

## Research Article

# Anatomical variation in the formation and course of median nerve: a cadaveric study

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### ABSTRACT

**Background:** Median nerve is one of the terminal branches of brachial plexus. Its formed by the union of medial root and lateral root coming respectively from medial and lateral cords of brachial plexus. Knowledge of anatomical variations of median nerve at origin and course is important in repair of traumatic injuries and surgical correction of brachial plexus injuries. These conditions need dissection of median nerve and knowledge of its variations.

**Methods:** Present study included 53 cadavers and 106 upper limbs from our department of Anatomy. In this study, anatomically embalmed cadavers which were kept for routine dissection for under graduates were included. The present study we studied the anatomical variations in origin and course of median nerve in arm. We also studied the relation of median nerve with axillary and brachial arteries.

**Results:** In this study we found origin of median nerve from 3 roots in 26.41%, 4 roots from 1.88%. Regarding the relation of median nerve with axillary artery we observed in 8.49% cadavers median nerve lies medial to axillary artery and in 0.94% Median nerve is passing along the lateral side of brachial artery without crossing the artery.

**Conclusions:** This study shows high percentage of deviations from normal anatomy in origin of median nerve. Anatomical variation in brachial plexus and adjacent arteries knowledge is important for anatomist, plastic surgeon and vascular surgeons.

**Keywords:** Median nerve, Variations, Origin and course

### INTRODUCTION

The median nerve is formed by the union of median root from the median cord (C8,T1), and lateral root from the lateral cord (C5,C7), of brachial plexus anterior or lateral to the third part of axillary artery.<sup>1</sup>

In the arm the nerve passes at first lateral to brachial artery (near the insertion of coracobrachialis) then cross in front of the brachial artery, descending medial to it in the cubital fossa where it passes posterior to the bicipital aponeurosis anterior to the brachialis.<sup>1</sup> No branches of median nerve are found in the arm. In the forearm, it

passes between the two heads of pronator teres muscle and crosses lateral to the ulnar artery. Median nerve descends after that between flexor digitorum superficialis and flexor digitorum profundus and passes to the palm between the muscle and flexor retinaculum. In the forearm and palm it gives to flexor muscles and sensory branches to lateral 1½ fingers. This course is seen in 82.8% of 1000 dissections.<sup>2-5</sup>

Nerve variations of upper limb are very important in routine surgery during radical neck dissection where these variations are more prone to injury.<sup>6</sup>

## METHODS

In 106 upper limbs of 53 embalmed cadavers from the department of Anatomy, Andhra medical college, Visakhapatnam in the duration of 6 years were studied. During the routine dissection of upper limb for under graduate medical students we found variations in the origin of median nerve and variations in the course of the median nerve in the arm.

## RESULTS

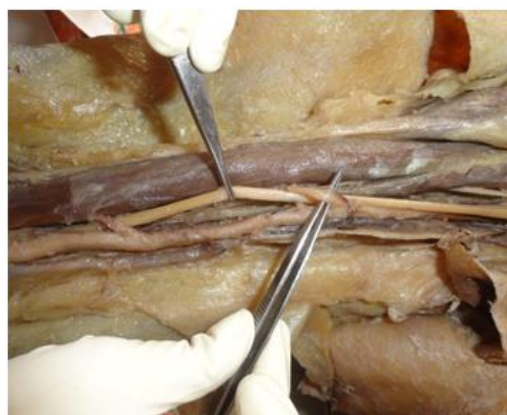
Variations in formation of median nerve were observed in all cadavers. Variations in formation of median nerve includes, trifurcate origin in the formation were found in 26.41% (28/106) (Figure 1), 4 roots taking part in formation were found in 1.88% (2/106) (Figure 4), median nerve formation in the arm medial to axillary artery were seen in 8.49%. Median nerve course varied in 0.94% (1/106) cadavers (Figure 2 & 3). It was not crossing the brachial artery from lateral to medial in the anterior aspect. It courses in the lateral side of brachial artery in the arm up to cubital fossa. We found no other variation in course and branching pattern at forearm and palm level.



**Figure 1: Trifurcate origin of Median nerve.**



**Figure 2: Course of median nerve in arm showing complete lateral to brachial artery without crossing it anteriorly.**



**Figure 3: Course of median nerve in the middle of arm.**



**Figure 4: Four root origin of median nerve.**

## DISCUSSION

Brachial plexus branches as reported by many authors, are associated with several variations which include abnormal origins, varied course and different branching. Median nerve variations include abnormal communication with other nerves such as musculocutaneous and ulnar nerve.<sup>7</sup> Variations in the formation of median nerve were reported by some authors,<sup>8</sup> Casal, Santos et al.<sup>9</sup> reported median nerve formation by 3 roots, 2 roots from lateral cord and 1 root from medial cord. In the present study we observed 16.98% (18/106) upper limbs the third root arise from lateral cord of brachial plexus. Total trifurcation origin cadavers were 26.41% (28/106) origin of median nerve four roots were observed in 1.88% (2/106), two from lateral cord and two from median cord.

Nayak, Samuel and Somayaji (2006) observed a case of median nerve in which was formed just below the midpoint of the arm.<sup>10</sup> In the present study, it has been observed the formation of median nerve in the arm in 8.49% cadavers. Median nerve is closely related to the brachial artery in proximal region, the median nerve is immediately lateral to the brachial artery. Median nerve crosses the artery in the anterior aspect to the medial side.

In the present study median nerve does not cross the brachial artery. It lies lateral to the brachial artery from the lower border of axilla to the cubital fossa. This is seen in 0.94% cadavers. The anomalies in the formation of nerves of the upper limbs have been described by several authors. Badawoud showed 4 types of anomalies in the median nerve formation found in 48 upper extremities of 24 cadavers. The found anomalies comprised of communicating branches between lateral and medial roots of median nerve, a communicating branch between lateral root of median nerve and the medial cord of brachial plexus, communicating branches between lateral root of median nerve and musculocutaneous nerve, unusual long roots of median nerve.<sup>10</sup> Suruchi showed an anomalous course of right median nerve occurring medial to the axillary artery and having 2 communicating branches with musculo cutaneous nerve.<sup>11</sup> This variation can be explained embryologically. The upper limb bud lies opposite to lower fifth cervical and upper second thoracic segments. As soon as the buds form, the ventral primary rami of spinal nerves penetrate into the mesenchymal limb bud and established intimate contact with mesodermal condensation. The variation could arise from circulatory factors at the time of fusion of brachial plexus cord. Once formed, any developmental difference would obviously present postnatally.<sup>12</sup>

## CONCLUSION

Most knowledge of anatomical variation is of interest to anatomist and surgeon. Anatomical variations are significant during exploration of axilla and arm surgeries involving neoplasms and other vascular masses. Brachial plexus anomalies are particularly interested in the field of plastic surgeons and vascular surgeons.

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