

Is Variation in the Formation of Median Nerve Common?

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ABSTRACT

Anatomical variations of median nerve are frequent. Anomalies of the brachial plexus and its terminal branches are also common. The aim of this work was to study the variations of the median nerve in the axilla. 50 preserved human cadavers (100 upper limbs), ranging in age from 30 to 67 years, were dissected in pursuit of this aim. Variation in the formation of median nerve was found in 6% cadavers. In three cadavers median nerve was formed by more than two roots and the formation of median nerve was different in each case. These variations can be explained in the light of their embryogenic development. Injury to a variant nerve in the proximal arm may lead to a galaxy of manifestations including sensory, motor, vasomotor and trophic changes. Hence it is important to keep such variations in mind while attempting surgery for breast malignancy or axillary dissection.

Keywords: Median nerve, variations, formation of median nerve

INTRODUCTION

Variations of median nerve have clinical importance especially in post-traumatic evaluations and exploratory interventions of the arm for peripheral nerve repair and to some extent during flap dissections.¹ The Median nerve (C 5, 6, 7, 8, T1) is formed in the axilla by one root each



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from the medial cord and lateral cord of the brachial plexus.² Generally the medial root joins with the lateral root after crossing the front of the third part of the axillary artery. Median nerve enters the arm at first lateral to brachial artery, and near the insertion of coracobrachialis it crosses in front of the artery descending medial to it in the cubital fossa without receiving any branch. It supplies most of the flexor muscles in the anterior aspect of the forearm along with muscles of thenar eminence and lateral two lumbricals.³ Knowledge of variable anatomy of the nerve could help to avoid iatrogenic injuries during surgery, e.g. in radical neck dissection, surgery in breast malignancy or axillary dissection. Sometimes a variant root (course/origin) may compress the blood vessels in the axilla, leading to diminished blood supply. This study deals with the formative variations of median nerve.

MATERIAL AND METHODS

This study was carried out in Department of Anatomy, Jawaharlal Nehru Medical College, Sawangi Wardha, Maharashtra. Proper dissection of formalized 100 upper limbs (50 cadavers) were carried out using regular dissection kit with the help of standard dissection manual over a period of two years. Formation of the median nerve was studied and the variations were noted carefully, sketched and photographed accordingly.

Results were compared with normal standard origin, courses and branches of Median Nerve (MN) as stated in the Gray's Anatomy. Variations were calculated in percentage with reference to total numbers of observations.

OBSERVATION

The median nerve was studied in the axilla with regard to its existence and origin. Median nerve was present in all cadavers (100%). The median nerve took origin in the axilla by union of medial and lateral roots from medial and lateral cords of brachial plexus respectively in 47 cadavers (97 upper limbs). In two upper limbs it was formed by union of three roots and in one upper limb by four roots. Observations are depicted in table 1. We observed that three cadavers the median nerve was formed by more than two roots and the formation of median nerve was different in each case.

Where median nerve was formed by three roots, two roots originated from lateral cord and one root from medial cord of the brachial plexus [Fig. 1(a) and (b)].

Table 1: Formation of median nerve

Particulars	Normal	Variations
Formation	47 (97 upper limbs)	3 cadavers (3 upper limbs)
Percentage	94%	6%

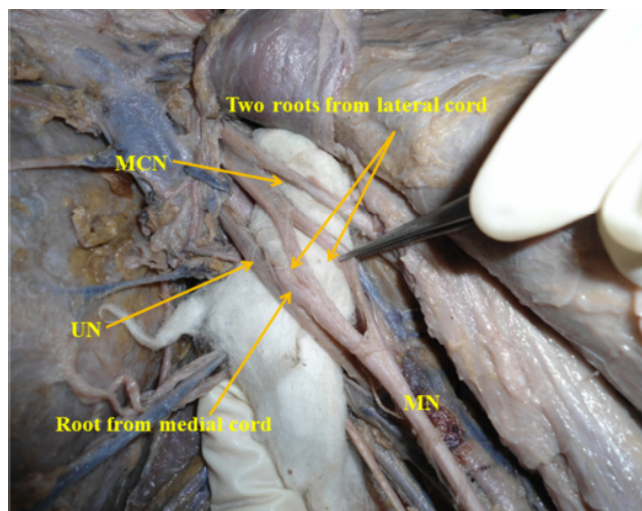


Figure 1 (a): Formation of median nerve by three roots

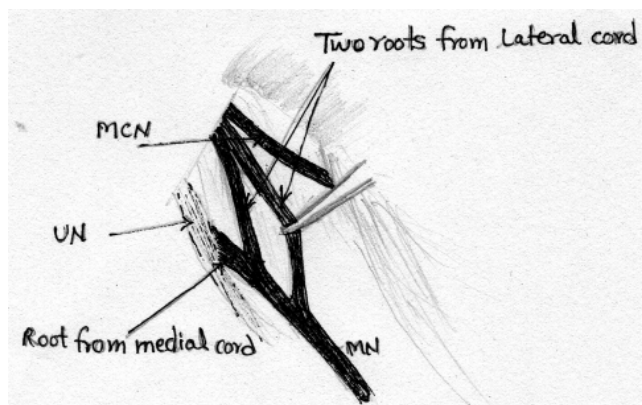


Figure 1(b): Schematic representation of left axilla showing formation of median by three roots (MN- Median nerve, MCN- Musculocutaneous nerve, UN- Ulnar nerve)

In the second case where median nerve was formed by three roots, one root originated from lateral cord, second from medial cord and third from musculocutaneous nerve [Fig. 2(a) and (b)].

Where median nerve was formed by four roots, three roots originated from the lateral cord and one from medial cord [Fig. 3(a) and (b)].

DISCUSSION

Median nerve is among the peripheral nerves whose existence is almost universal and so in the present study it was present in all 50 cadavers (100%). Median nerve as reported in literature is associated with several variations which include abnormal communications with other nerves

Table 2: Formation of median nerve as per observations of other authors

Authors	2 roots	3 roots	4 roots
Badawod ¹⁵	43/48(89.6%)	4/48(8.3%)	1/48(2%)
Budhiraja <i>et al.</i> ¹⁶	145/196(73.9%)	44/196(22.4%)	7/196(3.6%)
Present study	97/100(97%)	2/100(2%)	1/100(1%)

such as musculocutaneous and ulnar nerves,⁴ splitting of the median nerve⁵ and unusual innervations of flexor muscles of arm by the median nerve.⁶ Present study deals with the anatomy of median nerve in the axilla and we have found variations in its formation. Variations in the formation of median nerve were observed in three cases (6%). The formation of median nerve is different in each case.

In one right upper limb median nerve was formed by fusion of three roots; two of them coming from lateral cord and one from medial cord (Fig. 1). Variation in the formation of median nerve had been reported earlier by few authors.⁷⁻⁹ Eglseder and Goldman¹⁰ found that the median nerve was formed of two lateral roots in 14% of their specimens. Uzun and Bilgic¹¹ reported 3% variation in origin of median nerve which is similar to our series where it is found in 2% specimen.

In our second case median nerve was formed by union of three roots, two from normal medial and lateral cords and

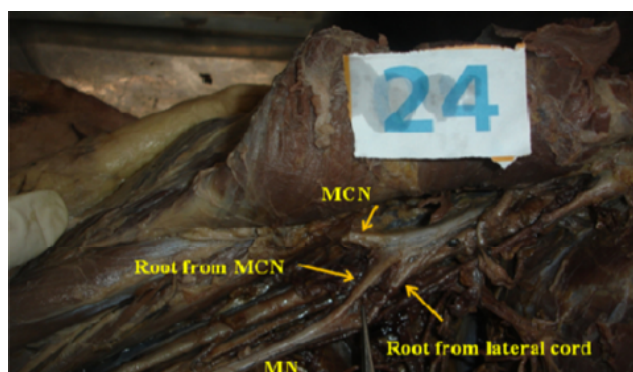


Figure 2 (a): Formation of median nerve by three roots

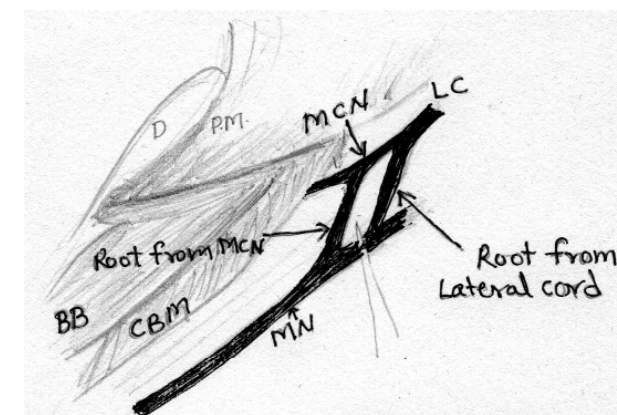


Figure 2(b): Schematic representation of right axilla showing formation of MN by three roots (MN- Median nerve, MCN- Musculocutaneous nerve)

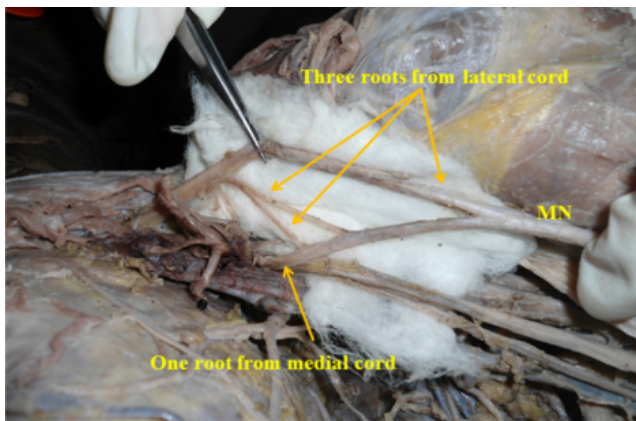


Figure 3 (a): Formation of median nerve by four roots

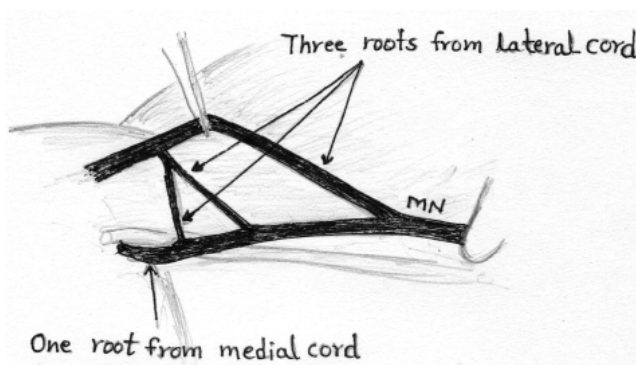


Figure 3 (b): Schematic representation of left axilla showing formation of median nerve by four roots (MN- Median nerve)

one from musculocutaneous nerve. In previous literature the most frequent variation is the presence of a communicating branch from the musculocutaneous nerve which goes distally to join the median nerve in the lower third of arm¹². If this branch is given off in upper third of the arm, it is generally considered as third (double lateral) root of the median nerve.¹³

In third case median nerve had four roots and musculocutaneous nerve was absent, 3 roots originated from lateral cord and one from medial cord (Fig. 3). Uzun & Seelig¹⁴ and Satyanarayana & Guha⁸ reported formation of median nerve by four roots (three lateral and one medial root) and similar variation was observed earlier by different authors also⁴.

In the present study percentage of variant formation of median nerve was less. However the variations related to formation of the median nerve by more than two roots which have been observed in present study are rare as revealed by survey of literature. These variations can be explained in the light of embryogenic development. Over the years, two principal theories have emerged concerning the directional growth of nerve fibres – the neurotropism or chemotropism hypothesis and the principle of contact-guidance of Weiss.¹⁷ Over or under expression of one or multiple transcription factors have been found to be responsible for

the variations in the formation, relation and distribution of the motor nerve fibers.¹⁸ The variations as noted in the present study may be attributed to misexpression of one or more transcription factors. Injury to such a variant nerve in the proximal arm may lead to a galaxy of manifestation including sensory, motor, vasomotor and trophic changes.⁷ Awareness of the normal and variant patterns of the brachial plexus branches might be of great importance to the medical specialists particularly anatomists, surgeons, neurologists, orthopaedicians, radiologist, anaesthetist and traumatologists as these may give rise to variable clinical picture depending upon the type of variation present.

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