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Presence of Additional Head of Pronator Teres Muscle - Case Report

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Authors' contributions

This work was carried out in collaboration between both authors. Author TRR designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author SRR managed the analyses of the study and the literature searches. Both authors read and approved the final manuscript.

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Case Report

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ABSTRACT

Arm and cubital fossa are the sites for frequent injuries and it is involved in many surgical procedures. Variations in the arm and cubital fossa have immense clinical significance. Accurate knowledge of these variations will be of considerable clinical significance when conducting surgeries of the arm, fracture management of humerus and diagnosis of various compressive neuropathies. During routine dissection of the upper limb, we observed an unusual additional head of pronator teres muscle and the entrapment of brachial artery between the tendon of biceps brachii and the bicipital aponeurosis. In this report an attempt has been made to highlight its embryological basis and clinical implications.

Keywords: Pronator teres; pronator syndrome; common flexor origin of muscles; intermuscular septum; bicipital aponeurosis.

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1. INTRODUCTION

The pronator teres is one of the five superficial flexor muscles of the forearm. All the superficial muscles have a common humeral origin from the medial epicondyle of the humerus. In addition, each arises from the covering deep fascia and the facial partitions between them. Pronator teres arises from the humeral and ulnar heads. The humeral head, takes origin from just above the medial epicondyle, and from the common flexor tendon with the other flexor muscles of the forearm and also from the intermuscular septum which is present in between the pronator teres and the flexor carpi radialis. Few fibers of pronator teres also takes origin from the antibrachial fascia. The thin fasciculus of the ulnar head of pronator teres, arises from the coronoid process of the ulna on its medial side, which latter joins the humeral head at an acute angle. Between the two heads of the pronator teres muscle, the median nerve enters the forearm, which is parted from the ulnar artery by the ulnar head of pronator teres. The pronator teres crosses obliquely in the forearm, and finally gets attached to the rough impression on the middle of the lateral surface of theshaft of the radius and innervated by the median nerve [1]. Here we observed a rare case of the occurrence of supplementary heads for the pronator teres taking origin from the bicipital aponeurosis.

2. CASE REPORT

During routine dissection of the upper limb, with the purpose of teaching medical students, in a middle aged male cadaver we observed an unusual supplementary head of pronator teres muscle taking origin as a discrete slip from the underneath aponeurotic extension of the biceps brachii proximate at its tendo-aponeurotic junction in the cubital region (Fig. 1). This abnormal muscle slip, in addition to humeral and ulnar heads of pronator teres, had slanting course from medial to lateral side below the superficial fascia of the cubital fossa and over the brachial artery, ulnar artery and the median nerve. The brachial artery was found to be entangled amongst the tendon of biceps brachii and the bicipital aponeurosis. The abnormal slip of pronator teres, in its midway of the course, it became a fleshy muscle belly and merged with the main bulk of the pronator teres of the left limb (Fig. 1). The presence of this abnormal slip may explain the unusual neurovascular symptoms due to close relationship with neurovascular bundles in the forearm area and also plays an important role in surgeries of the cubital and elbow region.

3. DISCUSSION

A review of the shows many abnormal muscle slips of pronator teres originate from various sources such as, the medial epicondyle of the humerus, supracondylar process of the humerus, Struthers' ligament, tendineous insertion of the biceps brachii, medial epicondyle of the humerus, lateral side of the brachialis muscle and lateral intermuscular septum which is attached to the lateral supracondylar line of the humerus. Conversely, the recent disparity, of the additional muscular slip of the pronator teres arising from the bicipital aponeurosis is not only encompassing to the pronator teres but also to the flexor carpi radialis has not been documented in any of the earlier reports. The incidence of such auxiliary slips are the most influencing reasons for median nerve entrapment. In the existing variant, the supplementary slip of pronator teres was tendineous in origin and was posturing, to the superficial head of the pronator teres and establishing a muscular tunnel and through which the radial and ulnar arteries and the median nerve were traversing, thus any contraction of the additional slip may cause neurovascular compression.

During early embryonic stages of the upper limb development, the restrained upper limb somites are independently migrating to the developing limb bud, later several segments of somites fuses to form the explicit muscle. Topographic and temporal molecular regulation of these confined somites of the upper limb had lead to patterning of the muscles via differential growth and also by apoptosis. Any discrepancy in this progression may lead to nonappearance or rare presence of a muscle, positioning of the muscles may be the reasons for the incidence of additional slips from the bicipital aponeurosis [2].

Normally the bicipital aponeurosis is attached to the antebrachial fascia of the forearm on its medial side and also to the posterior border of ulna. Along with the biceps brachii it help in supporting in the supination of the forearm. Many earlier studies have shown that any variations in the bicipital aponeurosis may lead to neurovascular compression [3]. In our existing case, the bicipital aponeurosis showed medial and lateral slips. In which the medial slip gave origin to few fibers of pronator teres and flexor carpi radialis. Whereas few fibers of

Fig. 1. Anomalous origin of pronator teres

1. Pronator teres
2. Anomalous origin of pronator teres
3. Bicipital aponeurosis
4. Tendon of biceps brachii
5. Biceps brachii
6. Brachial artery
7. Radial artery
8. Ulnar artery
9. Median nerve
10. Brachioradialis
11. Flexor carpi radialis

brachioradialis raised from the lateral slip. In our opinion these type of rare slips of bicipital aponeurosis may distribute the stress concentration and may function in different directions affecting the supination of forearm.

The most remarkable variant of the pronator teres is the extent of the origin to get attached to a supracondylar process or the ligament which attaches this with the epicondyle. In these types of variations, there will be deviation in the course of the brachial artery will be accompanied by the median nerve passes behind the process deep to the auxiliary portion of the muscle to reach the antecubital space. In absence of the supracondylar process, an auxiliary head may arise from any of these sites like, the median intermuscular septum, the humerus, the fascia of the arm, or one of the muscles. Auxiliary head may also get attached with the flexor carpi radialis or flexor digitorum superficialis. Both the heads may be completely separated, and both the coronoid and the humeral heads have been seen divided. The radial attachment may have a more extensive insertion on the radius than usual. In the early embryo the muscles descends to a more distal level than it does in the fully developed arm. This is due to the greater relative growth of the distal part of the shaft of the radius. A very marked ulnar head is present in the monotremes, but is absent in mammals generally, including the lower primates. The

muscle was probably originally flexor, and persists in many animals in which it can act only as such. The deep head probably represents an upper detached part of the original pronator muscle which extended between the bones in the whole length of the arm. The nerve supply by two distinct branches points to its double origin [4].

If there is variation in the origin of the pronator teres, the course of the brachial artery accompanied by the median nerve normally get deviated as mentioned above. In incidences of higher branching of the brachial artery it is the ulnar artery that normally traverses deep to the process or ligament (of Struthers). Supplementary heads of pronator teres may take origin either from the biceps, brachialis, or humerus near the insertion of coracobrachialis. Sometime the coronoid head may be absent or undeveloped. Pronator teres has been seen reinforced by fibers from the front of the ulna. Both the heads of the muscle may be fully detached or be divided. The radial attachment may be more widespread than normal. It may extend to the long flexor of the thumb. Sometime under the thick humeral tendon of pronator teres a sesamoid bone may be found [5].

Normally the pronator teres usually has humeral and ulnar attachments. The larger humeral head takes origin close to the medial epicondyle of the humerus. The smaller ulnar head coils from the the coronoid process of the ulna from its medial side. Several reports on the absence of coronoid attachment, accessory slips arising from a supracondylar process of the humerus, or from biceps, brachialis or the medial intermuscular septum has been documented [1].

Sushma et al. [6] in their study reported the presence of additional head of origin of pronator teres and anomalous course of ulnar artery and median nerve that were found traversing through the bridge, which measured two centimeters long and to arise from the medial intermuscular septum and also from the fibrous arch form the shaft of the humerus to the medial intermuscular septum formed by supplementary humeral head of the pronator teres [7].

Pronator quadratus and pronator teres brings the pronation of the forearm. The pronator quadratus is the chief pronator of the forearm, the action being autonomous of the position of the elbow. The pronation of the forearm is strengthened by the pronator teres when it is required or any reistance is applied to the movement. The involvement of the supplementary head of pronator teres or accessory pronators, in bringing the pronation of the forearm is controversial. The pronation and supination of the forearm with the elbow flexed at 90 degrees the average rage measures 173 degrees at the level of the hand and 156 degrees at the wrist. The average range of pronation is 62 degrees and ranges from 49 degrees to 84 degrees [7].

4. CONCLUSION

Muscular and arterial variations in the upper limb have varied clinical and surgical significance. The acquaintance of such muscular and arterial discrepancies plays an important role during surgeries of the arm and cubital regions. It may also help in diagnosing the uncommon neurovascular symptoms due to their close and unusual relationship with the neurovascular bundles in this area. In addition, these variations in the musculature may also cause diagnostic misinterpretations in MRI or CT scans.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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