

**VARIATION IN THE FORMATION AND INNERVATION OF THE MEDIAN NERVE**B. Narayana Rao<sup>1</sup>, D. A. V. S. Sesi<sup>2</sup>**HOW TO CITE THIS ARTICLE:**

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**ABSTRACT:** Variations in the anatomy of brachial plexus are common. So is the median nerve anatomy. Knowledge of the variations contributes to the surgeons planning and curative intent during surgical repair of the Median nerve deficiencies. During routine brachial plexus dissections of cadavers for undergraduate students a variation of formation and innervations by the median nerve was identified at our department of anatomy, Rangaraya medical college, kakinada. A total of forty two brachial plexuses were explored and a variation in a male body on the left side was noted.

**KEYWORDS:** Median nerve A08.800.800.720.050.500, Brachial plexus A08.800.800.720.050, Innervation 19.8.39;

**INTRODUCTION:** The brachial plexus is formed by the union of the anterior rami of C5, C6, C7, C8, and T1. C5 usually receives some fibers from C4, and T1 usually receives fibers from T2. Shortly after leaving the intervertebral foramen, each root receives its sympathetic component via a gray ramus. The cervical roots receive their sympathetic components from one of the lower cervical sympathetic ganglia and the T1 root from its own sympathetic ganglion after contributing a white ramus to it. The formation of the brachial plexus begins just distal to the scalene muscles. Here the C5 and C6 roots unite to form the upper trunk, the C7 root continues alone to form the middle trunk, and the C8 and T1 roots unite to form the lower trunk. The three trunks formed precede inferolaterally behind the clavicle, and each divides into anterior and posterior divisions. The three posterior divisions unite to form the posterior cord, the anterior divisions of the upper and middle trunks unite to form the lateral cord, and the anterior division of the lower trunk continues alone to form the medial cord. These three cords embrace the axillary artery in the relationships that their names imply. No branches arise from the divisions of the plexus. The lateral pectoral nerve arises from the lateral cord, and the medial pectoral nerve arises from the medial cord. These two nerves descend, communicate by an anastomotic loop, and innervate the pectoralis major and minor. Innervation of the clavicular head of the pectoralis major is from the lateral pectoral nerve only, whereas the sternocostal head receives innervation from lateral and medial pectoral nerves. The musculocutaneous nerve is the only additional branch of the lateral cord. The remainder of this cord joins the medial cord to form the median nerve. The medial brachial cutaneous and medial antebrachial cutaneous nerves arise from the medial cord, which divides into its two main branches—the ulnar nerve and its contribution to the median nerve. (Fig. 1).

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**AIM AND OBJECTIVES:** The variations of brachial plexus and its terminal branches are common and have been widely documented. The aim of this study was to provide additional information about variations in the formation of median nerve.

**MATERIAL AND METHOD:** A total of forty two brachial plexuses were explored on various south Indian corpses at our Department of Anatomy, Rangaraya medical college, Kakinada. All the bodies were embalmed in routine manner. All the bodies were Formalin prepared. Dissection was performed by removing the lateral two thirds of Clavicle and the Subclavius muscle along with deflection of the muscles attached to the coracoid process. The Brachial plexus was followed upto the axilla and distally the arm was dissected for all the three nerves up to elbow.

**Inclusion Criteria:** All south Indian races included. Both male and female bodies were included.

**Exclusion Criteria:** Euarcan, African, Mongolian races and paediatric age group less than 12 years excluded. Previous surgical scarring at axillae was excluded.

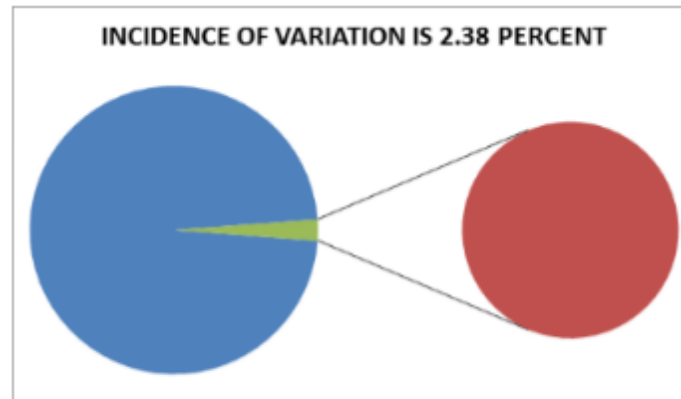
**RESULTS & OBSERVATIONS:** During the routine dissections for anatomy students a south indian male body showed the variation on the left side. The median nerve after the formation from the medial and lateral cords communicated with the musculocutaneous nerve at a distance of 4 cm and formed a single bundle of a 6cm length then it gave branches to biceps brachii and later it innervated the flexor muscles in a regular manner (Fig. 2, 3, 4). This variation found to be rare with an incidence of 2.38% of explored brachial plexuses at our institute. (Table1).

Sl. No.	sex	RT Upper limb	LT Upper limb
1	M	N	<b>Variation (Median Nerve)</b>
2	F	N	N
3	F	N	N
4	M	N	N
5	M	N	N
6	M	N	N
7	F	N	N
8	M	N	N
9	M	N	N
10	M	N	N
11	M	N	N
12	F	N	N
13	M	N	N
14	M	N	N
15	M	N	N
16	M	N	N
17	F	N	N

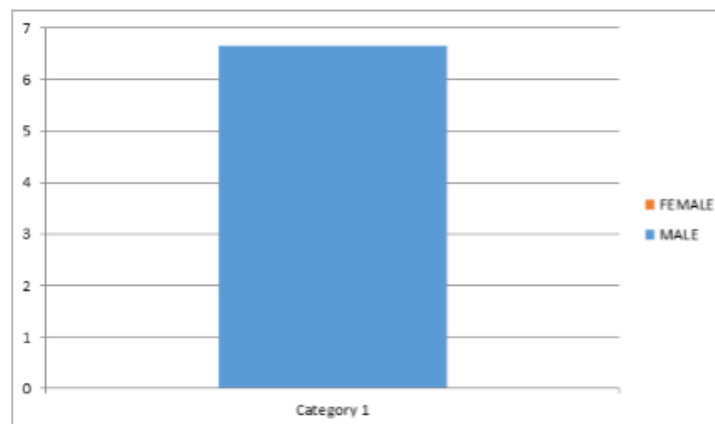
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18	F	N	N
19	M	N	N
20	M	N	N
21	M	N	N

- N = Normal.
- M = Male.
- F = Female.



**GRAPH 1**



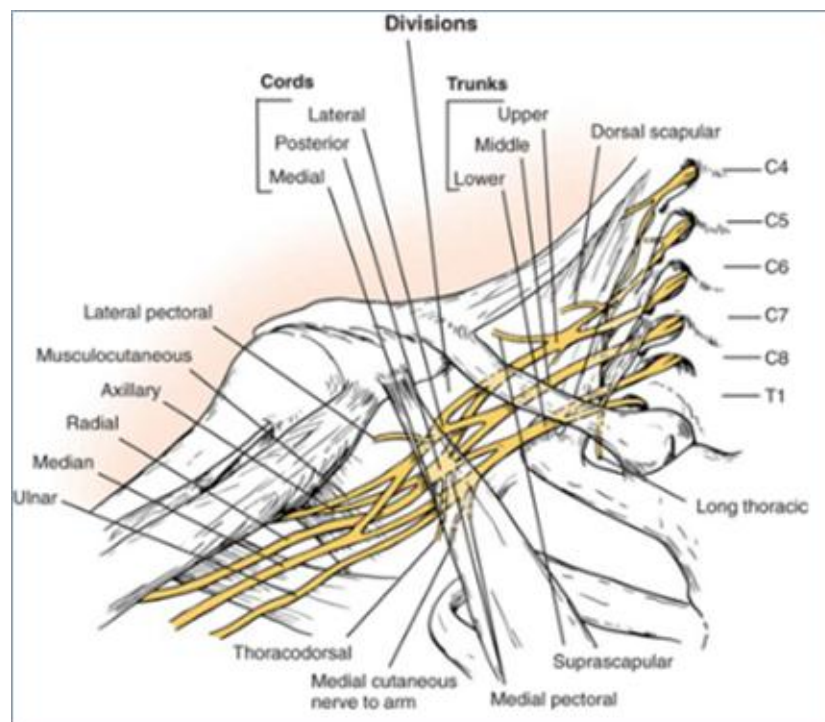
**GRAPH 2**

**DISCUSSION:** Variations in the formation and branching of the brachial plexus are common and have been reported by several investigators. Chauhan and Roy reported formation of median nerve by two lateral and one medial roots.<sup>[1]</sup> Similar finding was observed by Saeed and Rufai.<sup>[2]</sup> Satyanarayana and Guha reported formation of median nerve by four roots (three lateral and one medial root).<sup>[3]</sup> The ulnar nerve has its roots C7, C8 and T1 and it is a branch of medial cord. However the medial cord is not contributed by the C7 root at all. To have C7 root in it the ulnar nerve must receive the contribution from lateral cord. It is a common variation of the brachial plexus to find contribution to ulnar nerve from lateral cord.<sup>[4]</sup> Jakubowicz and Ratajczak reported

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that the lateral root united with the medial root at the level of the cubital fossa to form the median nerve.<sup>[5]</sup> Median nerve as reported in literature, is associated with several variations which include abnormal communications with other nerves such as musculocutaneous and ulnar nerves.<sup>[6]</sup> Splitting of the median nerve was reported by Sundaram, Kumar, Sethupathi et al.<sup>[7]</sup> Nayak described unusual innervations of flexor muscles of arm by the median nerve.<sup>[8]</sup> Variations in formation of median nerve were reported earlier by Bhanu, Sankar and Susan.<sup>[9]</sup> Sontakke, Tarnekar, Waghmare et al. described a case where median nerve was formed by three roots.<sup>[10]</sup> In our study the variation described nearly coinciding with Chauhan and Roy as well as Jakubowicz et al.,

**CONCLUSION:** In humans, the forelimb muscles develop from the mesenchyme of the para-axial mesoderm during fifth week of embryonic life.<sup>[11]</sup> The axon of spinal nerve grows distally to reach the limb bud mesenchyme. The peripheral process of the motor and sensory neurons grows in the mesenchyme in different directions. Once formed, any developmental differences would obviously persist post-natally.<sup>[12]</sup> As the guidance of the developing axons is regulated by expression of chemo-attractants and chemo-repellants in a highly coordinated site specific fashion, any alteration in signaling between mesenchymal cells and neuronal growth cones can lead to significant variations.<sup>[13]</sup> Knowledge of anatomical variations is of interest to the anatomist and clinician alike. Variations assume significance during surgical exploration of the axilla. Nerve blocks of infra-clavicular part of brachial plexus can fail inexplicably in the absence of such knowledge. Surgeons who perform procedures involving neoplasms and repairing neuronal trauma need to be aware of these variations.

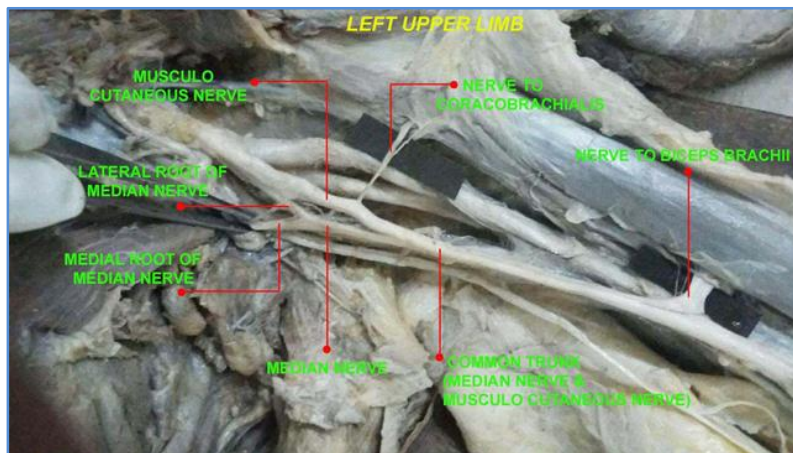


**Figure 1: Brachial plexus normal schematic**

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**Figure 2**



**Figure 3**



**Figure 4**

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