

# Study of variant relations of median nerve to axillary and brachial artery

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## Abstract

**Background:** The knowledge of anatomical variations in the formation, course and relations of median nerve with nearby structures is important in surgical procedures to avoid injury to either nerve or its nearby structure. **Aim and Objective:** To know variations in course and relation of median nerve with Axillary and Brachial artery. **Material and Methods:** The study was carried out at department of Anatomy, Bharati Vidyapeeth (Deemed to be university) Medical College, Sangli on 100 formalin fixed specimens of upper limb from 50 adult human cadavers (irrespective of sex and age 25-70 years). After careful dissection, relations of median nerve with axillary and brachial artery and course of median nerve in arm were noted and recorded. Data was analyzed by Microsoft excel analysis. **Observations and Results:** In 90% specimens, Median nerve formation commonly occurred in Axilla or upper third of arm whereas in 10% specimens it was formed in relation to brachial artery. In 64 out of 90 specimens median nerve was formed anterior to axillary artery. Median nerve coursed lateral to brachial artery and then crossed it medially in 81 specimens while in 19 it was medial throughout its course in arm. **Conclusion:** Different anatomical variations of relation and course of median nerve to axillary and brachial artery can be of use to plastic, orthopedic and vascular surgeons

**Key Word:** Median nerve, variations, abnormal relations, course

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## INTRODUCTION

The median nerve has two roots from the lateral (C5, 6, 7) and medial (C8, T1) cords, which embrace the third part of the axillary artery, and unite anterior or lateral to it. After formation in arm, it courses lateral to the brachial artery. Near the insertion of coracobrachialis it crosses in front of (rarely behind) the artery, descending medial to it to the cubital fossa where it is posterior to the bicipital aponeurosis and anterior to brachialis.<sup>1</sup> Median nerve is

one of the nerves that has been studied extensively and reported for its different variations. Variations of the nerves of the upper limb may have clinical implications, so it is important to report them during cadaveric dissection.<sup>2</sup> Several variations associated with median nerve include additional roots taking part in formation, abnormal communications with other nerves such as musculocutaneous and ulnar nerves, variations in relation and course etc. The key to carry out therapeutic and diagnostic procedures successfully, on upper limbs depends on the knowledge of the possible variations of nerves and arteries which may be encountered. Such neurovascular variations are not only more prone to iatrogenic injuries but they interfere in the correct interpretation of clinical conditions as well. Some of the complications that have been reported include injuries to nerves, arteries and wrong diagnosis.<sup>3</sup> Thus documentation and descriptions of nerve variations are useful in clinical and surgical practices since an anatomical variation can be the cause of a nerve palsy syndrome due to different relation of a nerve, related muscles and structures.

## OBJECTIVES

To know variations in course and relation of median nerve with Axillary artery and Brachial artery

## MATERIALS AND METHODS

The study was carried out after obtaining approval from IEC.

**Study place:** Bharati Vidyapeeth (Deemed to be university) Medical College and Hospital, Sangli and Government Medical College, Miraj (Western Maharashtra).

**Study material:** 100 specimens of upper limb from 50 adult human cadavers (irrespective of sex and age 25-70 years) fixed in 10% formalin solution.

**Study design:** It was descriptive and observational study.

**Type of study:** It was cadaveric, observational study

**Inclusion Criteria:** 100 cadaveric (50 right, 50 left) upper limb specimens fixed in 10% formalin irrespective of sex (age 25-70).

**Exclusion Criteria:** Damaged or incomplete upper limbs specimens.

**Study duration:** Over a period of two years (2016 and 2017) .100 upper limb specimens belonging to 50 cadavers (irrespective of sex and age 25-70 years) fixed in 10% formalin solution were dissected. The specimens were labeled from 1 to 50 with letters R or L denoting the right or left side of upper limb. Meticulous dissection was carried out according to Cunningham’s dissection manual (15<sup>th</sup> edition).<sup>4</sup> in Axilla and Arm to know the formation of median nerve. The level of formation of median nerve was decided by measuring arm length (tip of coracoids process to lateral epicondyle) with the help of measuring tape and then it was divided in to upper third, middle third and lower third. After dissection, relations of median nerve with Axillary artery and Brachial artery were noted. The most representative specimens were photographed with Nikon COOLPIX L23 camera. All the data was recorded and then analyzed with Microsoft excel analysis.

## OBSERVATIONS RESULTS

**Table 1:** Formation of Median Nerve in Relation to Axillary Artery (AA)

Formation of median nerve in relation to axillary artery	Number of specimens		
	Rt 50	Lt 50	Total 100
Anterior	32(64%)	32(64%)	64(64%)
Lateral	04(8%)	05(10%)	09(9%)
Medial	07(14%)	07(14%)	14(14%)
Posterior	02(4%)	01(2%)	03(3%)

In 90% specimens median nerve was formed in axilla and upper third of arm in relation to axillary artery and in 10% specimens it was formed in middle or lower third of arm in relation to brachial artery. According to the text book literature, the most common relation is formation of median nerve is lateral to axillary artery. In the present study the most common type of formation of median nerve was anterior to axillary artery in 64 (Unilateral-10 Bilateral-27) of total specimens (32 right and 32 left). (photograph 1) Formation of median nerve was observed medial to axillary artery in 14 specimens (Unilateral-6 Bilateral-4) (7 right and 7 left), lateral to axillary artery in 9 specimens (Unilateral-3 Bilateral-3) (4 right and 5 left) and posterior to axillary artery was in 3 specimens (Unilateral) (2 right and 1 left). (photograph 2,3 and 4)

**Table 2:** Formation of Median Nerve in Relation to Brachial Artery

Formation of median nerve in relation to brachial artery	Number of specimens		
	Rt 50	Lt 50	Total 100
Lateral	02 (4%)	03 (6%)	05 (5%)
Medial	02 (4%)	03 (6%)	05 (5%)

Formation of median nerve was observed lateral to brachial artery in 5% of total specimen (2 right and 3 left). (photograph 5) and was medial to brachial artery in 5% of total specimen (2 right and 3 left). (photograph 7)

**Table 3:** course of median nerve in Relation to brachial artery in arm

Course of median nerve	Number of specimens		
	Rt 50	Lt 50	Total 100
Lateral to brachial artery and crossed to medial side	41 (82%)	40 (80%)	81 (81%)
Medial to brachial artery throughout the arm	9 (18%)	10 (20%)	19 (19%)

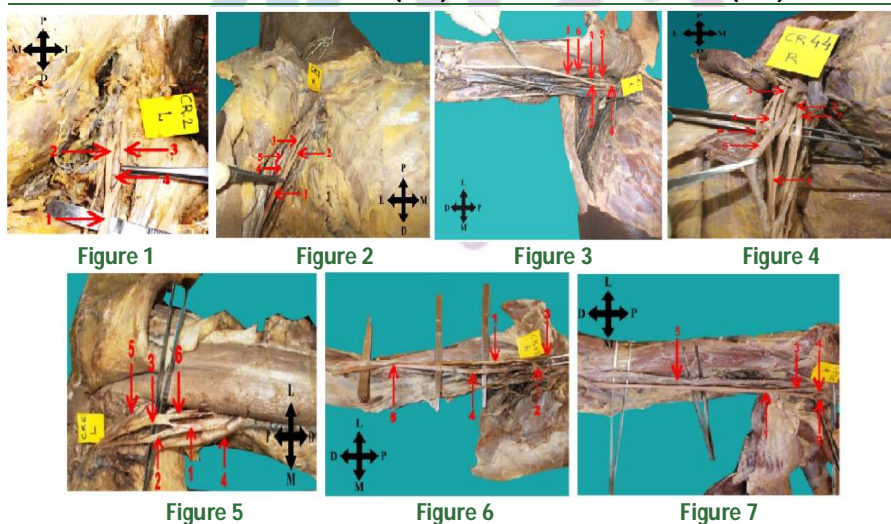
In 81 specimens (Unilateral-7 Bilateral-37) (41 right and 40 left) the median nerve was lateral to the brachial artery in upper part of arm and then crossed the brachial artery from front (at the level of insertion of coracobrachialis muscle) and then coursed medially. (photograph 6) In 19 specimens (Unilateral-11 Bilateral-4) median nerve was running medial to the artery throughout the course till it reached the cubital fossa. This pattern was observed in 9 out of 50 specimens on right side and in 10 out of 50 specimens on left side. (photograph 7) Out of 19 of total specimens, in 14 specimens median nerve was formed in axilla (in relation to axillary artery) and coursed medially throughout whereas in 5 specimens it was formed in relation to brachial artery

**Table 4: Formation of Median Nerve in Relation to Axillary Artery**

Investigators	Lateral to axillary artery	Anterior to axillary artery	Medial to axillary artery	Posterior to axillary artery
Budhiraja V <sup>5</sup> (2011)	-	03 (1.53%)	12 (6.12%)	-
Chanabasangauda <sup>3</sup> (2013)	42 (84%)	05 (10%)	03 (6%)	-
Ashraf Y Nasr <sup>6</sup> (2012)	46 (76.7%)	05 (8.3%)	04 (6.7%)	01 (1.7%)
C.N. Mat Taib <sup>7</sup> (2016)	(Lateral+ Anterior) 36 (81.8%)		04 (9.09%)	04 (9.09%)
Samarawickrama M.B <sup>8</sup> (2017)	(Lateral+ Anterior) 80 (81.63%)		-	1 (1.2%)
<b>Present Study</b>	<b>09 (9%)</b>	<b>64 (64%)</b>	<b>14 (14%)</b>	<b>03 (3%)</b>

**Table 5: Course of Median Nerve in Relation to Brachial Artery in Arm**

Investigators	Lateral to brachial artery and crossed to medial side	Medial to brachial artery throughout the arm
Chanabasangauda <sup>3</sup> (2013)	47 (94%)	03 (6%)
<b>Present Study</b>	<b>81 (81%)</b>	<b>19 (19%)</b>



**Figure 1:** Showing formation of Median Nerve in axilla with 2 roots anterior to Axillary Artery: Median Nerve (1), Medial Root (2), Lateral Root (3), Axillary Artery (4), **Figure 2:** Showing formation of Median Nerve in axilla with 2 roots medial to Axillary Artery: MN (1), MR (2), LR (3), AA (4), MCN (5), **Figure 3:** Showing formation of Median Nerve by 2 roots in upper third of arm lateral to Axillary Artery: Median Nerve (1), Medial Root (2), Lateral Root (3), Axillary Artery (4), Musculocutaneous nerve (5), Coracobrachialis (6), **Figure 4:** Showing formation of MN by 3 roots in Axilla posterior to AA: MN (1), MR (2), LR (3), Second LR (4), AA (5), MCN (6), UN (7), **Figure 5:** Showing formation of MN by 2 roots in middle third of arm lateral to BA: MN (1), MR (2), LR (3), BA (4), MCN (5), Muscular branch from lateral root to BB and coracobrachialis (6), **Figure 6:** Showing course of MN Lateral to BA then crossed medially: MN (1), MR (2), LR (3), BA (4), Site of crossing of MN from lateral to medial side (5), **Figure 7:** Showing course of MN medial to BA throughout the arm: MN (1) MR (2) LR (3), Single interconnecting branch between 2 roots of MN (4), BA (5)

## DISCUSSION

The relation of formation of median nerve to axillary artery could be lateral, anterior, medial and posterior. The most common pattern of formation of median nerve as described by many authors was lateral to the axillary artery and the incidence ranged between 76.7% to 81.8%. The next common pattern found was anterior to axillary artery. The results of present study were contrary to previous researchers; the most common pattern of formation of median nerve was anterior to axillary artery (64%). Next common was medial to artery (14%). Knowledge of such variations in relation to axillary artery has clinical importance especially in post traumatic evaluations and peripheral nerve repair.<sup>5</sup>

**Formation of Median Nerve in Relation to Brachial Artery:** As the median nerve forms in middle third or lower third of arm it directly comes in relation to brachial artery rather than axillary artery. Hence in present study we noted the formation of median nerve in relation to brachial artery. We noted formation of median nerve lateral to brachial artery in 5% of total specimen (2 right and 3 left) and medial to brachial artery in 5% of total specimen (2 right and 3 left). Researchers like Lakshmi Kumari K<sup>9</sup> and Jamuna Meenakshisundaram<sup>10</sup> had mentioned the formation of median nerve at lower level like middle third or lower third of arm but authors have not mentioned the formation with relation to brachial artery. Such knowledge of variations in the formation of median nerve in terms of number of roots and level of formation and its relation with axillary or brachial artery is important for surgeons who perform the procedures involving neoplasms or repairing trauma.

## CONCLUSION

Knowledge of variations of median nerve can be of interest to anatomists and clinicians. There are several publications mentioning the numerical variations of roots in formation

of median nerve but little attention has been paid to its relation with axillary and brachial artery. Thus the present study highlights the neurovascular variations associated with relations and course of median nerve which can be of help during surgical procedures to avoid iatrogenic injuries.

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