

The Study of Anomalous Origin of Flexor Carpi Radialis Muscle

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Abstract

Flexor carpi radialis [FCR] is a superficial flexor muscle of forearm and show variations in pattern of origin, abnormal fusion with other muscles, as well as insertion pattern. The objective of the study was to enumerate variations of FCR muscle and to establish a clinico-anatomical correlation. The present study was conducted on bilateral upper limbs of thirty cadavers, irrespective of sex, over a period of four years. The study revealed two abnormal pattern of origin of FCR in two cadavers. In one cadaver, FCR has additional B/L head of origin from Biceps tendon insertion. In another cadaver, U/L fused origin of FCR with Pronator teres was found. This study has relevant implication related to clinical and radiological diagnosis of neurovascular compression involving forearm, and also various reconstructive surgeries involving forearm structures.

Keywords: Flexor Carpi Radialis; Pronator Teres; Forearm; Median Nerve.

Introduction

Flexor carpi radialis is one of the superficial flexor group of muscles of the anterior compartment of the forearm, along with pronator teres, palmaris longus, flexor digitorum superficialis and flexor carpi ulnaris. It takes origin from the medial epicondyle of the humerus as common flexor origin. The fusiform muscle belly becomes tendinous in the middle of forearm and is inserted into the palmar aspect of base of second and third metacarpal bones. It derives its nerve supply from median nerve in forearm [1]. Anatomical variations of FCR muscle include its unusual origin and occurrence, attachments, duplication including presence of additional belly and/or tendon, abnormal fusion with other muscle, and also regarding insertion pattern [2-7]. The objective of this study is to identify and document variations of FCR muscle and to

establish an anatomical basis which can be of great help to radiologist during diagnosis and surgeons during reconstructive surgeries involving neurovascular and musculotendinous pathologies.

Materials and Methods

The present study was conducted on sixty upper limbs of thirty cadavers of different ages, irrespective of sex. It was carried out during routine dissection of superior extremity for teaching undergraduate students in the department of Anatomy, Kalinga institute of medical sciences, over a period of four years. Flexor compartment of arm and forearm were dissected according to standard dissection technique and all the muscles were exposed carefully. FCR muscles were isolated from origin to insertion and were carefully observed, for any variations regarding their origin, course, abnormal fusion with other muscles, nerve supply and insertion. All variations were carefully noted and their photographs were taken.

Result

Meticulous dissection of forearm was done in all cadavers, and structures were exposed. In all 58 upper

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limbs, no significant abnormality in FCR was noted. Only two of cadavers showed U/L abnormal FCR muscle as described below.

In one of the 65 year old female cadaver, left upper limb showed additional slip of origin of FCR from lower end of insertion of biceps brachii muscle and bicipital aponeurosis. This additional slip was fused with fibres of pronator teres, almost covering it and making it unrecognisable from above. Pronator teres was recognised by the entrance of median nerve in it [Figure 1]. When muscle fibres of additional head of FCR were dissected, then pronator teres muscle become evident. The tendon of FCR was found to be fused with pronator teres from origin to insertion [Figure 2]. Other muscles were normally arranged with normal pattern of neurovascular structures. Right upper limb showed no abnormality.

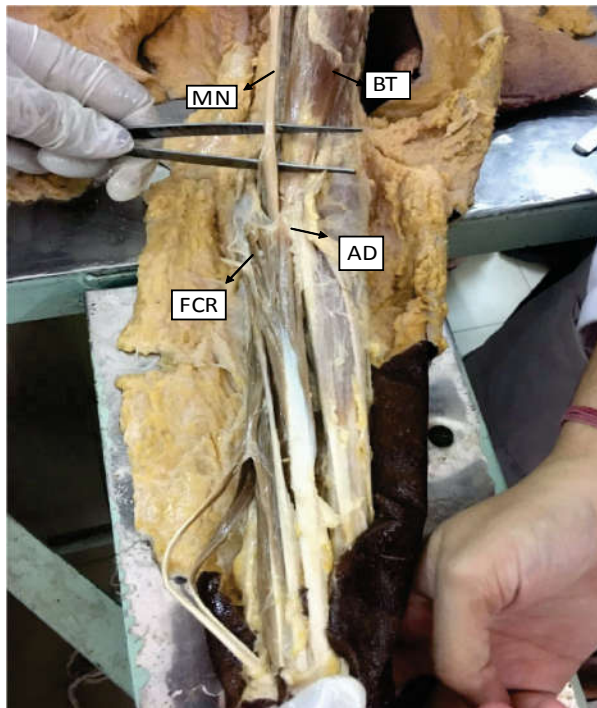


Fig. 1: Flexor carpi radialis[FCR], additional head of flexor carpi radialis[AD], Median nerve[MN], Biceps tendon insertion[BT]

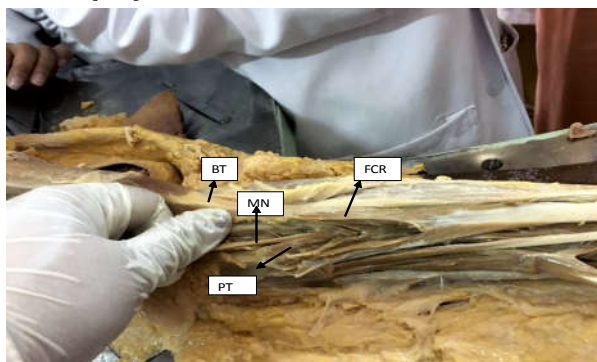


Fig. 2: Flexor carpi radialis[FCR], Median nerve[MN], Pronator teres[PT], Biceps tendon[BT]

In another 50 year old male cadaver, right forearm showed the origin of FCR from medial epicondyle and from fibres of Pronator teres, showing fusion. FCR covers Pronator teres upto its insertion and the insertion of pronator teres can be seen by carefully retracting FCR [Figure3]. Neurovascular structures like median nerve, brachial artery, etc were normal. Left forearm showed no structural abnormality.

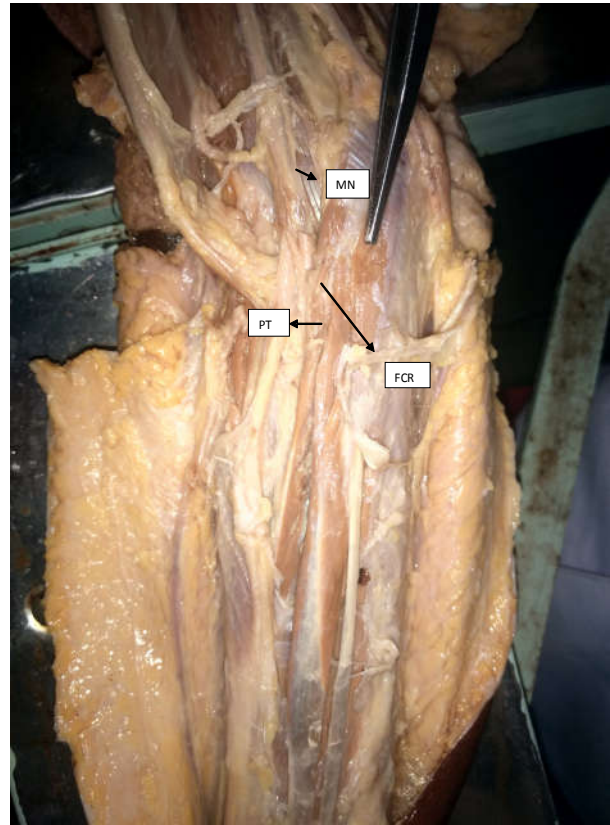


Fig. 3: Flexor carpi radialis[FCR], Pronator teres[PT], Median nerve[MN]

Discussion

Various anatomical anomalies of musculotendinous structures around the wrist are known [4]. They are often found by chance during imaging studies and surgical procedures, and sometimes perceived when they cause certain pathologic conditions, such as compression neuropathy [8]. Variations of muscles of flexor compartment of forearm have always been an area of interest for anatomist, radiologist as well as vascular surgeons. Variations in occurrence, origin, duplication, fusion with other muscles, and insertion have been reported earlier [2-7]. Carleton A et al in 1935 described a muscle naming Flexor carpi radialis vel profundus, taking origin from front and lateral

side of radius and inserting into third and fourth metacarpal bone [2]. Nakahshi T et al in 1987 reported a case of fusion of FCR with Extensor carpi radialis brevis around the wrist [3]. Dodds SD et al in 2006 reported FCR muscle with anomalous origin from distal part of radius [4]. Scott F M Duncan et al in 2006 reported a case of Flexor carpi radialis brevis originating from beneath of FCR muscle [5]. Mantovani G et al in 2010 described six case reports of anomalous Flexor carpi radialis brevis muscle from volar aspect of forearm [6].

Trivedi S et al in 2015 reported a case of musculotendinous slip from insertion of Biceps brachii to Pronator teres and FCR [7]. Deopujari et al in 2014 [9] and Madhumita Dutta et al in 2016 [10], reported a study regarding additional head of FCR originating from junction of Biceps tendon and Bicipital aponeurosis similar to our study. But difference is that in those study fibres of FCR were not fused with fibres of Pronator teres in any aspect.

Moreover, no case had been reported earlier where fibers of FCR were found to be fused with Pronator teres. In present study, two cases were reported. In one cadaver, origin of additional head of FCR from junction of Biceps tendon and Bicipital aponeurosis were found and this muscle completely covered Pronator teres and was fused with it from origin to insertion. In another cadaver, only origin of FCR was found to be fused with Pronator teres. This fusion reflects embryological basis related to development of upper limb muscles [10]. Such variations have been reported as clinically relevant implicating aponeurosis causing median nerve entrapment, compression of brachial artery, pronator syndrome etc. The knowledge of such variation of FCR can be of great help in various reconstructive surgeries [11] and neurovascular surgeries involving wrist and hand. One of the main clinical implication of FCR is graft [12] and tendon transfer surgery [13]. Biomechanics of wrist joint can be altered due to imbalanced structure of FCR [14].

Conclusion

Various earlier study had reported bicipital origin of FCR, but abnormal, partial or complete fusion with Pronator teres had not been reported earlier. Knowledge of present study highlighting anatomical variant of FCR muscle seemed to be relevant and clinically noteworthy and it would be of great help in various reconstructive, neurovascular, tendon transfer and graft surgeries involving forearm, wrist and hand.

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