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Research Article

Radix formation between median and musculocutaneous nerves: embryological, morphological and clinical correlation

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ABSTRACT

In ours study we report radix formation between median nerve and musculocutaneous nerves. The study was conducted in the Department of Anatomy, Kamineni Institute of Medical Sciences, Narketpally, Nalgonda Dt., Andhra Pradesh, India. During routine cadaveric dissections in the upper limbs, we observed an anastomosis (radix) between median and musculocutaneous nerves in the arm. Variations in the origin, course, branching pattern, communications was observed. These variations have clinical significance in brachial plexus block and surgical procedures.

Keywords: Musculocutaneous nerve, Median Nerve

INTRODUCTION

The median nerve is usually formed just lateral to the third part of the axillary artery by the union of its medial and lateral roots coming from medial and lateral cords of the brachial plexus. It then descends down in the front of the arm and crosses the brachial artery from lateral to medial side. The musculocutaneous nerve is a branch of the lateral cord of the brachial plexus. It pierces the coracobrachialis muscle and enters the front of the arm. It supplies the biceps, brachialis and coracobrachialis muscles. The communication (radix) formation between median nerve and musculocutaneous nerves is important from the clinical point of view.

The development of the brachial plexus is important for observing anatomical variations in the median nerve and musculocutaneous nerves.[8] The human upper limb bud appears at 26-27 days in the developing embryo and motor axons arising from the spinal cord enter the limb buds during the fifth week. Formation of the brachial plexus is evident from about 34-35 days as a single ridiculer cone in the upper limb. About 46-48 days, all the upper limb nerves comprise an orientation and arrangement similar to those seen in the adult. Anastomosis between the median and musculocutaneous nerves is common origin during development.

METHODS

The formalin fixed 30 cadavers, 60 upper limbs constitute the materials for study. During routine dissection of axilla and arm for medical undergraduate's muscles were reflected to visualize the formation of median nerve and variations in its formation were noticed. The method followed is normal dissection according to the Cunningham's dissection manual.

RESULTS

We observed the following communications and variations.

In our observations most of the limbs are having normal branching pattern of brachial plexus as mentioned in the standard text books, there are no connecting fibers between the musculocutaneous and median nerve. The musculocutaneous nerve is arising from lateral cord of the Brachial plexus then it pierces the coracobrachialis muscle and innervates the coracobrachialis, the biceps brachii and brachialis muscles and it continues as a lateral cutaneous nerve of the forearm.

But we observed following variations in our routine cadaveric dissections. Although some fibers of the medial root of the median nerve unite with the lateral root of the median nerve and form the main trunk of median nerve, remaining medial root fibers run in the musculocutaneous nerve leaving it after a distance to join the main trunk of median nerve.

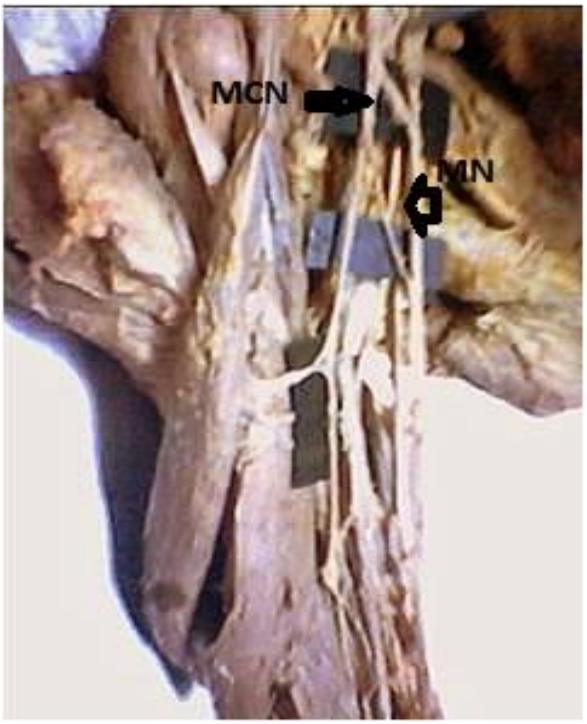

Figure 1: Showing left upper limb variations in the formation of MCN and MN.

The lateral root of the median nerve from the lateral cord runs in the musculocutaneous nerve and leaves it after a distance to join the main trunk of median nerve.

The musculocutaneous nerve is absent. The fibers of the musculocutaneous nerve runs within the median nerve along its course. In this type the musculocutaneous nerve does not pierce the coracobrachialis muscle. In our observation the lateral cord of the brachial plexus has given the branches as lateral pectoral nerve and nerve to coracobrachialis. The fibers of the musculocutaneous nerve unite with the lateral root of the median nerve. After some distance, the musculocutaneous nerve arise from the median nerve.

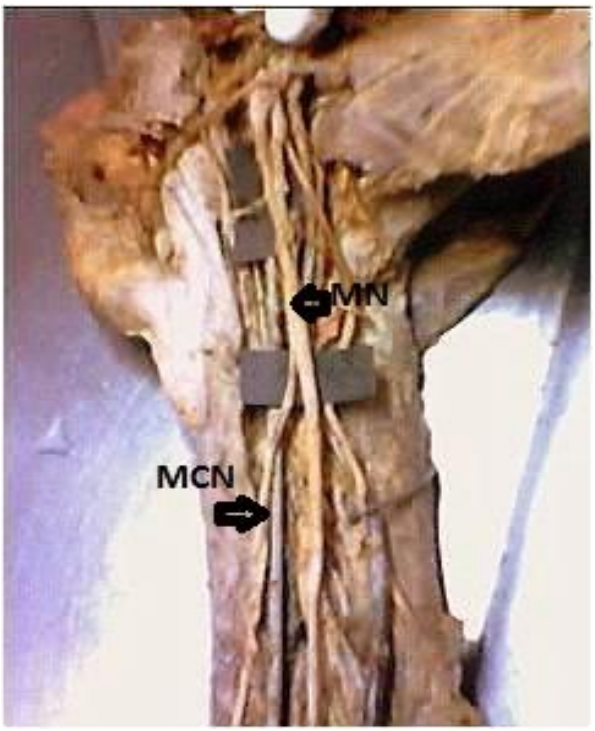

Figure 2: Showing MN not piercing the coracobrachialis muscle.

In our observation the variant originated musculocutaneous nerve is not piercing the Coracobrachialis muscle. The coracobrachialis was supplied directly by a branch from the lateral cord of the brachial plexus. The coracobrachialis is more important morphologically than functionally. It represents the medial compartment of the arm which is so well developed in the thigh .In four legged animals the muscle is tricipital. In man the upper two heads are fused, but the musculocutaneous nerve passes between the remnants of these two heads.

DISCUSSION

We observed variations in formation and communication of median nerve and musculocutaneous nerves.

These observations are compared with the study of LeMinor.[1]

Type I: There are no connecting fibers between the musculocutaneous and median nerve as described in classic textbooks. The musculocutaneous nerve is arising from lateral cord of the Brachial plexus then it pierces the coracobrachialis muscle and innervates the coracobrachialis, the biceps brachii and brachialis muscles and it continues as a lateral cutaneous nerve of the forearm.

Type II: Although some fibers of the medial root of the median nerve unite with the lateral root of the median nerve and form the main trunk of median nerve,

remaining medial root fibers run in the musculocutaneous nerve leaving it after a distance to join the main trunk of median nerve.

Type III: The lateral root of the median nerve from the lateral cord runs in the musculocutaneous nerve and leaves it after a distance to join the main trunk of median nerve.

Type IV: The fibers of the musculocutaneous nerve unite with the lateral root of the median nerve. After some distance, the musculocutaneous nerve arises from the median nerve.

Type V: If the musculocutaneous nerve is absent. The fibers of the musculocutaneous nerve run within the median nerve along its course. In this type the musculocutaneous nerve does not pierces the coracobrachialis muscle.

Venieratos and Anagnostopoulou[2] reported three types of communications between median and musculocutaneous nerves considering the coracobrachialis muscle as the reference point. In type one, the communication was proximal to the entrance of the musculocutaneous nerve into coracobrachialis. In type two, the communication was distal to the muscle and in type three, the nerve and the communicating branch did not pierce the muscle

In the most recent observations recorded by Choi[3] such communications have been broadly classified into three patterns. In pattern 1, the two nerves are fused. In type 2, there was one communicating branch between the musculocutaneous nerve and the median nerve. In pattern 3, two connecting branches are between the two nerves. Our observations of communications between musculocutaneous and median nerves were compared with various classifications. Eglseder and Goldman dissected 54 cadaver arms to determine the course and anatomic relationships of the musculocutaneous nerve in the arm.[4] They noticed interconnections between the musculocutaneous nerve and median nerve in 36% of dissections. The mean length of these interconnections was 1.77 cm. Connections from median nerve to musculocutaneous nerve in the opposite direction are rarely found.

Communication between the musculocutaneous and median nerves in the arm is considered as remnant from the phylogenetic or comparative point of view. Kosugi suggested that there was one trunk equivalent to the median nerve in the thoracic limb of the lower vertebrates (amphibians, reptiles. birds).[6] In man, the forelimb muscles develop from the mesenchyme of the paraxial mesoderm during the fifth week of intrauterine life.[7] The axons of the spinal nerves grow distally to reach the mesenchyme. As the guidance of the developing axons is regulated by the expression of chemoattractants and chemorepulsants in a highly coordinated site specific fashion, significant variations in nerve patterns may be a result of altered signalling between mesenchymal cells and neuronal growth cones[8] or circulatory factors at the time of fusion of brachial plexus cords. Studies of comparative anatomy have observed the existence of such connections in monkeys and in some apes; the connections may represent the primitive nerve supply of the anterior arm muscles.[9]

Such variations have also clinical importance especially in posttraumatic evaluations and exploratory innervations of the arm for peripheral nerve repair. The knowledge of the variations of this communication between the musculocutaneous and median nerves in the distal third of the arm is important in the anterior approach for the fracture of the humerus. This knowledge is also important for the clinicians to avoid unnecessary release of the carpal tunnel by them. Lesions of the communicating nerve may give rise to patterns of weakness that may impose difficulty in diagnosis. Clinical implication of this could be that injury of musculocutaneous nerve proximal to the anastomosis branch between musculocutaneous and median nerve may lead to unexpected presentation of weakness of forearm flexors and thenar muscles.[10] There is a need for newer classification of the communication types between musculocutaneous and median nerves incorporating the different classifications.

CONCLUSION

Knowledge of the radix formation between median and musculocutaneous nerves may prove valuable information's in traumatology of the arm, as well as in plastic and reconstructive repair operations.Variations in the origin, course, branching pattern, communications having clinical significance in brachial plexus block and surgical procedures. This study was useful for undergraduates and postgraduates.

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