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Third Root of Median Nerve Arises from the Posterior Cord –A Case Report

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Abstract:- Unusual variation in the brachial plexus root, trunk, division, cord & branches are more common and have been reported by different authors. This type is variation arise due to embryological aspect. The lateral root from lateral cord and medial root from medial cords of brachial plexus unite to form the median nerve. The present report describes a case of variation of the median nerve observed in the unilateral right upper limb of male cadaver during routine dissection in Department of Rachana Shareera, Patanjali Ayurveda Medical College & Research Centre, Dhulikhel, where the median nerve was found to be formed by three roots. In the present case one extra root arising from the posterior cord that unite with the median nerve approximately 3.2 cm below the union of lateral and medial root of median nerve. Knowledge of anatomical variation in the brachial plexus and nerve arising from them in axillary region is important for anatomist, surgeon, orthopedics, anesthesiologist, physiotherapist, sport medicine, neurophysicians etc. as these nerves are more susceptible to be injured during sport injuries, surgical interventions etc.

Keywords:- *Axilla, Plexus, Root, Cord, Median Nerve, Etc.*

I. INTRODUCTION

The median nerve is called as labourer's nerve which is formed by two roots; i.e. lateral root from the lateral (C5, C6, C7) and medial root from medial cords (C8, T1) of brachial plexus in axillary region. Both of these roots join in front of the 3rd part of axillary artery in 'Y' shape fashion.[1,2]

In axilla the median nerve lies on the lateral side of the 3rd part of axillary artery. It enters the arm at lower border of teres major. In the upper part of arm it is lateral to the artery, in middle of arm it crosses the artery from lateral to medial side and remains on the medial side of the artery up to the level of elbow. In arm it give branches to pronator teres, vascular branch to the brachial artery, articular branch to elbow joint.[2,3]

Median nerve lies medial to the brachial artery underneath the bicipital aponeurosis and in front of brachialis muscle in cubital fossa. It passees between the two head of pronator teres to reach in forearm. In the forearm it has course deep to the flexor digitorum superficialis over the flexor digitorum profundus. In the wrist region its pass between tendon of flexor carpi radialis laterally and flexor digitorum superficialis medially. In the forarm it gives muscular branches for flexor carpi radialis, palmaris longus, flexor digitorum superficialis. It gives anterior interosseous branch which supply flexor pollicis longus, lateral part of flexor digitorum profundus, pronator quadratus. The articular branch for the proximal & distal radioulnar, wrist joint. Vascular branches for radial and ulnar arteries & communicationg branch to ulnar nerve.[2,4]

The nerve passes deep to flexor retinaculum through the carpal tunnel where it divides into medial and lateral division to innervate the hand region. The lateral division innervate the thenar muscles & 1st lumbricals by giving muscular branches and digital branches for lateral 1& 1//2 digits. The medial division gives the two common digital branches (i.e. lateral & medial) for the 2nd and 3rd interdigital cleft that supply the adjacent side of the 2nd, 3rd & 4th finger. The lateral common digital branch also supplies 2nd lumbricals.[2,5]

Medial nerve controls the coarse movement of the hand. Injury to this nerve lead to ape like hand, sensory loss of hand along site of distribution of nerve, claw hand due to entrapment of ulnar and median nerve in carpal tunnel.[2,5] Atypical formation of the median nerve by extra roots serves as the alternative channels for sensation & control over the muscle movement supplied by it but it bring the serious problem during the clinical practice, diagnosis & other surgical interventions.

II. CASE REPORT

During the routine dissection of axillary region of the male cadaver in dissection Hall of Department of Rachana Sharir, Patanjali Ayurveda Medical College, Dhulikhel there observed the following variation;

- Unilateral variation on formation of median nerve that was confined at right side.
- Median nerve have 3 roots; one from each cord.
- The 3rd root was from the posterior cord which unites to form median nerve 3.2cm below the site of union of lateral and medial root of median nerve arising from lateral and median cord respectively at upper 1/3rd of arm.

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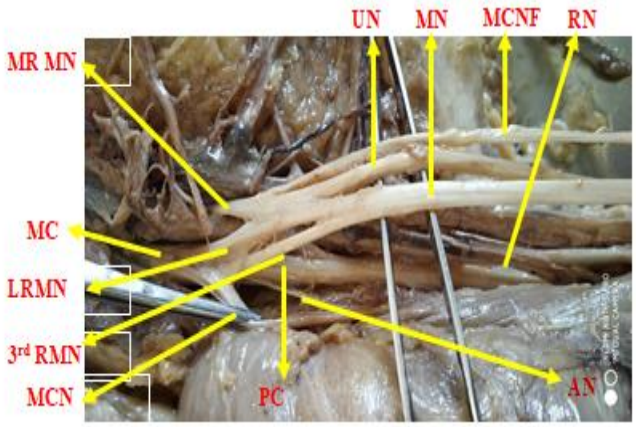
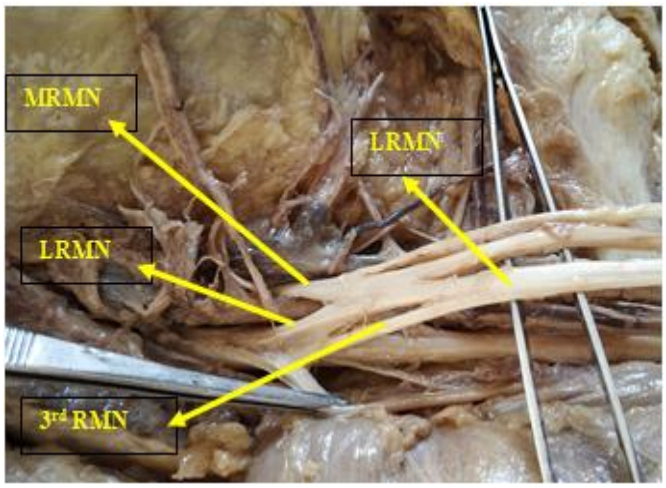
- On the left side pattern of formation of median nerve was normal.
- Regarding the course, distribution of the median nerve on the both side was normal.



Photograph no 1: Infracalvicular part of Brachial plexus of Rt. Side.
MRMN –Medial root of Median Nerve, MC –Medial Cord, LRMN –Lateral Root of Median Nerve, MCN –Musculocutaneous Nerve, UN –Ulnar Nerve, MN –Median Nerve, MCNF –Medial Cutaneous Nerve of Forearm, RN –Radial Nerve, AN –Axillary Nerve, PC –Posterior Cord, 3rd RMN – 3rd Root of Median nerve



Photograph no 2: Showing 3rd Roots of Median Nerve
MRMN –Medial root of Median Nerve, LRMN –Lateral Root of Median Nerve, MN –Median Nerve, 3rd RMN – 3rd Root of Median nerve

III. DISCUSSION

Brachial plexus is formed by anterior primary rami of C5,C6,C7,C8 & T1 spinal nerves, with contribution anterior primary rami of C4 and T2. There may be the prefixed or postfixes formation plexus due to shifting of root one spinal segment upward or downward respectively. The root value for the median nerve is C5,C6 & C7(for its medial root) and C8 & T1(for its lateral root).[6]

In the present case lateral root of the median nerve from the lateral cord and medial root of the median nerve from the medial cord arch the 2nd part of axillary artery and untie to form the median nerve. One extra root arise from the posterior cord which arise before the appearance of axillary nerve which run along the lateral side to axillary artery and unite with the median nerve 3.2cm below the fusion of its two roots at upper one third of arm. This third root of median nerve was observed on the right side only, the anatomical structure of the brachial plexus and its nerve along with its course and distribution was otherwise normal for both upper limbs. According to *Bergman et al.* the branch of brachial plexus that joins the median nerve in the upper third of the arm qualifies as its root.[7] Since the 3rd root coming from the posterior cord unite with the median nerve within upper one third of arm it can be considered as the 3rd root and which is unusual anatomical variation in formation of median nerve.

Saeed et al. also reported a case in which median nerve had three roots unilaterally, the third root taking origin from lateral cord.[8] *Mohd.Saleem Itoo, Raj Tajamul Hussain, Omer Bashir Itoo et. al.* in their study found the third root of median nerve originated from the lateral cord of brachial plexus between the origin of lateral root and musculocutaneous nerve.[9]

These variations arise during development of limb in embryo. Buds for the upper limbs appear at 26th to 27th day on either side of the trunk opposite to the level of lower five cervical and upper two thoracic spinal segments.[10] When elongation of limb buds occurs, muscular tissue split up into flexor and extensor compartments along with that nerve from ventral rami from spinal nerves innervate them respectively. The neurotropism or chemotropism hypothesis of *Ramon y Cajal*[11] and the theory of contact guidance of *Weiss*.[12] gives better explanation for direction of growth of the nerve fibres. The theory of Chemotropism explain that axonal growth cones act as sensors to sense the concentration gradients of molecules in the surrounding and grows towards the source, i.e. the target tissue. Whereas the contact guidance mechanism states that the adhesion between proliferating neuron (growth cone) and surrounding myocytes (future muscle) and extracellular matrix are influenced neuronal cell adhesion molecule (N-CAM) and L1, cadherins, N-cadherin and the integrin. These groups of cell surface receptors i.e. molecular heterodimers which recognise and bind to components of extracellular matrix, such as fibronectin, laminin and collagen. So, the both cell-cell and cell-matrix interactions is responsible for axon growth in specific direction.[13]

Even slight deviation of axonal path guiding factors due to any means results in defective neuron-myocyte adhesion, which lead to alteration muscular innervation by the nerve resulting this type of anatomical variations in the nerve genesis.

IV. CONCLUSION

Variation in brachial plexus and its nerve arise during embryological development may be associated with diverse presentations which lead to variety of clinical presentation such as sensory, motor, vasomotor and trophic changes when get injured or entrapped. One of the developmental anomalies of median nerve is presence of additional roots of median nerve which was from the posterior cord. This type of variation of median nerve is unusual. The knowledge of these type anomalies of the brachial plexus and nerve arising from them in axillary region is important for anatomist, surgeon, orthopedics, anesthesiologist, physiotherapist, sport medicine, neurophysicians etc. as these nerves are more susceptible to be involve during injuries, surgical interventions etc. this unusual variation of median nerve will be the big issue for anesthetists while performing the nerve block, to operate and manipulate the axillary region in clinical practice.

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