

## INNERVATION PATTERN OF PRONATOR TERES MUSCLE AND ITS RELATION TO MEDIAN NERVE: A CADAVERIC STUDY

Channabasanagouda <sup>1</sup>, Manjunath Halagatti \*<sup>2</sup>.

<sup>1</sup> Associate Professor, Department of Anatomy, Koppal Institute of Medical Sciences, Koppal, Karnataka, India.

\*<sup>2</sup> Assistant Professor, Department of Anatomy, Koppal Institute of Medical Sciences, Koppal, Karnataka, India.

### ABSTRACT

**Background:** Pronator teres is one among the superficial muscles of the front of forearm, being supplied by the median nerve, this muscle bears a significant relation with the trunk of the nerve. There are variations in the number of branches to pronator teres and their level of origin.

**Materials and Methods and Observations:** In our study, done on 62 formalin fixed adult cadaveric upper limbs, we have identified 47 pronator teres muscles with one branch of median nerve, 13 muscles with 2 branches and 2 muscles with 3 branches. Out of 62 specimens, 54 had the nerve passing between the two heads of the muscle.

**Conclusion:** Number of branches of median nerve to the pronator teres muscle and their level of origin is of significance for various surgical procedures involving this muscle. Relation of the median nerve to pronator teres muscle is to be analysed for diagnosis of entrapment neuropathies.

**KEY WORDS:** Median Nerve, Pronator Teres, Lateral Epicondyle.

**Address for Correspondence:** Dr. Manjunath Halagatti, Assistant Professor, Department of Anatomy, Koppal Institute of Medical Sciences, Gangavathi Road, Koppal, Karnataka - 583231, India. Phone : 09742094893, **E-Mail:** [drmanjunathhalagatti@gmail.com](mailto:drmanjunathhalagatti@gmail.com)

### Access this Article online

#### Quick Response code



DOI: 10.16965/ijar.2017.258

**Web site:** International Journal of Anatomy and Research  
ISSN 2321-4287  
[www.ijmhr.org/ijar.htm](http://www.ijmhr.org/ijar.htm)

Received: 17 May 2017  
Peer Review: 18 May 2017  
Revised: None

Accepted: 18 Jun 2017  
Published (O): 31 Jul 2017  
Published (P): 31 Jul 2017

### INTRODUCTION

Median nerve is one of the significant branch from the brachial plexus. It is formed by the union of lateral root from the lateral cord and medial root from the medial cord of brachial plexus. It mainly innervates the bulky muscles of anterior compartment of forearm, hence it is called as the labourers nerve. Pronator teres is grouped under the superficial muscles of anterior compartment of forearm, essential for the action of pronation, as its name indicates. It has a humeral and an ulnar head of origin, and it is supplied by the median nerve. The median nerve

bears an important relation with the pronator teres muscle. Usually it passes between the two heads of pronator teres to enter the front of forearm.

Median nerve may be subjected for compression at several narrow passages, most common site of compression being the carpal tunnel. Such entrapments may also occur during its course of entry into the forearm. Some of the factors responsible for its compression being, Struthers ligament, presence of anomalous arteries and abnormal muscles and pronator teres syndrome. Among these, pronator teres is one of common-

est cause of entrapment neuropathies involving the median nerve [1]. Pronator teres muscle has a significant role not only as a muscle for pronation movement, but also as a donor muscle. Hence the relation of median nerve to this muscle and its motor innervation is of special importance for restoring functional ability of fingers after trauma [2].

A branch of median nerve to pronator teres can be considered for neurotization of the radial nerve in the cubital fossa [3]. Pronator teres rerouting is an important surgery to improve both, active supination and dynamic forearm positioning in children with cerebral palsy [4]. Injection of botulinum toxin and selective fascicular neurotomy is used for treatment of spasticity of upper limb [5].

It may be neurotization or treatment of spasticity of upper limb or pronator teres rerouting surgery in cerebral palsy, a precise anatomical knowledge of motor innervation of pronator teres very much needed. Similarly, the relation of pronator teres to median nerve is of significance, so as to avoid confusion between pronator teres syndrome and carpal tunnel syndrome, thus to plan for a better treatment [6].

A better knowledge of pronator teres muscle, its innervation, its relation to median nerve is needed for orthopedic surgeons and neurosurgeons for a better investigation, diagnosis and treatment modalities. A detailed anatomy of number of branches to pronator teres will help in better surgical interventions and thus for a good post operative outcome. This study is aimed at a research on number of branches to pronator teres muscle, the level of origin of these branches from the lateral epicondyle and the relation between median nerve and pronator teres muscle.

### MATERIALS AND METHODS

This study was conducted in 62 formalin fixed upper limbs of adult cadavers irrespective of age and sex. The dissection method was followed according to Cunningham's Manual of practical anatomy, volume one, 15<sup>th</sup> edition. The following points were observed

1. Relation between pronator teres and median nerve.

2. Number of branches of median nerve to pronator teres

3. Level of origin of median nerve branch to pronator teres

### OBSERVATIONS

**Table 1:** Relation between median nerve and pronator teres muscle.

Relation between Median Nerve and Pronator Teres muscle	Number of specimens
Between two heads of pronator teres	54
Deep to the pronator teres	3
Through the Ulnar head of pronator teres	3
Deep to the humeral head, ulnar head being absent	2

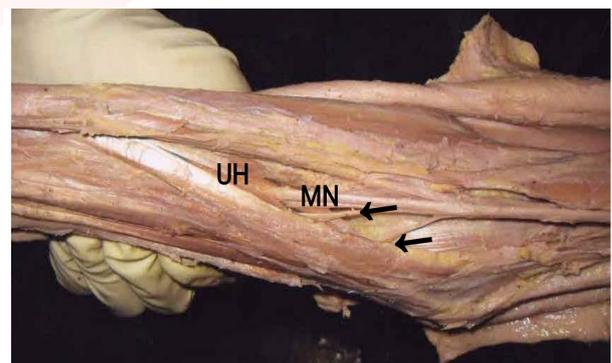
**Table 2:** Number of branches of median nerve to pronator teres.

Number of branches from median nerve	Number of specimens
One	47
Two	13
Three	2

**Table 3:** Level of origin of median nerve branches to pronator teres muscle.

	Level of origin of median nerve branches to pronator teres muscle from the lateral epicondyle			
	<5cm Proximal to interepicondylar line	<5cm Distal to the interepicondylar line	5-10cm distal to the interepicondylar line	>10cm distal to the elbow joint
Pronator teres	33	17	12	0

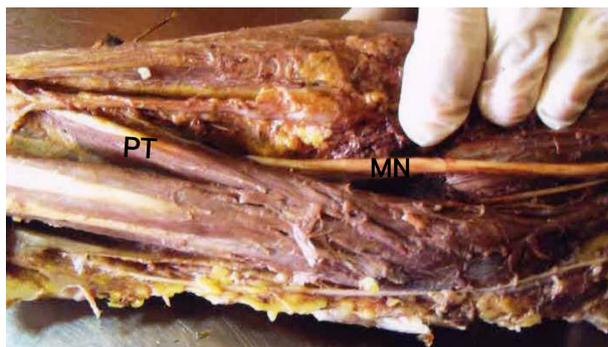
**Fig. 1:** Median nerve (MN) passing through the ulnar head of pronator teres muscle (UH) and pronator teres muscle with 2 branches from median nerve (arrows).



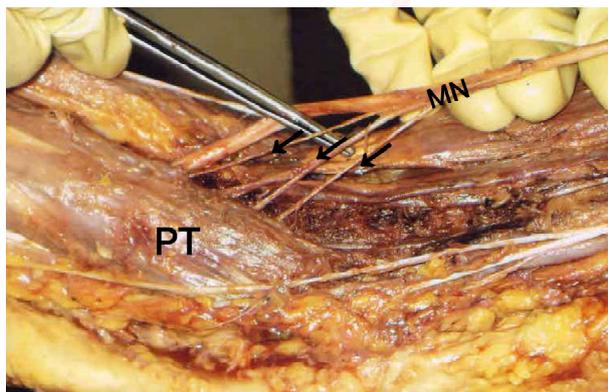
**Fig. 2:** Median Nerve (MN) Passing between Humeral Head (HH) and Ulnar Head (UH) of Pronator teres muscle.



**Fig. 3:** Median Nerve (MN) Passing deep to pronator teres muscle (PT) ulnar head being absent.



**Fig. 4:** Median nerve (MN) giving 3 branches (arrows) to Pronator teres muscle (PT).



## DISCUSSION

Variations are encountered in the innervation pattern of pronator teres muscle and also in its relation to median nerve. Many surgical modalities which involve pronator teres muscle, must be based on the precise information of these possible variations. Various researches have been done on number of branches of median nerve for the pronator teres muscle, which vary from single branch upto 4 branches.

A study of 50 dissected upper limb specimens by Bindurani et al, showed 28 pronator teres muscles with single nerve supply, 18 muscles with 2 nerves and 3 branches for 4 specimens [7]. A similar study by Chantelot in 42 specimens, revealed 1 branch in 28 specimens, 2 branches in 13 specimens and 3 branches in one specimen of pronator teres muscle [8]. Our study was on 62 specimens of pronator teres muscles, irrespective of side. The specimen number in our study is more than that done in previous studies. We have identified 1 branch to pronator teres muscle in 47 specimens. Two branches were observed in 13 pronator teres muscles. Three branches were observed innervating 2 specimens. The results of our study are

almost similar to those by Bindurani et al [7] who did a study on 50 specimens and observed 50 specimens of pronator teres, out of which, 1 branch was found for 34 specimens, 2 branches for 14 specimens, and 3 branches were observed for 2 specimens [9]. Out of 24 specimens of pronator teres studied by Chandini Gupta et al, 5 specimens had 1 branch, 12 specimens had 2 branches, 5 specimens had 3 branches and 2 specimens had 4 branches [10].

In a study by Alves, most proximal branch for the pronator teres from median nerve was located 4cm above the interepicondylar line and most distal was 1cm below the line [11]. Bindurani observed the origin of branch to pronator teres was between  $1.31 \pm 0.58$ cm proximal to interepicondylar line (range 0.5-3cm) and  $1.2 \pm 1.27$ cm distal to the interepicondylar line (0-3.5cm) [7]. In Linel's study, the main nerve supply to pronator teres arose 1-2cm below the level of lateral epicondyle [12]. Branch to pronator teres arises 1-3cm proximal to the elbow from the medial aspect of median nerve [13]. In a study on 20 dissected upper limbs, the mean distance between the origin of branch to pronator teres and medial epicondyle of humerus was 4.1cm [3].

In our study, for 33 pronator teres muscles branch from median nerve arose <5cm proximal to the interepicondylar line, for 17 specimens it was <5cm distal to the interepicondylar line, for 12 specimens it was 5-10cm distal to the interepicondylar line.

There were very few studies carried out on, relation between median nerve and pronator teres muscle. Classically it has been described that median nerve passes between the two heads (superficial and deep) of pronator teres muscle and enters the forearm. Beaton and Anson observed this relation in dissected upper limbs and concluded that 82% cases with median nerve between the two heads of pronator teres, in 9% ulnar head was absent, in 7% nerve was deep to ulnar head and in 2% nerve passed through the humeral head [14]. Whereas Alves observed in his study, majority of specimens with the median nerve between the two heads of pronator teres muscle [11].

In the current study on 62 specimens, in 54 specimens median nerve was between the two heads

of pronator teres muscle, in 3 cases nerve was deep to the muscle, in 3 cases it was passing through the ulnar head and in 2 specimens ulnar head was absent.

## CONCLUSION

Pronator teres is an important muscle not only due to the action it performs but also due to its relation to the median nerve. This relation has got a wide range of significance, being a reason for pronator teres syndrome and also its importance for surgical procedures.

There is variation in number of branches of median nerve which supply the pronator teres muscle and also the level of their origin. This prior knowledge is of need in diagnostic and treatment modalities. Clinicians, physiotherapists, neurosurgeons and orthopedicians can avoid wrong diagnosis and can perform a better surgery with orientation of these variations. Also, number of branches, their level of origin is significant in muscle transfer procedures.

**Conflicts of Interests: None**

## REFERENCES

- [1]. Dellon, A. L. & Mackinnon, S. E. Musculoaponeurotic variations along the course of the median nerve in the proximal forearm. *J. Hand Surg.*, 1987;12b(3):359-63.
- [2]. Canovas F, Moulleron PH, Bonnel F. Biometry of the muscular branches of the median nerve to the forearm. *Clin Anat.* 1998;11:239-245.
- [3]. Tubbs SR, Beckman MJ, Loukas M, Shoja MM, et al. Median nerve branches to the pronator teres: cadaveric study with potential use in neurotization procedures to the radial nerve at the elbow. *Journal of neurosurgery.* 2011;114: 253-255.
- [4]. Bunata ER. Pronator teres rerouting in Children with cerebral palsy. *The journal of hand surgery.* 2006;31 (3):474.e1-474.e11.
- [5]. Lepage D, Parrate B, Talu F, Vuiller F, Monnier G. Extra and intramuscular nerve supply of the muscles of the anterior antebrachial compartment: applications for selective neuroanatomy and for botulinum toxin injections. *Surg Radiol Anat.* 2005;27:420-430.
- [6]. Lister G, *The Hand: Diagnosis and Indications*, Churchill Livingstone, Edinburgh, 1993, pp 283-323.
- [7]. Bindurani MK, Lokesh HM. Study of Muscular branches of median nerve to the pronator teres. *National journal of Clinical Anatomy*, 2013 ;2(2):67-70.
- [8]. Chantelot C, Feugas C, Guillem P, Chapnikoff D, Remy F, Fontaine C. Innervation of the medial epicondylar muscles: an anatomical study in 50 cases. *Surg Radiol Anat.* 1999;21:165-168.
- [9]. Pushpalatha . M, Jayanti.K.S Variations of Number of Branches to the Pronator Teres. *Anatomica Karnataka*, 2011;5(2):43-46.
- [10]. Gupta C, Seva NK, Kalthur GS, D'souza AS. A morphometric study of variations in the innervation of pronator teres with its clinical implications. *2015:J Med Sci*:35(3):97-99.
- [11]. Alves N., Candido P L et al. Innervation of pronator teres muscle. *Int.J. Morphology.*2004;22(3):237-240.
- [12]. Linel EA. The distribution of nerves in the upper limb, with reference to variabilities and their clinical significance. *J Anat* 1921; 55: 79-112.
- [13]. Tetro AM, Pichora DR. High median nerve entrapments. An obscure cause of upper extremity pain. *Hand Clin.* 1996;12(4): 691-703.
- [14]. Beaton, L. E. & Anson, B. J. The relation of the median nerve to the pronator teres muscle. *Anat. Rec.*, 1939;75:23-6.

### How to cite this article:

Channabasanagouda, Manjunath Halagatti. INNERVATION PATTERN OF PRONATOR TERES MUSCLE AND ITS RELATION TO MEDIAN NERVE: A CADAVERIC STUDY. *Int J Anat Res* 2017;5(3.1):4092-4095. DOI: 10.16965/ijar.2017.258