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ANATOMICAL VARIATION IN FORMATION OF LATERAL ROOT OF MEDIAN NERVE, ITS EMBRYOLOGICAL BASIS AND CLINICAL SIGNIFICANCE

Anatomy

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ABSTRACT

Introduction: Median nerve is formed in axilla by medial and lateral roots from medial and lateral cords of brachial plexus respectively. Anatomical variations of median nerve are not uncommon. Incidences of variation in lateral root is more common than that of the medial root. The additional lateral root of median nerve is of great academic and clinical significance as this finding will provide anatomical basis for clinical correlation in case of neuropathies & surgeries of upper limb. Also understanding the embryological stages in development of brachial plexus is important for explaining possible anatomical variants.

Aim And Objectives: This study was conducted to provide a thorough description of anatomical variation in formation of the lateral root of median nerve along with its embryological basis and clinical significance.

Material And Methods: This study was conducted on 22 (20 male, 2 female) formalin fixed human cadavers available in the Department of Anatomy, Osmania Medical College, Koti, Hyderabad.

Results: Median nerve was formed in the axilla by one medial root & two lateral roots in one of the male cadaver among 22 cadavers that is in 2.27% cases and the additional lateral root joined the median nerve in middle third of arm.

Conclusions: Anatomical variability in formation of the lateral root of median nerve does exist and significant in the management of surgical exploration of the axilla or arm and in the nerve blocks procedures of the brachial plexus as this being a peripheral nerve is more susceptible to be injured during operations. Injury to such a variant nerve in the proximal arm may lead to a number of manifestations. Possible clinical implications relating either to the surgical approach to the shoulder joint and entrapment syndromes are important and can be explained based on embryological basis.

KEYWORDS

Anatomical Variation, Median Nerve, Additional Lateral Root, Brachial Plexus.

INTRODUCTION:

The Median nerve (C5- T1), commonly termed as Labourer's Nerve is formed by two roots, lateral root from the lateral cord (C5- C7) and medial root from the medial cord (C8- T1) of the Brachial Plexus. The median nerve enters the arm at first lateral to the brachial artery. Near the insertion of the coracobrachialis, it crosses in front of (rarely behind) the artery, descending medial to it. However, the unusual distribution and formation of median nerve in the upper limbs can be found during routine cadaveric dissection of brachial plexus. Hence this study was conducted to find variations of lateral root in formation of the median nerve. Nerve variations of the upper limb are described by many authors, these variations may help in interpretation and diagnosis of a nervous compression having unexplained clinical symptoms.

MATERIAL AND METHODS:

Twenty-Two (Twenty male and Two female) adult formalin fixed human cadavers from Department of Anatomy, Osmania Medical College, available during study period were taken. None of them had any signs of surgery, wound scars or trauma in the Axilla or Arm.

During routine undergraduate dissection, after removal of skin, loose connective tissue, fat and lymph nodes of axilla, the Coracobrachialis muscle was exposed. The axillary artery, the cords of the brachial plexus and the branches of the cords were identified medial to the muscle, the musculocutaneous nerve was seen entering the deep surface of Coracobrachialis.

Brachial plexus of each of the 44 upper limbs (both limbs of 22 cadavers) were studied meticulously to find out the anatomical variations in formation of roots of the median nerve.

Fig: CB- Coracobrachialis, MCN-Musculocutaneous nerve, AA- Axillary Artery, LC- Lateral cord of Brachial Plexus, MR – Medial root of Median Nerve, LR– Lateral root of Median Nerve, AdLR- Additional Lateral Root, MN- Median nerve, UN- Ulnar Nerve.

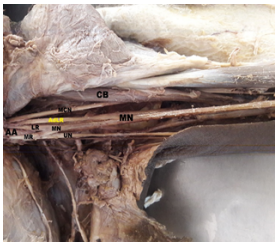

Fig: CB- Coracobrachialis, MCN- Musculocutaneous nerve, AA- Axillary Artery, MR– Medial root of Median Nerve, LR– Lateral root of Median Nerve, AdLR- Additional Lateral Root, MN- Median nerve, UN- Ulnar Nerve.

RESULTS:

In the present study, one case in one of the upper limb on the left side

that is unilaterally (2.27%), median nerve in axilla showed formation by one medial root from medial cord, passed between axillary artery and subscapular artery and joined the lateral root from lateral cord anterior to axillary artery. One Additional Lateral Root emerged from the lateral cord after the musculocutaneous nerve was given off in between the lateral root and musculocutaneous nerve and joined the main trunk of median nerve medial to the axillary artery in the middle third of arm. Median nerve was found to be normal in rest of its course and distribution. The origin, course and branching pattern of median nerve on the right side of this cadaver was normal.

DISCUSSION:

Variations of the median nerve have been studied and presented by many authors elsewhere. In the present study, the additional root arose from lateral cord. It is more common to have an additional root coming from lateral root as it is evident from several case reports and studies on variations of roots of the median nerve (Ibrahim et al.; Surendran et al. Herath et al.). Badawoud also found the same variation as our study and reported that in 6.3% (3/48) by three roots. Study done by Eglseder and Goldman investigated that the Median Nerve was formed of two lateral roots in 14% of their specimens. These variations can be explained in the light of embryogenic development. The first indication of limb musculature is observed in the seventh week of development as condensation of mesenchyme near the base of the limb buds. With further elongation of the limb buds, the muscle tissue splits into flexor and extensor compartments. The upper limb buds lie opposite the lower five cervical and upper two thoracic segments. As soon as the buds form, ventral primary rami from the spinal nerves penetrate into the mesenchyme. At first, each ventral ramus divides into dorsal and ventral branches, but soon these branches unite to form named peripheral nerves which supply extensor and flexor group of muscles respectively. Immediately after the rearrangement of nerves, they enter the limb buds and establish an intimate contact with the differentiating mesodermal condensations and this early contact between the nerve and muscle cells is a prerequisite for their complete functional differentiation. Over the years, two principal theories have emerged concerning the directional growth of nerve fibres – The Neurotropism or Chemotropism Hypothesis of Ramon et al and The Principle of Contact-Guidance of Weiss. The variation as noted in the present study may be attributed to misexpression of one or more transcription factors.

The variations in the formation and relations of median nerve in the arm bear remarkable clinical significance. It is important for medical staff to be aware of this variation while planning a surgery in the region of axilla or arm, as these nerves are more susceptible to be injured during operations. Injury to such a variant nerve in the proximal arm may lead to a number of manifestations including sensory, motor, vasomotor and trophic changes. The possible clinical implications of these variations relating either to the surgical approach to the shoulder joint and entrapment syndromes are important.

CONCLUSION:

The variations related to the formation of median nerve by more than two roots are relatively uncommon as compared to the other types of variations of median nerve. Some embryological explanations are available. Finally, knowledge of these variations is important particularly to the surgeons for carrying out surgical procedures in axilla and arm as these nerves are more susceptible to injury leading to variable manifestations and entrapment syndromes.

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