

# Variations in the formation of the median nerve and its clinical correlation

V. Budhiraja, R. Rastogi, A.K. Asthana

Department of Anatomy, Subharti Medical College, Meerut (U.P.), India

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*Variations in the formation of the median nerve are of interest to anatomists, radiologists, and surgeons. These variations may be vulnerable to damage in surgical operations, but their knowledge also helps in the interpretation of a nervous compression having unexplained clinical symptoms. We studied the variation in the formation of the median nerve in 87 cadavers, i.e. 174 upper limbs of formalin preserved cadavers at the department of Anatomy, Subharti medical college. We observed an additional root taking part in the formation of the median nerve in 26.4% of upper limbs, unusual low formation of the median nerve in the arm in front of the brachial artery in 18.4% of upper limbs, and median nerve formation medial to the axillary artery in 10.3% of upper limbs. Knowledge of such anatomical variations is of interest to the anatomist and clinician alike. Surgeons who perform procedures involving neoplasm or trauma repair need to be aware of these variations. (Folia Morphol 2012; 71, 1: 28–30)*

**Key words:** anatomical variations, cadaver, median nerve

## INTRODUCTION

The median nerve is formed lateral to the third part of the axillary artery by the union of the lateral and medial roots originating from the lateral and medial cords of the brachial plexus. It passes into the arm anterior to the brachial artery [12]. Anatomical variations of the median nerve have been described in humans by many authors although such variations have not been extensively catalogued [13, 19]. The variations of the median nerve are of interest to anatomists, radiologists, and surgeons. These variations may be vulnerable to damage in surgical operations, but their knowledge also helps in the interpretation of a nervous compression having unexplained clinical symptoms.

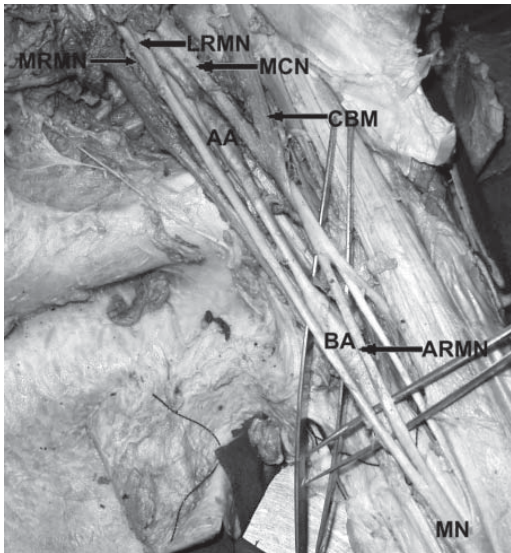
## MATERIAL AND METHODS

Eighty-seven formaline-fixed cadavers (72 male and 15 female), i.e. 174 upper limbs, constituted the material for the study. The specimens were 50–75 years

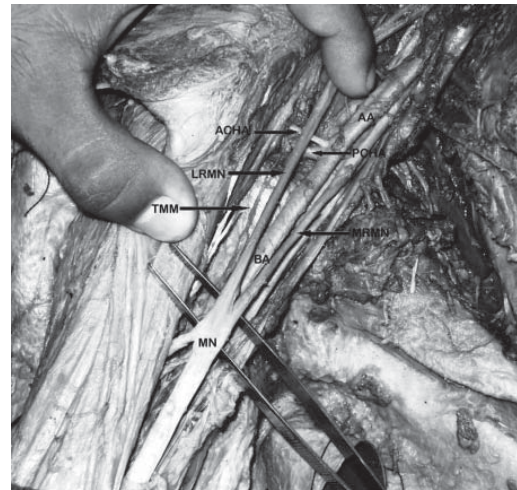
old. Dissection of the extremities was carried out during undergraduate dissection classes in the department of anatomy of Subharti Medical College and the formation of median nerve was observed.

## RESULTS

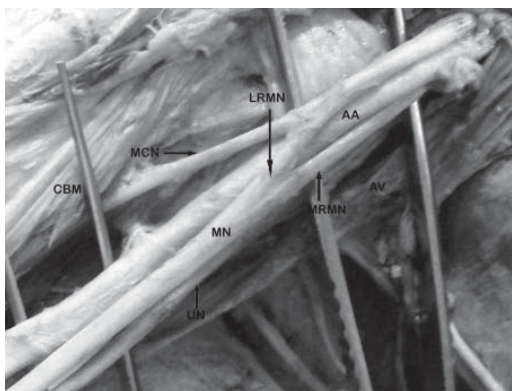
Variations in the formation of the median nerve included an additional root taking part in the formation in 26.4% of (46/174) upper limbs (Fig. 1). The additional root arose from the lateral cord in 16.1% (28/174) of upper limbs, from the musculocutaneous nerve in 8.0% (14/174) of upper limbs, and two additional roots, one arising from the lateral cord and another from the musculocutaneous nerve, in 2.3% (4/174) of upper limbs. An unusual low formation of the median nerve in the arm in front of the brachial artery (Fig. 2) was observed in 18.4% (32/174) of upper limbs, and formation of the median nerve medial to the axillary artery (Fig. 3) in 10.3% (18/174) of upper limbs.



**Figure 1.** Median nerve formation by three roots; AA — axillary artery; ARMN — additional root of median nerve; BA — brachial artery; CBM — coracobrachialis muscle; LRMN — lateral root of median nerve; MCN — musculocutaneous nerve; MN — median nerve; MRMN — medial root of median nerve.



**Figure 2.** Median nerve formation in the arm in front of the brachial artery; AA — axillary artery; ACHA — anterior circumflex humeral artery; BA — brachial artery; LRMN — lateral root of median nerve; MN — median nerve; MRMN — medial root of median nerve; PCHA — posterior circumflex humeral artery; TMM — teres major muscle.



**Figure 3.** Median nerve formation medial to axillary artery; AA — axillary artery; AV — axillary vein; CBM — coracobrachialis muscle; LC — lateral cord; LRMN — lateral root of median nerve; MCN — musculocutaneous nerve; MN — median nerve; MRMN — medial root of median nerve; UN — ulnar nerve.

## DISCUSSION

The brachial plexus appears as a single radicular cone in the upper limb bud. The cone divides longitudinally into dorsal (which gives rise to the radial and axillary nerve) and ventral (which gives rise to median and ulnar nerve) divisions [2]. As the embryonic somites migrate to form the extremities, they bring their own nerve supply, so that each myotome retains its original segmental innervations. The cords of the brachial plexus are normally seen in relation to the seventh cervical segmental artery, which gives origin to the axillary artery that passes between the lateral and medial cords. Some-

time the subclavian-axillary stem is derived from the sixth or eighth segmental arteries, and then it has an abnormal relation to the cords of the brachial plexus [6]. The variations in the formation, location, and course of the median nerve with their communicating branches may be due to an abnormal embryological relation between the cords of the brachial plexus and the cervical segmental branches of the dorsal aorta [8].

Variations in the formation of the median nerve were reported earlier by some authors [1, 17]. Uzun and Seeling [18] described a case in which the median nerve was formed by the fusion of four branches, three of them coming from the lateral cord and one from medial cord; on the other hand Jafari et al. [7] observed a case of a bilateral additional root forming the median nerve. The additional root came from the lateral cord of the brachial plexus on both sides. Ramachandran et al. [11] also found three roots forming the median nerve, but the third root came from the musculocutaneous nerve. In another case Das and Paul [4] reported the formation of the median nerve by three roots: two of them coming from the lateral cord and one from the medial cord. The first root coming from the lateral cord crossed the axillary artery from lateral to medial to join with the medial root to form the median nerve, which then crossed the axillary artery from medial to lateral to join with the second root of the lateral cord lateral to the third part of the axillary artery. In the present study, the additional root came from the

lateral cord in 14.9% (28/174) of cases and from the musculocutaneous nerve in 8.0% (14/174) of cases, but in 2.3% (4/174) of cases the two additional roots came one from the lateral cord and the other from the musculocutaneous nerve.

The median nerve usually formed in the axilla. Nayak et al. [9] observed a case where the median nerve was formed just below the midpoint of the arm. The medial and lateral roots of the median nerve and lateral cord were very long and the median nerve was formed just medial to the brachial artery. Satyanarayana et al. [14] reported a case of median nerve formation by medial root and lateral root (coming from the medial and lateral cords, respectively) proximal to the insertion of the coracobrachialis muscle; both the roots were lateral to the third part of the axillary artery. In the present study we also observed low formation of the median nerve in 18.4% (32/174) of cases, where the medial and lateral roots were very long and joined in front of the brachial artery to form the median nerve. Such cases of low origin of median nerve might lead to confusion in surgical procedures and nerve block anaesthesia.

Normally, median nerve formation occurs lateral to the third part of the axillary artery as the medial root crosses the axillary artery anteriorly to join with the lateral root. Haviarova et al. [5] reported a case in which the median nerve was formed posterior to the axillary artery; however, Chitra [3], Satyanarayana et al. [15], and Singhal et al. [16] observed cases in which the median nerve was formed medial to the axillary artery. Pandey and Shukla [10] reported median nerve formation medial to the third part of the axillary artery in 4.7% of cases. In these cases the lateral root crossed the axillary artery anteriorly to join with the medial root lying medial to the axillary artery. In the present study, in 10.3% of upper limbs the median nerve formed medially to third part of the axillary artery (the lateral root crossed the axillary artery from lateral to medial). Knowledge of such variations has clinical importance especially in posttraumatic evaluations and peripheral nerve repair.

## CONCLUSIONS

Knowledge of such anatomical variations is of interest to the anatomist and clinician alike. Variations assume significance during surgical exploration of the axilla and can even cause failure of nerve block of the infraclavicular part of the brachial plexus. Surgeons who perform procedures involving neoplasm or trauma repair need to be aware of these variations.

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