

## **Case report: Variation in the formation of cords of brachial plexus and its relation with axillary artery**

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### **Abstract**

**Brachial plexus is a complex structure, variations in formation of roots, trunks, divisions and cords are common. The aim of present study is to contribute to existing knowledge of the variations in the Anatomy of Brachial plexus, explaining its morphological and clinical significance. This case was reported during routine dissection of a 65-year-old embalmed male cadaver conducted for undergraduate medical students. Dissection of the neck, pectoral region, axilla and arm was performed in the right upper limb. Observation was done on branches of cords below the clavicle, cords, trunks of brachial plexus, axillary artery and relation of cords to it. Two trunks were observed as Upper and Lower Trunk. Upper trunk was formed by union of C5& C6 roots. C7, C8 & T1 united to form Lower trunk. Middle trunk was absent. The lateral and medial cord fused to form superior cord. Posterior cord continued as inferior cord. This variation could have potential clinical implications while performing axillary surgery. Unusual relationship of axillary artery with cords fail the nerve block of infraclavicular part of brachial plexus.**

**Key Words:** Brachial plexus, Axillary artery, Variations, roots.

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### **Introduction**

The brachial plexus is divided into roots, trunks, divisions and cords. The brachial plexus is formed by the union of ventral rami of C5, C6, C7, C8 and greater part of T1. These ventral rami are the roots of plexus, almost equal in size but variable in their mode of junction. Ventral rami of C5 and C6 unite at the lateral border of the Scalenus medius to form upper trunk. C7 continues as middle trunk. C8 and T1 unite behind Scalenus anterior to form lower trunk. These three trunks incline laterally, just above or behind the clavicle each bifurcates into anterior and posterior divisions. The anterior divisions of upper and middle trunks form a lateral cord, lateral to the axillary artery. The anterior division of the lower trunk descends at first behind, then medial to the axillary artery, forming medial cord. Posterior divisions of all the three form the posterior cord, at first above and then behind the axillary artery [1]. Since the brachial plexus is a complex structure, variations in formation of roots, trunks, divisions and cords are common. The aim of present study is to contribute to existing knowledge of the variations in the Anatomy of Brachial plexus, explaining its morphological and clinical significance.

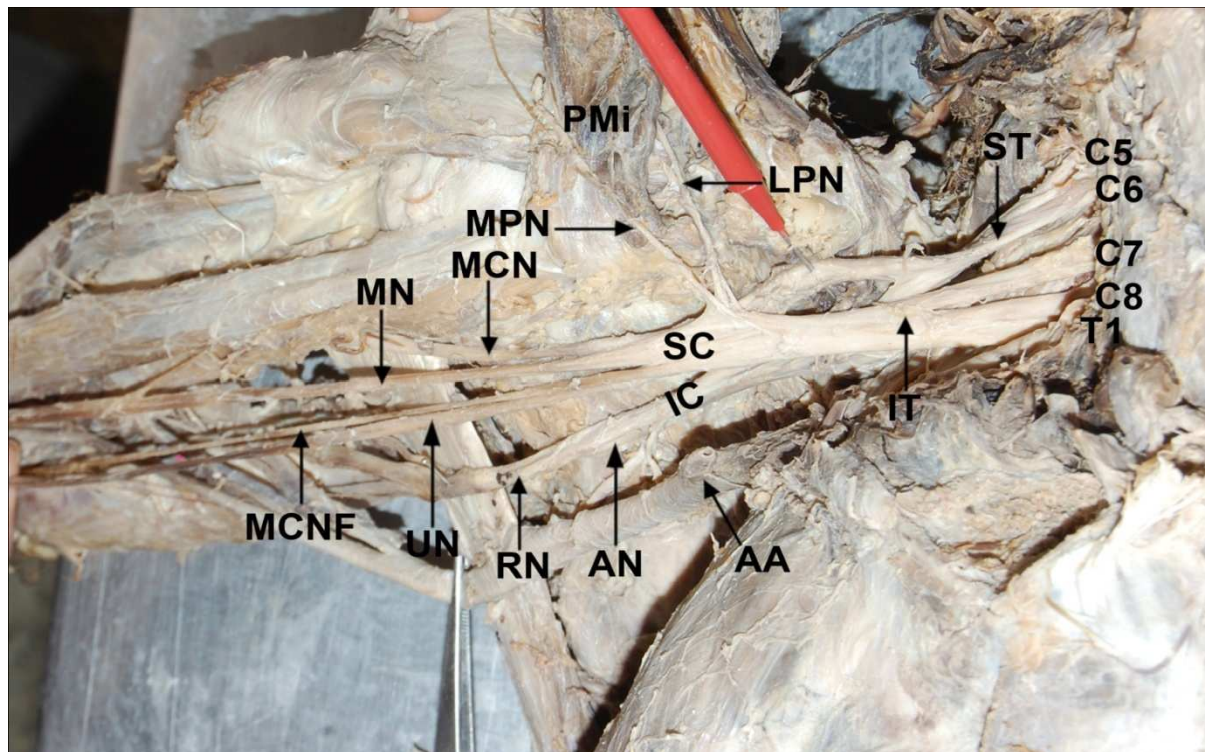
### **Case report**

This case was reported during routine dissection of a 65-year-old embalmed male cadaver conducted for undergraduate medical students in Department of Anatomy, J.J.M Medical College, Davangere, Karnataka, India. Unilateral variation of the brachial plexus was observed at the trunk, Division and cord level.

Dissection of the neck, pectoral region, axilla and arm was performed in the right upper limb. Observation was done on the formation of Brachial plexus at roots, trunks, divisions, cords and branches of cords below the clavicle. Axillary artery and its relations to cords was also observed. During this process we observed Two trunks, Upper and Lower trunks. Upper trunk was formed by union of C5& C6 roots. C7, C8 and T1 united to form Lower trunk. Middle trunk was absent. Anterior divisions of upper and lower trunks joined to form superior cord and posterior divisions of the two trunks joined to form Inferior cord instead of three cords namely lateral, medial and posterior cords normally. Both the cords observed were lateral to the axillary artery. Superior cord represented union of lateral and medial cords. Inferior cord represented Posterior cord. The branches of lateral and

medial cords gave musculocutaneous, median, ulnar , medial cutaneous nerve of arm and forearm, medial and lateral pectoral nerves were arising from superior cord.

The branches of posterior cord , Radial and Axillary nerve were arising from the Inferior cord.



**Figure 1: photograph of right axilla showing two trunks and two cords.**

*ST-Superior trunk,IT-Inferior trunk,SC-Superior cord,IC-Inferior cord,MPN-Medial pectoral nerve, LPN-Lateral pectoral nerve,MCN-Musculocutaneous nerve,MN-Median nerve,UN-Ulnar nerve,MCNF-Medial cutaneous nerve of forearm,RN-Radial nerve,AN-Axillary nerve,AA-Axillary artery,Pmi-Pectoralis minor muscle.*

## Discussion

Variations in the formation and branching pattern of brachial plexus have been documented well by many authors. Variations in the trunks, divisions and cord formation is seen, however the makeup of terminal branches is not affected. Accurate knowledge of these variations other than that quoted in classical text books is important from both medical and surgical aspects.

Kerr [2] has studied the variations of brachial plexus in man and classified the structure into 3 groups and 7 sub groups. He reported the presence of two cords Anterior and Posterior, where Medial and Lateral cords of classical brachial plexus united to form Anterior cord which were lateral to axillary artery. This correlates with the findings of the present study where only two cords were found Superior and Inferior, Superior Cord gave the branches of Lateral and Medial cords and Inferior cord gave the branches of Posterior cord ..

Aggarwal, Puri,Aggarwal, Sahni [3].reported variation in the formation of brachial plexus with Two Trunks and Two Cords and unusual relationship with Axillary artery. Two trunks were formed by union of ventral primary rami of C5, C6 and C7,C8, T1 respectively which splitted and united in an unusual manner to form two Cords posterior and lateral. Medial cord was absent. This coincides with the present case report where two trunks and two cords Superior and Inferior were found..

Oluyemi, Adesanya, Ofusori, Okwuonu, Ukwenya, Om'iniabohs, Odion encountered only Medial and Lateral cords of brachial plexus instead of three cords and three abnormal communications. An abnormal branch was arising from lateral cord which communicated with medial cord before the origin of medial root of median nerve. A branch of posterior cord divided into radial and axillary nerves. This does not correlate with present findings [4].

### *Variation in the formation of cords of brachial plexus.....*

Shankar and Veeramani [5] reported a case of formation of a common cord replacing medial and lateral cords. In his report common cord was observed lateral to second part of axillary artery.

Aggarwal, Harjeet, Sahni, Aggarwal reported presence of two trunks which form two cords: posterior and lateral instead of three. Medial cord was absent. Both cords were found superolateral to second part of axillary artery and the median nerve was formed from a single cord [6].

Jamuna, Amudha [7] reported brachial plexus with two cords Anterior and Posterior which were lateral to the axillary artery which correlates with present study.

Embryologically the guidance of developing axons is controlled by chemoattractants and chemorepellants. Deviation from normal signalling between mesenchymal cells and neuronal growth cones may lead to significant variations. It is very important to be aware of the variations of the cords of the brachial plexus and its relation to axillary artery during neurotization of brachial plexus lesions, shoulder arthroscopy by anterior glenohumeral portal and during reconstructive surgery of the shoulder joint. This variation could have potential clinical implications while performing axillary surgery. Unusual relationship of axillary artery with cords fail the nerve block of infraclavicular part of brachial plexus: Injury to Superior cord could result in serious compromise of upper limb function.

### **References**

1. Bannister LH, Berry MM, Couins P, Dyson M, et al. Gray's anatomy - The anatomical basis of medicine and surgery. 38<sup>th</sup> ed. Edinburgh London: Churchill Livingstone; 2000 .p.1267
2. Kerr AT. The brachial plexus of nerves in man, the variations in its formation and branches. Am J Anat 1918; 23: 285-395.
3. Aggarwal A,Puri N,Aggarwal AK,Harjeet K, Sahni D. .Anatomical variation in the formation of brachial plexus and its branching. Surgical and Radiologic Anatomy 2010; .32 (9): 891-894.
4. Oluyemi KA, Adesanya OA, Ofusori DA, Okwuonu CU, Ukwenya VO, Om'iniabohs FA, Odion BI. Abnormal pattern of brachial plexus formation: an original case report. The Internet Journal of Neurosurgery. 2007; 4: Number 2. **page numbers?**
5. Shankar N, Veeramani R. Replacement of the medial and lateral cords of the brachial plexus by a common cord and its trifurcation into major brachial. International Journal Of Anatomical Variations.2010;3:205-207.
6. Aggarwal A, Harjeet K, Sahni D, Aggarwal A. Bilateral multiple complex variations in the formation and

branching pattern of brachial plexus. Surg Radiol Anat. 2009; 31 (9): 723-731. Epub 2009 Apr 22.

7. Jamuna M, Amudha G. Two cord stage in the infraclavicular part of brachial plexus.International Journal of Anatomical Variations.2010;3: 128-129.

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