

Variant Median and Absent Musculocutaneous Nerve

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ABSTRACT Three roots of Median nerve and absence of Musculocutaneous nerve was encountered unilaterally on right side during routine undergraduate dissection training at Padmashree Dr. D. Y. Patil Medical College, Pimpri, Pune. Median nerve gave four branches in the arm. It pursued normal course and distribution in forearm and hand. Anatomical knowledge of the variations about Root, Trunk, Divisions and Cords of Brachial plexus along with the branches arising from these structures which supply pectoral girdle and upper extremity is extremely important while surgical exploration and administration of neuromuscular blocks in the Axillary region. This knowledge also proves helpful while planning reconstructive flap surgeries and treatment of fractures at the upper end of Humerus.

INTRODUCTION

Ventral rami of spinal nerves from C5 to T1 form Brachial plexus. Brachial plexus also convey sympathetic nerves for upper limb from T2 to T6 spinal segments. Their formation starts in Posterior triangle and they give terminal branches in Axilla.

Roots give branches to Serratus Anterior (C5, 6, 7) and Rhomboideus (C5). Roots C5 and C6 join to form Upper Trunk. Root C7 continues as Middle Trunk. C8 and T1 Roots join to form Lower Trunk.

Trunks are found in Posterior triangle. Upper Trunk gives a branch to Subclavius muscle (C5, 6) and Suprascapular nerve. Each trunk divides in an anterior and a posterior division so that three anterior and three posterior divisions are formed. The anterior divisions of Upper and Middle Trunk join to form Lateral Cord. Anterior division of Lower Trunk continues as Medial Cord. Posterior divisions of all the three Trunks join to form the Posterior Cord.

Cords are seen in Axilla and named according to their relation with second part of Axillary artery. Branches from Cords are given around third part of Axillary artery.

Branches of Lateral Cord are: 1) Lateral Pectoral 2) Musculocutaneous 3) Lateral Root of Median nerve.

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Branches of Medial Cord are: 1) Medial Pectoral 2) Medial Cutaneous nerve of arm 3) Medial Cutaneous nerve of fore arm 4) Ulnar nerve 5) Medial root of Median nerve.

Branches of Posterior Cord are: 1) Upper Subscapular 2) Nerve to Latissimus Dorsi also known as Thoracodorsal nerve 3) Lower Subscapular 4) Axillary nerve 5) Radial nerve.

Median Nerve (Mn) is formed by union of Lateral Root from Lateral Cord and Medial Root from Medial Cord of Brachial plexus. Median nerve does not give any branch in the arm unless the nerve to Pronator Teres is unusually high. Musculocutaneous nerve (Mcn) supplies Coracobrachialis, Biceps and Brachialis muscles. It gives articular branches to Shoulder and Elbow joint, its cutaneous supply includes skin over anterolateral aspect of fore arm till the base of Thenar eminence (Gray's Anatomy 2000).

CASE REPORT

The following case report describes three Roots and four branches of Median nerve (Mn) in the arm associated with absence of Musculocutaneous nerve (Mcn) unilaterally on right side in a 70 year old male cadaver.

Median nerve (Mn) was formed by union of three Roots (Fig. 1)

Root "A" from Lateral cord,

Root "B" and "C" from Medial Cord

Root "A" and "B" joined first to form Median nerve and received root "C" distally to complete the formation of Median nerve.

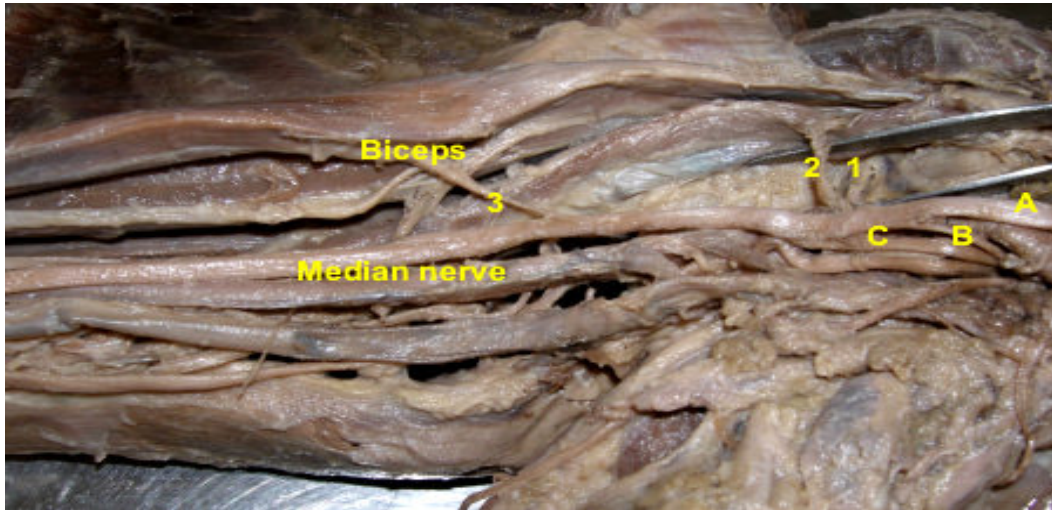


Fig. 1. Right Axilla showing formation of Median nerve by union of three Roots (A, B and C)

Median gave four muscular branches in the arm in that order (Fig. 2)

1. To Coracobrachialis muscle.
 2. To Shoulder joint.
- Branch one (1) and two (2) were given at same level.
3. To Biceps muscle.
 4. Common trunk for Brachialis muscle, Elbow joint and Lateral Cutaneous nerve of forearm.

Median nerve pursued normal course in Cubital fossa, forearm and hand.

DISCUSSION

Multiple variations of Brachial plexus have been documented Henry Hollinshead (1969).

Uzan (2001) found three Roots from Lateral Cord and one Root from Medial Cord. These roots united to form Median nerve. In the present

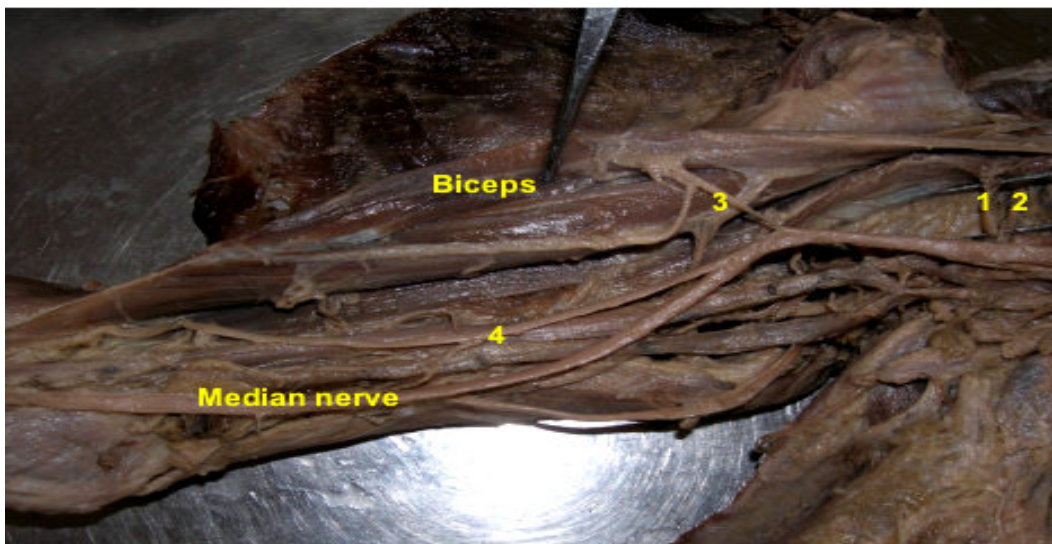


Fig. 2. Further course of Median nerve in right arm towards Cubital fossa. (1, 2, 3 and 4 are the branches supplying Shoulder joint, Coracobrachialis, Biceps and Brachialis muscles respectively)

case out of three Roots two Roots are from Medial Cord and one Root is from Lateral Cord.

Jahanshahi (2003) described absence of Musculocutaneous nerve and muscles normally supplied by it were supplied by Median nerve, however the Median nerve was formed in normal way. In our case Median nerve has three Roots, which is a variation, as Median nerve is normally formed by two Roots.

Nayak (2007) described presence of two bands running between Medial and Lateral Root of Median nerve which compressed Axillary artery. The researchers did not find such bands but the three Roots of Median nerve united normally in front of Axillary artery.

Satyanaraya (2009) describes three unilateral cases of variations in the formation of Median nerve. In the first case, the Median nerve was formed on the medial side of Axillary artery and also at a higher level. Later the Median nerve continued behind the Brachial artery and received a communicating branch from Lateral Cord of Brachial plexus. In the second case, formation of Median nerve was by three Roots, two Roots from Lateral Cord and one Root from Medial Cord. In the third case, Median nerve was formed by four Roots, three Roots from Lateral Cord and one root from Medial Cord. We have found three Roots of Median nerve. Two Roots were contributed from Medial Cord and one Root from Lateral Cord.

Darwish (2009) has reported a case where multiple variations of the Brachial plexus were found bilaterally. Musculocutaneous nerve was absent on right side. The flexors muscles of the arm and skin of the lateral aspect of forearm on right side were supplied by branches from the Medial Cord of the Brachial plexus and Median nerve. On left side the Median nerve was formed by four Roots, three Roots from the Lateral Cord and one Root from the Medial Cord of the Brachial plexus. The Radial nerve was formed by two Roots. The Roots of Radial nerve formed a loop anterior to the Subscapular artery. Posterior Cord contributed one Root and another Root of Radial nerve came from medial cord.

Two roots from Lateral cord and one Root from Medial Cord joined to form Median nerve as described by Nene (2010). However, Musculocutaneous nerve was present in that case. Musculocutaneous nerve was absent in our case and out of three Roots that contributed to the formation of Median nerve, two Roots were from

Medial Cord and one Root was from Lateral Cord.

Combination of absence of Musculocutaneous nerve and three Roots of Median nerve as seen in the present case is a rare occurrence. Knowledge of this variation is crucial while performing block dissection of Axilla, reconstructive flap surgeries, treating Humeral fractures by open reduction and even while performing incision and drainage of an Axillary abscess. Presence of such variation should always be kept in mind while testing of muscle after administration of neuromuscular block.

Embryological Explanation

William Larsen (1997) quotes that ventral column motor axons sprout from spinal cord in craniocaudal direction around day 30 in a developing embryo. An apical structure "Growth Cone" is formed at the growing tip of axon. The Growth Cone decides the path to reach the target organ. Filopodia present on Growth Cone grow towards the target organ by sensing molecular markers secreted by surrounding tissue. Location and innervations of the target organ (muscle, joint, skin) is dependent on secretion of certain tropic substances by target organs and its identification by growing axon.

Absence of Musculocutaneous nerve in the present case can be explained that growth cone Filopodia of ventral column motor axon sprouting from C5, C6 and C7 spinal segments took an unusual path and traveled from Lateral Cord to form Median nerve via Lateral Root of Median nerve. However the growth cone recognized their target organs correctly and innervated them. Median nerve had two medial Roots because fibers from C8 and T1 spinal segments joined lateral Root of Median nerve separately.

CONCLUSION

Roots of Brachial plexus seen in posterior triangle in the region of neck and Subclavian artery from the thoracic outlet pass through Axilla on their way to the superior extremity. Formation of Brachial Plexus and branching of Axillary artery is seen in and around the axillary region. Axilla is explored during various surgical, anesthetic, orthopedic and radiological procedures like, mobilization of pectoral neuromuscular flaps, treatment of fractures at the upper end of Humerus, surgeries related to

shoulder joint, block dissection of Axillary lymph nodes during radical mastectomy and administration of neuromuscular blocks. Profound knowledge of variation with respect to Brachial plexus and branches of Brachial plexus is important for every medical professional who explores the Axilla for treatment, intervention or for dissection, as a part of medical undergraduate and postgraduate curriculum.

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