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Unilateral Merging of Musculocutaneous Nerve with Variant Branching of Median Nerve

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Research Article

***Abstract*:** Variations of brachial plexus in different ways are very often detected in upper limb. During our study, in a 75 years old cadaver we found the musculocutaneous nerve communicating with median nerve in the left arm. The musculocutaneous nerve gave a branch to coracobrachialis then the nerve merged with the lateral root of median nerve. Later the area of innervations of musculocutaneous nerve was replaced by Median nerve. The Median nerve originated normally from the union of medial and lateral root but gave two muscular branches in the arm, to Biceps brachii, Brachialis & a sensory branch which continued as lateral cutaneous nerve of forearm. The course of Median nerve in the forearm was normal. The Musculocutaneous nerve of right side was present with normal course & routine branches.

***Keywords*:** Musculocutaneous nerve, Median nerve, Lateral cutaneous nerve of forearm, Lateral cord**.**

Introduction

Variations are common in the formation of the brachial plexus. The prevalence of variations ranges from 12.8 up to 53%.[1] Normally the brachial plexus is formed by the lower four cervical ventral rami and the greater part of the first thoracic ventral ramus.[2] These roots then joins or continues as trunks as upper, middle and lower. Trunks formed then divide into ventral and dorsal divisions. Ventral divisions of upper and middle trunks form lateral cord and ventral division of lower trunk form medial cord. Posterior divisions of all trunks form posterior cord. These cords give rise to different nerves. Lateral cord gives rise to lateral pectoral nerve, lateral root of median nerve.[3] Then this cord continues as musculocutaneous nerve.[4] The median nerve is formed by union of lateral root of median nerve and medial root of median nerve and nerve does not give any muscular branches in the arm. The musculocutaneous nerve is one of the terminal branches of the lateral cord of the brachial plexus with root values derived from 5th and 6th cervical nerves. Musculocutaneous nerve supplies the muscles in flexor compartment of arm i.e. Coracobrachialis, Biceps brachii and Brachialis and then becomes cutaneous as lateral cutaneous nerve of forearm. Variations of the musculocutaneous nerve may occur in 6.25% of cases[5] and its absence has been reported with a prevalence ranging from 1.7 to 15%[6,7,8,9]. Although the communications between the different nerves in the arm are rare, those between the median nerve and musculocutaneous nerve have been described from nineteenth century.[10] Knowledge of such variation is important while giving anesthetic blocks. There is also possibility of damaging variant muscular branches emerging from median nerve in arm by surgeons during surgical procedures in axilla.[11]

Material and Method

Brachial plexus and its branches belonging to 24 upper limbs of 12 cadavers (10 males & 2 females) of the department of Anatomy, Government Medical College, Miraj comprised the material for the study. These limbs were dissected retaining continuity with the trunk. Exposure of brachial plexus and it branches was achieved following classical incisions and dissection procedures as Cunnigham's manual, taking care to preserve all the branches of the brachial plexus. Variations were observed and recorded.[12]

Result

During our study we found unilateral variation on left side of arm in 75 year old male cadaver. In the present case the brachial plexus was formed from C5 to T1 roots. The C5 and C6 root united to form the upper trunk, C7 continued as middle trunk and C8 and T1 united to form the lower trunk of the brachial plexus. All the trunks divided into ventral and dorsal division. The dorsal division of all trunks fused to form the posterior cord while ventral division of upper and middle trunk formed the lateral cord and medial cord is formed from the ventral division of the lower trunk. Lateral cord divided into lateral pectoral nerve, lateral root of median nerve and musculocutaneous nerve. The lateral root of

median nerve fused with the medial root and median nerve is formed. The musculocutaneous nerve did not pierce coracobrachialis but instead gave a twig to coracobrachialis muscle. The musculocutaneous nerve soon fused with the median nerve (as shown in fig. 1).
Motor branches to biceps brachii, brachialis & (sensory) lateral cutaneous nerve to forearm were given by median nerve. Median nerve had normal course and branches in the forearm (fig. 2). While medial cord gave normal branches. There was no abnormality on right side. The other 23 upper limbs showed normal pattern of brachial plexus.

Figure 1. *Fusion of musculocutaneous and median nerve*

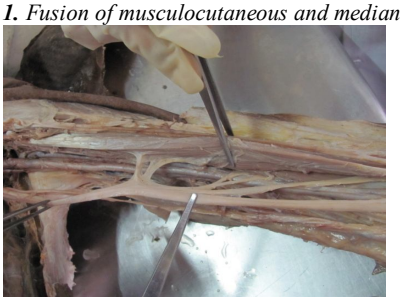

Figure 2. *Median nerve supplying biceps and brachialis.*

Discussion

The communication between the musculocutaneous nerve and the median nerve have been classified by Li Minor[13] into following five type: In type I, there is no communication between the median nerve and the musculocutaneous nerve, in type II, the fibers of the lateral root of the median nerve pass through the musculocutaneous nerve and join the median nerve in the middle of the arm, whereas in type III, the lateral root fibers of the median nerve pass along the musculocutaneous nerve and after some distance, leave it to form the lateral root of the median nerve. In type IV, the musculocutaneous nerve fibers join the lateral root of the median nerve and after some distance the musculocutaneous nerve arises from the median nerve. In type V, the musculocutaneous nerve is absent and the entire fibers of the musculocutaneous nerve pass through the lateral root and fibers to the muscles supplied by musculocutaneous nerve branch out directly from the median nerve. Later on Choi[14] et al classified these communications into three types. The first pattern comprised of fusion of both median and musculocutaneous nerves (19.2%). Pattern 2 showed the presence of one supplementary branch between both nerves (72.6%). This type was further subdivided as Pattern 2a, where a single root from musculocutaneous nerve, contributes to the connection (69.9%) while in Pattern 2b there are two roots from musculocutaneous nerve (2.7%). Pattern 3 showed presence of two branches between both nerves (6.8%). The musculocutaneous nerve merging with median nerve in the present study could not be incorporated into any of the above mentioned types described by Li Minor. But it partly resembles type 5 where musculocutaneous nerve is partly present only to supply coracobrachialis muscle. However it fits into type II (2a) of Choi et al. In the present study musculocutaneous nerve merged with lateral root of median nerve. If this occurs in upper third of the arm, it is generally considered as third (double lateral) root of the median nerve[13] or in other words the median nerve nerve can be said to be formed by three roots: a) one from the lateral cord; b) one from the musculocutaneous nerve; c) and the third from the medial cord. Ramachandran et al[16], Chauhan et al[17] and Saritha[18] found three roots forming median nerve as in the present case.

Chiarapattanakom et al[19] described that the limb muscles develop from the mesenchyme of local origin, while axons of spinal nerves grow distally to reach the muscles. Guidance for the developing axons is regulated by expression of chemo-attractants and chemo-repellants in a highly coordinated site specific fashion, any alteration in signaling between mesenchymal cells and neuronal growth cones can lead to significant variations.[20] The early contact between nerve and muscle cell is a prerequisite for their complete functional differentiation.[21] Significant variations in nerve patterns may be a result of altered signaling between mesenchymal cells and neuronal growth cones[22] or circulatory factors at the time of fusion of brachial plexus cords[23]

Conclusion

Variations of the brachial plexus have significant clinical and surgical importance.[11] This variation may provide explanation for cases where it is impossible to flex forearm due to median nerve injury[24]. Clinical importance of such variations is seen while giving anaesthetic blocks, performing surgical procedures in axillary region, interpreting tumour or traumatic nerve compressions. There is also possibility of damaging the variant muscular branches of median nerve in arm by surgeons. The median nerve and its roots are in proximation with the axillary vein, which is used as the landmark for axillary lymph node dissection, for treating breast carcinoma and melanoma. If the dissection extends more cranially it may injure the median nerve. The knowledge of the variations in the lateral cord of

brachial plexus is important while performing neurotization of brachial plexus lesions, shoulder arthroscopy by anterior glenohumeral portal and shoulder reconstructive surgery[25].

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