



A Morphometric Study of Variations in the Innervation of Pronator Teres with its Clinical Implications

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Background: The median nerve innervates the forearm and the hand muscles. Variations in its number of branches to pronator teres are frequently seen. The knowledge of its innervation to pronator teres is of utmost importance in understanding the several presentation of pronator teres syndrome, in investigating the median nerve lesions, to design satisfactory treatment, and to avoid iatrogenic injuries during operations. Hence, the aim of this study was to study the innervation of pronator teres muscle and its variations. **Materials and Methods:** The study was carried out on 24 cadaveric upper limbs. Dissection of the cubital fossa was done and branches of the median nerve to the pronator teres were identified and measured. The elbow articular line (interepicondylar line) was used as a reference point to measure the distance of various branches. **Results:** We found there were 1, 2, 3 and 4 branches in 5 (20.8%), 12 (50%), 5 (20.8%) and 2 (8.3%) specimens out of 24 upper limbs. In one specimen, we also found that musculocutaneous nerve was supplying the pronator teres muscle and that was arising 10.9 cm above the intercondylar line. **Conclusion:** This study will increase the knowledge of the anatomical distribution of nerves to pronator teres and therefore help in the treatment of pronator teres syndrome and in various surgical procedures.

Key words: Pronator teres, median nerve, innervative pattern, interepicondylar line

INTRODUCTION

The median nerve is formed by the combination of the lateral root from the lateral cord and medial root from the medial cord of the brachial plexuses. After its formation, the median nerve reaches at the upper border of pronator teres and then it passes between the two heads of the pronator teres muscle. Classically, the nerve provides medial branches to the pronator teres as it pierces the muscle. Entrapment of the median nerve in the elbow and proximal forearm has been involved as one of the reasons of the pronator syndrome.¹

Entrapment neuropathies are one of the common ailments of peripheral nervous system. Although there are several locations for median nerve entrapment like ligament of struthers, anomalous arteries, and muscles, but the pronator syndrome remains the most common reason for compression neuropathies of median nerve in the forearm.²

The information of innervation pattern of median nerve to pronator teres is of substantial importance in understanding the different presentation of pronator teres syndrome, in investigating

the lesions of median nerve, to plan suitable treatment and to prevent iatrogenic injuries during surgical repairs.²

The branches of median nerve to pronator teres can be considered for neurotization of the radial nerve in the cubital fossa. The pronator teres is used as a donor muscle transplants, so its innervation should be known in detail so as to restore movement of fingers after transplant.²

Hence, the aim of this study was to give detailed anatomical information about the pronator teres muscle innervation.

MATERIALS AND METHODS

Twenty-four forearms (12 right and 12 left) were dissected of formalin fixed South Indian cadavers from the Department of Anatomy, Kasturba Medical College, Manipal. After identification of the median nerve, through the course of the arm, its branches to pronator teres were seen, and they were counted. The branches were measured in reference to the elbow articular line, (determined by the medial and lateral epicondyles of humerus) by a divider and a ruler. Statistical analysis was done for the obtained data.

RESULTS

Number of branches of the median nerve to pronator teres and their level of origin on right and left side are shown in Tables 1 and 2.

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Variations in the innervation of pronator teres muscle

In one specimen of left side, we found that the pronator teres was supplied by musculocutaneous nerve and that nerve was arising 10.9 cm above the intercondylar line and it was running medial to brachial artery all along its length and in the cubital fossa it crosses the artery from above and then goes and supply the pronator teres muscle [Figure 1].

On the right and left side, we got 4 and 3 specimens in which the 1st branch to pronator teres was above the intercondylar line and the mean distance from the intercondylar line was 4.07 and 1.7 cm and range was 1.4-10 cm and 1.2-2.3 cm [Figure 2a].

In 4 and 5 specimens of right and left side, we found that the 2nd branch to pronator teres was arising below the intercondylar line and the mean distance from the intercondylar line was 1.14 and 2.56 cm and range was 0.8-1.4 cm and 2-3 cm [Figure 2b].

We found 5 and 2 specimen on right and left side in whom the 3rd branch to pronator teres was arising below the intercondylar line and their mean distance from the intercondylar line was 1.92 and 0.8 cm and range on right side was 0.4-3.4 cm, but on left side both distances were 0.8 cm [Figure 3a].

In 2 specimens of right side, we found that the 4th branch to pronator teres was below the intercondylar line one was 1.2 cm and other was 2.5 cm from the intercondylar line [Figure 3b].

DISCUSSION

Chantelot *et al.*, Pushpalatha and Jayanti and Demirci *et al.* found 1, 2, and 3 branches of median nerve supplying the pronator teres in 56%, 68% and 11.8%, 26%, 28% and 55.9% and 2%, 4% and 29.4% of cases while in our study we found 1, 2, and 3 branches in 20.8%, 50%, and 20.8% of specimens, in addition we also got 4th branch in 8.3% of cases which they

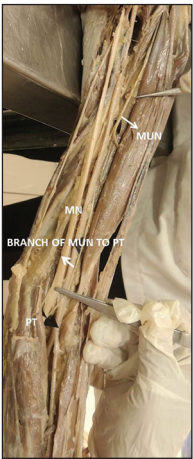


Figure 1. Musculocutaneous nerve supplying the pronator teres muscle

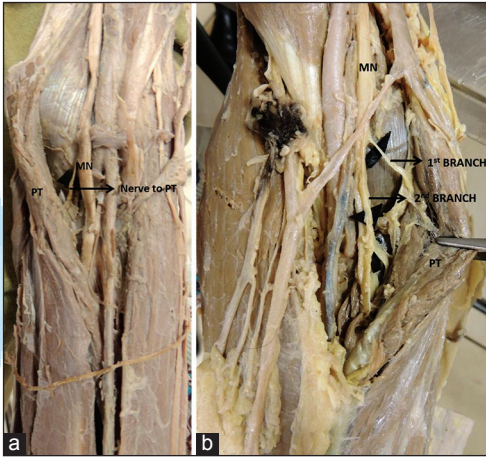


Figure 2. (a) One branch of median nerve supplying pronator teres muscle, (b) Two branches of median nerve supplying pronator teres muscle

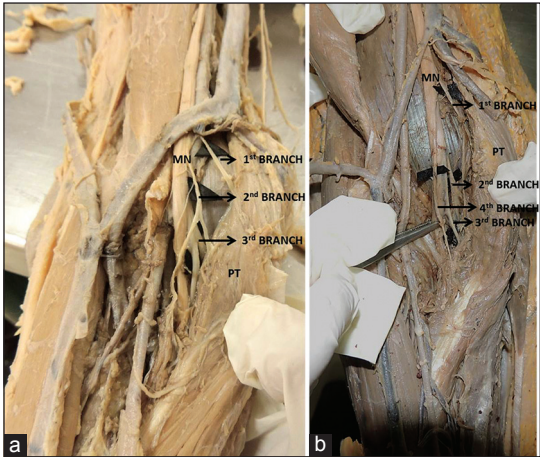


Figure 3. (a) Three branches of median nerve supplying pronator teres muscle, (b) Four branches of median nerve supplying pronator teres muscle

Table 1. Level of origin of branches to pronator teres								
Level of origin	1 st branch		2 nd branch		3 rd branch		4 th branch	
	Right	Left	Right	Left	Right	Left	Right	Left
At the level of intercondylar line	8	9	4	6	—	—	—	—
Above the intercondylar line	4	3	—	—	—	—	—	—
Below the intercondylar line	—	—	4	5	5	2	2	—

Table 2. Number of branches				
Number of branches to pronator teres	1	2	3	4
Right side	4	9	3	2
Left side	1	3	2	—
Total (%)	5 (20.8)	12 (50)	5 (20.8)	2 (8.3)

didn't got. The difference in result may be because of sample size of limbs on which they studied it Chantelot *et al.* and Pushpalatha and Jayanti studied on 50 limbs while Demirci *et al.* had done the study on 34 upper limbs while in our there were only 24 limbs so our sample size was less as compared to theirs.^{1,3,4}

Alves *et al.* also found 1-3 numbers of branches to pronator teres. They found the most proximal origin located 4.9 cm above the elbow articular line, and the most distal origin was 1.6 cm below the line. Bindurani *et al.* found the most proximal origin located 1.31 ± 0.58 cm above the elbow articular line, and the most distal origin was 1.2 ± 1.27 cm below the line while in our study we got the most proximal origin 10 cm above the intercondylar line while the most distal was 3 cm below the intercondylar line. The difference in result may be because of sample size of limbs on which they studied it Alves *et al.* studied only 18 limbs while Bindurani *et al.* had done the study on 50 upper limbs and in our there were 24 limbs.^{2,5}

According to Linell, the main nerve supply to pronator teres muscles was found to arise 1-2 cm below the level of lateral epicondyle.⁶

Tetro and Pichora found that the median nerve gives its first branch to pronator teres from its medial side approximately 1-3 cm proximal to the elbow, while in our study we got the first branch from its medial side, but its distance ranges from 1.2 to 10 cm.⁷

In the present study, we also got one specimen of the left side in which the pronator teres was supplied by the musculocutaneous nerve and that nerve was arising 10.9 cm above the intercondylar line. This was a new finding in our study which no author has found till now. This finding should be kept in mind by the surgeons while doing surgery for nerve entrapments because the even musculocutaneous nerve can gets compressed at many places.

Typical compression syndromes of the median nerve are termed as the pronator syndrome and the anterior interosseous syndrome. The management of the pronator syndrome might be made easier with information of anatomical distribution of nerves.¹

Awareness of variation in length and branches to the pronator teres muscle is of great significance for clinical doctors, orthopedists, and physiotherapists. As this might not only be useful in management and diagnosis, but it will also aid in recovering of lesions and chiefly in situation of surgical interventions in points where those nervous branches are situated.¹

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