Innervation pattern of the pronator teres muscle

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ABSTRACT

Objectives: To determine the innervation patterns of the pronator teres muscle (PTM), which is used as a donor in muscle transfer.

Methods: This study was conducted from 2001-2006 at the Anatomy Department of the Medical Faculty of Cerrahpasa, University of Istanbul. There were 34 upper extremities of 17 fixed adult cadavers dissected.

Results: The classical pattern of innervation by the superior and inferior branches of the median nerve was observed in 19 of the cases (55.9%). In 4 forearms (11.8%) one branch in 10 (29.4%), 3 branches (2 humeral, 1 ulnar) and in one (2.9%), 4 branches (3 humeral, 1 ulnar) were found to be innervating the muscles.

Conclusion: In all cases, the humeral and ulnar head of the PTM was innervated separately. These variations are of great importance during transfer of PTM.

Saudi Med J 2007; Vol. 28 (6): 838-840

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Received 6th November 2006. Accepted 27th December 2006.

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The pronator teres muscle (PTM) with its humeral and ulnar heads, is the most superficial muscle of the anterior compartment of the forearm. The humeral head, the larger and more superficial one, originates from the medial epicondyle of the humerus and adjacent fascia. The ulnar head is smaller and attaches to the coronoid process of the ulna. The PTM terminates by a common tendon at the *tuberositas pronatoria,* which is on the lateral surface of the radius.[1-4] In classical textbooks, 2 branches innervate the muscle namely, proximal and distal of the median nerve that runs between the 2 heads.[5-8] The first proximal branch of the median nerve usually supplies this muscle. The pronator branches of the median nerve usually take origin from the posterior and medial aspect of the median nerve.[8]

Methods. This anatomical study was carried out on 34 upper extremities of 17 formalin fixed cadavers (14 males and 3 females). From 2001-2006 at the Anatomy Department of the Medical Faculty in Cerrahpasa, University of Istanbul, Turkey, to observe the innervation patterns of PTM. The dissection was performed under loupe magnification (4 x 4). After removal of the skin and subcutaneous tissue, the brachial and antebrachial facies and lacertus fibrosus of the biceps brachii muscle were incised and the median nerve was found in the medial bicipital groove. The superficial muscles of the forearm, namely the pronator teres muscle, flexor carpi radialis muscle, palmaris longus muscle, and the flexor carpi ulnaris muscle, were exposed and retracted medially. Between the 2 heads of the PTM, the distributions of the anterior branches in the median nerve to the muscles were identified.

Results. In all cases, the 34 upper extremities in the PTM were innervated by the median nerve. In 2 forearms, the humeral head of the PTM was innervated by a branch from the anterior interosseous nerve and the ulnar head by a branch from the median nerve (**Figure 1**). The classical pattern of innervation by proximal and distal branches of the median nerve was observed in 19 forearms (55.9%). The innervation of PTM showed variation in 44.1% of our cases; in 4 forearms (11.8%) one branch, which divided after a short distance into 2 branches destined to the ulnar and humeral heads was found in 10 forearms (29.4%), 3 branches were found (2 humeral, one ulnar), and in one (2.9%) 4 branches were found (3 humeral, one ulnar) (**Figures 2-5**).

Discussion. The variability of the innervation patterns in the PTM by the median nerve was observed in 34 forearms. The classical pattern of the median nerve's 2 branches innervating each separately, the

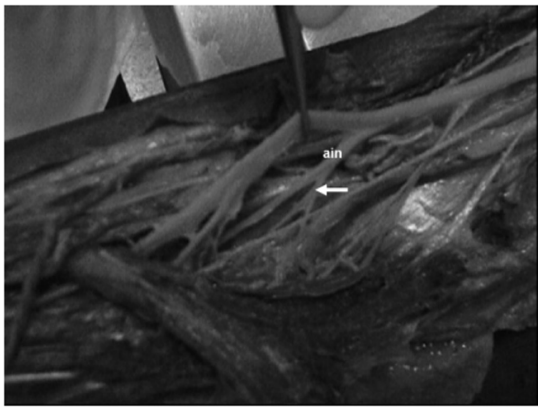

Figure 1 - Innervation of the pronator teres muscle by the anterior interosseous nerve. The arrow shows the humeral branch of the anterior interosseous nerve.

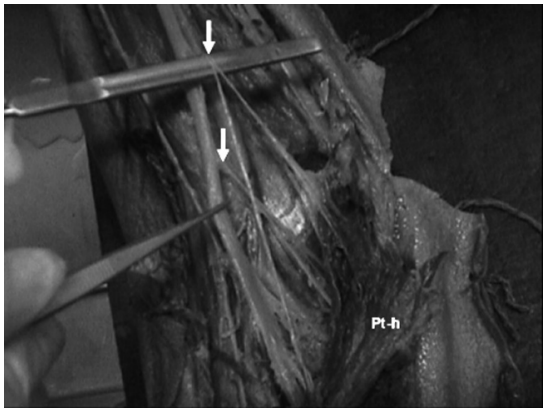

Figure 3 - Innervation of the pronator teres muscle by 2 branches. Pt-h: Humeral head of pronator teres muscle. The arrow shows a branch of median nerve to pronator teres muscle.

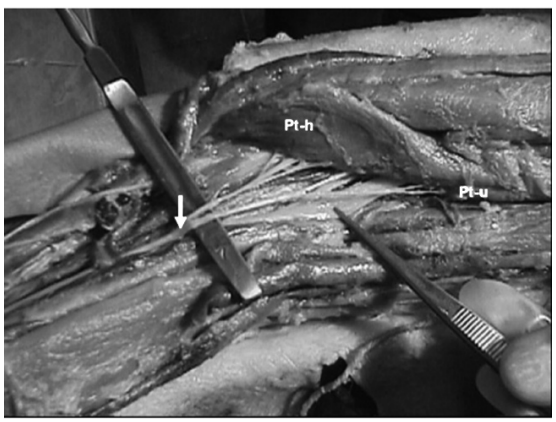

Figure 2 - Innervation of the pronator teres muscle by one branch. The arrow shows a branch of median nerve to pronator teres muscle. Pt-h: Humeral head of pronator teres muscle. Pt-u: Ulnar head of pronator teres muscle.

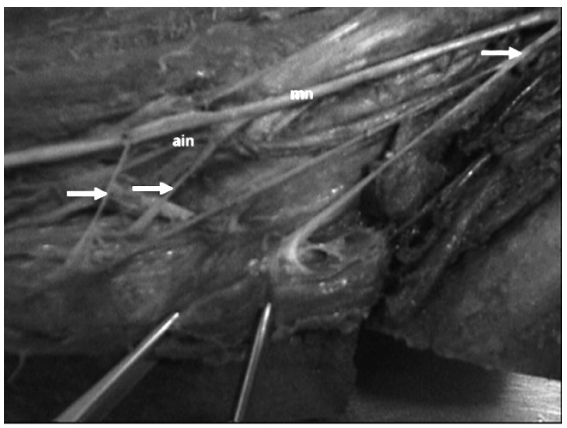

Figure 4 - Innervation of pronator teres muscle by 3 branches; mn: median nerve; ain: anterior interosseous nerve. The arrow shows a branch of median nerve to pronator teres muscle.

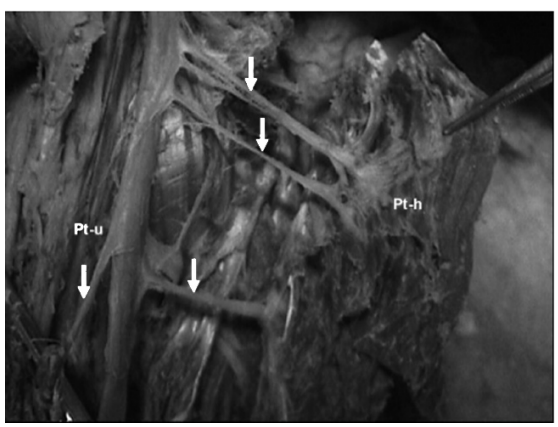

Figure 5 - Innervation of pronator teres muscle by four branches; Pt-h - humeral head of pronator teres muscle. Pt-u - ulnar head of pronator teres muscle. The arrow shows a branch of median nerve to the pronator teres muscle.

PTM bellies was reported by Chantelot et al[9] as 26% (13 out of 50 specimens). In our study, we found this pattern (55.9%) of our cases. Chantelot et al[9] found one branch supplying the PTM in 28 out of 50 specimens and 3 branches in one forearm. Whereas Lepage et al,[10] noticed each pattern equally in 2 out of 30 cases. In our study, one and 3 branches to the PTM occurred in 4 (11.8%), and 10 (29.4%) cases out of 34 forearms. Only in one case, we found 4 (2.9%) branches destined to the PTM. Gunther et al[8] classified in their micro dissection study the branches of the median nerve in 4 groups and reported that branches to the PTM originate from the first branch of the median nerve. Canoves et al,[6] showed in their morphometric study the variability of the median nerve. In the study of Gunther et al,[8] the anterior interosseous nerve from the median nerve supplied in one out of 20 cases the humeral head of the PTM. This pattern was found in our study in 2 forearms out of 34 cases. Also, the effectivity of pronator teres rerouting is controversial,[11,12] there are studies using the pronator teres muscle in upper limb spasticity to repair supination and forearm positioning during use.[13-15] Variations concerning the branching pattern supplying the PTM are of great importance during transfer of the muscle. In the treatment of the spastic upper limb, and selective neurotomy, are methods used nowadays requiring anatomical knowledge of the nerve branches supplying the forearm muscles. Although the innervation pattern of the PTM showed great variability in all cases, the humeral and ulnar heads were supplied separately. Concerning these findings, we think that the 2 heads of the PTM can be transferred each separetely.

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