transverse Carpal Ligament (TCL), and median nerve.*

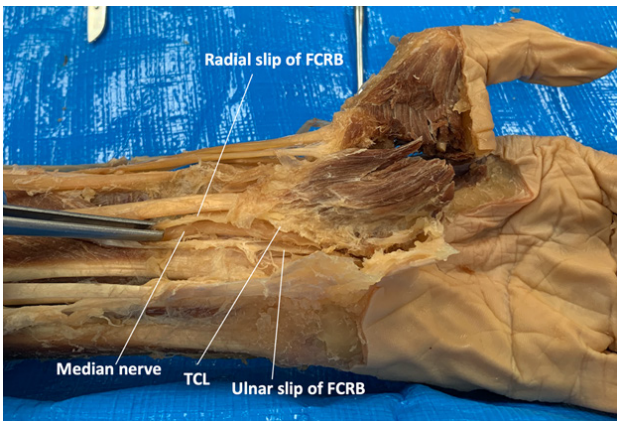

Figure 5) *Dissection of the left anterior wrist highlighting the median nerve, radial slip of Flexor Carpi Radialis Brevis (FCRB), ulnar slip of FCRB, and Transverse Carpal Ligament (TCL).*

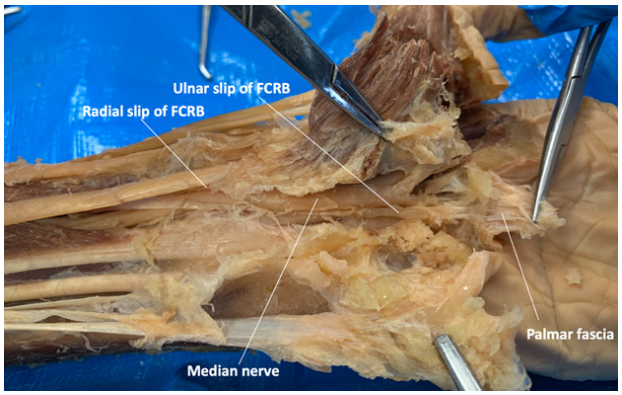

Figure 6) *Dissection of the left anterior wrist highlighting the ulnar slip of flexor carpi radialis brevis (FCRB), radial slip of FCRB, median nerve, and palmar fascia.*

Discussion

The FCRB is a rare anatomical variation with a prevalence that is unaffected by sex or race; however, the prevalence may increase as

awareness of this anomalous muscle increases [2,7]. Although most reports on the FCRB suggest it is a rare anatomical anomaly, Mantovani et al report a clinical case series of this anomaly and suggest that the FCRB is relatively common from their experience [12].

Several insertions have been reported in literature including the base of the 2-4th metacarpal and radial sided carpals [3,7,9,10]; however, this is the second reported case, to our knowledge, of a FCRB traveling through the carpal tunnel. FCRBs are usually found intraoperatively or during postmortem dissection. Previous reports suggest the FCRB is rarely symptomatic, though in some cases, it has caused radial-sided wrist pain, and neuropathies in the hand [2,3,10,11] In 2018, Kordahi et al reported the first case of a patient with radial sided wrist pain and a partial tear of the FCRB [13]. A tendon of an accessory muscle traveling through the carpal tunnel, such as the cases presented here, may contribute to congestion of the carpal tunnel and increase pressure on the median nerve leading to carpal tunnel syndrome. Both the R and L FCRB muscle reported here also had the potential of compromising the median nerve before the nerve traveled through the carpal tunnel. The R median nerve was observed traveling between the R FCRB tendon and the tendons of the FDP, while the L median nerve traveled through the bifurcation of the L FCRB tendon. Both of these anomalies may increase pressure on the median nerve, contributing to neuropathies in the hand. Although FCRB muscles are rare, this accessory muscle should be considered in the differential diagnosis of wrist and hand syndromes. Surgeons should be aware of this variation during the distal radius volar plating procedure and carpal tunnel release. Additionally, the FCRB may cause confusion when interpreting imaging results. Ultrasound imaging show that the FCRB demonstrates biomechanics of typical skeletal muscle and it is voluntarily controlled by flexing the wrist and, therefore, probably plays a role in active stability of the wrist [14]. Knowledge of the study of anatomy and its diversity is an essential inlet to all medical sciences, whether basic, clinical or surgical practice [15].

Conclusion

The FCRB is a rare anatomical variation of the anterior, distal forearm. Though it is rare, the FCRB should be considered in patients presenting with radial sided wrist or hand dysfunction. This anatomical anomaly may contribute to clinical pain syndromes, cause difficulties with MRI and imaging studies, and lead to surgical challenges when performing internal fixation of the radius using a volar plating approach. This case reports bilateral FCRB and is, to our knowledge, the first reported instance of the median nerve traveling through a bifurcation of the FCRB tendon.

Ethical Approval

Institute review board review and approval was not required for this cadaver case report.

Statement of Human and Animal Rights

This report was performed in accordance with ethical standards.

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Authors' contributions

WC and SF were responsible for idea conceptualization. WC, SF, RMC, KEM, and NBW were responsible for writing and approving manuscript prior to submitting.

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