

CASE REPORT

Unusual high-origin of the pronator teres muscle from a Struthers' ligament coexisting with a variation of the musculocutaneous nerve

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Abstract

During routine anatomical dissection of the right upper extremity of a 53-year-old woman cadaver, an unusual high-origin of the pronator teres muscle was discovered. The fibers of the aberrant muscle arose from two bone origins – the medial epicondyle and a small supracondylar process of the humerus, and from a tendinous arch (Struthers' ligament) extending between them. In addition, there was a variation of the musculocutaneous nerve – in the axillary fossa the musculocutaneous was fused to the median nerve and its usual branches arose consecutively from the median nerve stem. The last of these branches – the lateral antebrachial cutaneous arose in the lower part of the arm from the median nerve and companion to it and to the brachial artery passed under the Struthers' ligament. Our findings indicate that in some rare cases of combined muscular-nerve variations, the lateral antebrachial cutaneous nerve can be added to the neurovascular structures possibly entrapped by the Struthers' ligament.

Keywords: pronator teres muscle, Struthers' ligament, variations, nerve compression.

□ Introduction

Among the numerous variations of the pronator teres muscle (PT) [1–4], its high humeral origin is one of the most interesting ones, because it is usually associated with the existence of the supracondylar (supra-epitrochlear, epicondylic) process of the humerus and the ligament (arcade) of Struthers [5]. These fibromuscular variations forms an entrapment site where the median nerve is most commonly affected, but the brachial artery, a variant ulnar artery or rarely the ulnar nerve can also be compressed [2, 6, 7]. Moreover, sometimes, the median nerve itself may present variant branches [8], which may complicate the clinical signs of the entrapment.

□ Material, Methods and Results

The variations were found during routine anatomical dissection, approved by the medico-legal office and local Ethic Committee, of a 53-year-old formalin-carbol fixed woman cadaver for whom we have no information for previous diseases. While dissecting the anterior elbow region of the right upper extremity, showing no signs of accidental or surgical trauma, an unusual PT was observed. Its muscular fibers arose from two bone origins and from a tendinous arch extending between them (Figures 1 and 2).

The proximal bone origin was the medial supracondylar ridge of the humerus, 5.7 cm above to the medial epicondyle. The distal bone origin was the medial epicondyle and the lowest part of the medial supracondylar ridge of the humerus.

Following careful dissection at the place of proximal attachment revealed a small, nearly 2-mm-high bone spike, representing a “supracondylar process” of the humerus. In that aspect, the tendinous arch of the variant PT extending between the supracondylar process and the medial epicondyle represented a Struthers' ligament. Additionally, in this case, there was no ulnar head of the PT observed. The variant PT had a triangular muscular body, which passed obliquely across the upper forearm and inserted just posterior to the most prominent part of lateral convexity of the radius. As usual, a branch from the median nerve innervated the PT.

In our case, the musculocutaneous nerve was absent – it was fused with the median nerve in the axillary fossa. As a result, the usual branches of the musculocutaneous came off directly from the median nerve stem. The branches to the coracobrachialis and biceps brachii arose from the median nerve in the upper part of the arm; the middle part of the median nerve gave rise to the branch supplying the brachialis.

The lateral antebrachial cutaneous nerve originated from the median nerve in the lower part of the arm. It passed under the tendinous arch of the variant PT (Struthers' ligament) together with the median nerve and the brachial artery (Figures 1 and 2).

Further, the lateral antebrachial cutaneous passed deep to the distal tendon of the biceps brachii and continued into the forearm as usual. The brachial artery in our case presented no variation in its branching pattern; at the level of the neck of the radius, it divided into the radial and ulnar arteries.

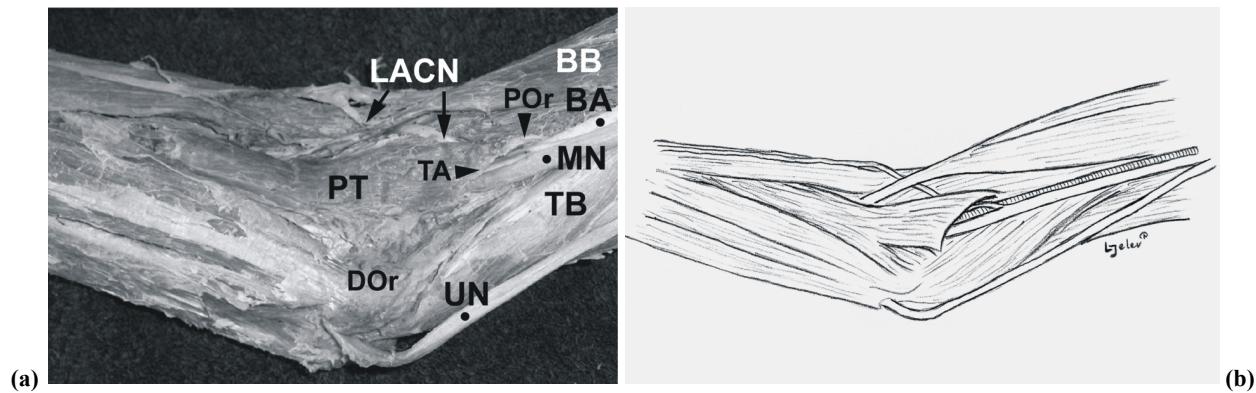


Figure 1 – Photograph (a) and scheme (b) of the variant findings. Muscles: PT, pronator teres; POr, proximal origin of the pronator teres; DOr, distal origin of the pronator teres; TA, tendinous arch extending between the two origins of the pronator teres, which is regarded as Struthers' ligament; BB, biceps brachii; TB, triceps brachii. Nerves: MN, median nerve; LACN, lateral antebrachial cutaneous nerve; UN, ulnar nerve. Artery: BA, brachial artery.

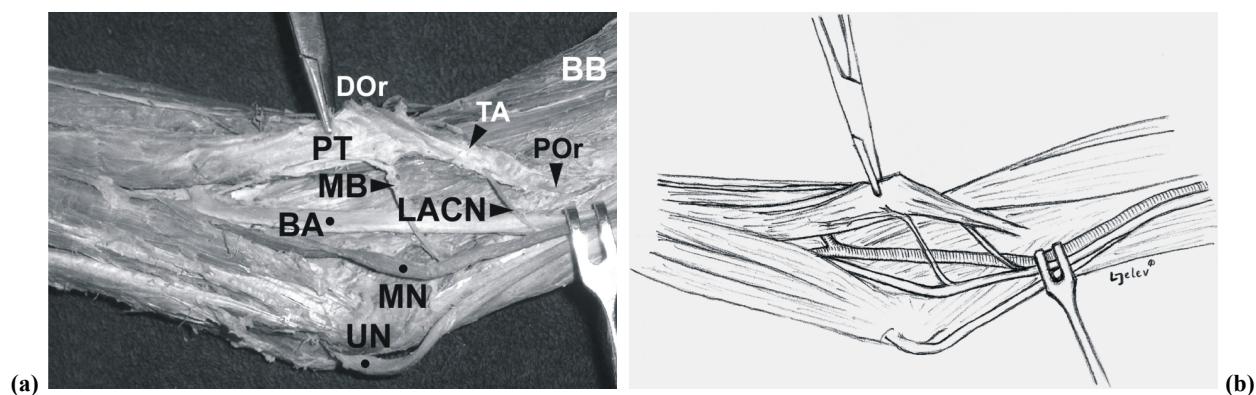


Figure 2 – Photograph (a) and scheme (b) of the variant findings after cutting and retracting laterally the distal origin of the variant pronator teres. Muscles: PT, pronator teres; POr, proximal origin of the pronator teres; DOr, distal origin of the pronator teres; TA, tendinous arch extending between the two origins of the pronator teres, which is regarded as Struthers' ligament; BB, biceps brachii. Nerves: MN, median nerve; LACN, lateral antebrachial cutaneous nerve; MB, muscular branch to pronator teres; UN, ulnar nerve. Artery: BA, brachial artery.

Discussion

The variant high-origin of the PT from the humerus is a rare variation, reported by some authors [4, 9]. Usually, it arises from an existing supracondylar process of the humerus and from a fibrous band extending between the supracondylar process and the medial epicondyle – the ligament of Struthers [5]. Thus, between the lower medial part of the humerus, the supracondylar process and the Struthers' ligament, an osseofibrous tunnel is formed through which passed the median nerve and brachial artery [2, 7], and sometimes a variant ulnar artery [2, 5, 10] or the ulnar nerve [7]. From embryological point of view, the Struthers ligament is a remnant of the tendon of the vestigial muscle, the latissimo-condyloideus, which is found in some climbing animals and also provide a large muscular attachment for the PT [2]. In lower mammals, the osseofibrous tunnel formed by the humerus, supracondylar process and the Struthers' ligament serves to protect the nerves and vessels going to the forearm [2]. In human, the presence of supracondylar process and the Struthers' ligament is usually asymptomatic, but also it is an important entrapment site for the median nerve and brachial artery. The compression symptoms include severe

paresthesia and hypesthesia of the hand and fingers, ischemic pain of the forearm and embolization of the distal arm arteries [2, 6, 7]. In the case of Mittal RL *et al.* [7] has been described compression syndrome involving median and ulnar nerves as well as brachial artery.

The musculotendinous variations, reported here, could be associated with unusual composition of neighboring anatomical structures, including high-division of the brachial artery or rarely high origin of the anterior interosseous nerve branch [10]. For the first time we describe a coexistence of variant high-origin of the PT from a Struthers' ligament and variation in the branches of the musculocutaneous nerve. As an isolated variation, the absence of the musculocutaneous has been rarely reported. During embryological development the brachial plexus appears as a single radicular cone of axons of spinal nerves growing distally to reach the muscles and skin of the upper limb; later these axons divide to form ventral and dorsal divisions. The musculocutaneous derived relatively later from the median nerve [8]. Thus, the absence of the musculocutaneous could be regarded as an incomplete differentiation of the brachial plexus. The reported combined variation in our case could be explained with a very rare coincidence of bone and musculotendinous remnant

(supracondylar process, Struthers' ligament and variant PT) and an incomplete division of the median-musculocutaneous nerves anlage (absence of the musculocutaneous nerve).

Conclusions

Despite present in low-frequency in human, the existence of high humeral attachment of the PT from the supracondylar process and Struthers' ligament should be suspected in patients with symptoms of median nerve and brachial artery compression or ulnar nerve compression alone. Possible clinical manifestations include pain, paresthesia, numbness and circulatory disorders. Moreover, because the median nerve may be accompanied by the lateral antebrachial cutaneous nerve, as described in our case, a possible sensory loss in the lateral antebrachial region could also be assumed.

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