

Clinicoembryological Submission of Unusual Variation in Course and Branching Pattern of Lateral Cord of Brachial Plexus – A Case Report

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Abstract

Variations are commonly observed and being reported in the formation of lateral cord of brachial plexus and in the communication of branches of lateral cord of brachial plexus, but formation of median nerve by lateral root of median nerve from lateral cord and medial root of median nerve from medial cord at a substantially low level is quite unusual and the case reports regarding piercing of the coracobrachialis by lateral cord of brachial plexus are infrequent. The present case report describes an unusual unilateral course of lateral cord piercing the coracobrachialis and ensuing path followed by its various branches as well as unusually low-level formation of median nerve from lateral and medial roots coming from the lateral and medial cord of brachial plexus, respectively. This was witnessed in the infraclavicular part of the brachial plexus during the routine gross anatomy dissection of the left upper extremity in a 35-year-old Indian male cadaver. Since axilla and upper half of the arm are challenging areas for surgical procedures, so the unusual variations being reported in this case may help the surgeons of different specialties in exploration of neuronal tumor, shoulder reconstructive surgery shoulder arthroscopy, and using the coracobrachialis flap for different surgical purposes.

Key words: Brachial plexus, Coracobrachialis, Lateral cord, Low median nerve

INTRODUCTION

The brachial plexus is formed by the ventral primary rami of spinal nerves from C5 to T1. Invariably, the plexus may receive fibers from the ventral rami of C4 and T2 and is termed accordingly as prefixed or post-fixed, respectively. These rami unite, divide, and reunite to form lateral, medial, and posterior cord of brachial plexus. Eventually, these cords and their branches appear in the axilla around the axillary artery^[1] lateral being lateral, medial being medial, and posterior being posterior to axillary artery in relation to pectoralis minor.

Variations of the lateral cord of the brachial plexus with regard to composition of fiber bundle and absence or communication between its branches are common and have been reported by numerous authors.^[1-7] The fibers from the median nerve may convoy the musculocutaneous as it transits that the coracobrachialis muscle is also being reported by various researchers such as Kaus and Wotowicz, 1995,^[8] Williams *et al.*, 1995,^[9] Venieratos and Anagnostopoulou, 1998,^[10] and Sevki *et al.*, 2001,^[11] but it is very rare to see coracobrachialis being pierced by lateral cord before its division into musculocutaneous and the lateral root of median nerve.^[12,13]

In normal course as mentioned in the textbooks, the lateral cord gives its initial branch the lateral pectoral nerve to the pectoralis major muscle and then splits into musculocutaneous and lateral root of median nerve. The musculocutaneous nerve pierces the coracobrachialis and passes obliquely to the lateral side of the arm between

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the biceps brachii and brachialis muscle, supplying their musculature as well. Later, it pierces the deep fascia above elbow, lateral to the tendon of biceps brachii and then endures as the lateral cutaneous nerve of the forearm. Median nerve is formed anterior or anterolateral to axillary artery by the union of its two roots. The lateral root to the median nerve is the largest branch of the lateral cord of the brachial plexus while the median root arises from the medial cord of brachial plexus and crosses in front of axillary artery to join the lateral root. After union of both roots the median nerve, it descends anterior to the axillary artery and in the upper part of brachial artery to reach the medial aspect of brachial artery in the distal half of the arm.^[9]

These anomalies must be kept in mind while performing surgical procedures either in trauma or any other pathological condition to avoid damage to these vital nerves.

CASE REPORT

During the routine dissection class on brachial plexus in the Department of Anatomy, All India Institute of Medical Sciences, Rishikesh, a 35-year-old Indian male cadaver, in the infraclavicular part of the brachial plexus on the left upper limb, we noticed that the lateral cord has pierced coracobrachialis muscles from its medial side. The first branch of the lateral cord, the lateral pectoral nerve was arising normally just below the outer border of first rib. It passed anterior to axillary artery and vein and supplied the deep surface of pectoralis major muscle. Then, the lateral cord comes to lie between the lateral border of coracobrachialis and medial border of biceps brachii. It then divides into lateral root of median nerve medially and musculocutaneous nerve laterally. The lateral root of median nerve was observed crossing from the lateral border of coracobrachialis downward, forward, and medially over the anterior surface of coracobrachialis to join its medial counterpart to form the median nerve approximately at the level of insertion of this muscle anterior to the brachial artery. In the normal course, the median nerve is formed in relation to the third part of axillary artery.

The other division the musculocutaneous nerve was seen passing between the two heads of biceps brachii and dividing into two branches, the upper one terminating in biceps brachii itself and the lower one was supplying the brachialis and thereafter continued as the lateral cutaneous nerve of forearm.

On exploring course of the lateral cord within the coracobrachialis muscles, it was observed to split into

musculocutaneous and lateral root of median nerve. The branch to the coracobrachialis was seen to be arising from musculocutaneous nerve. The lateral root of median nerve did not give any branch within the muscle and no communication was observed between musculocutaneous and lateral root of median nerve within the coracobrachialis muscle or in the later part of their course and thereafter it followed the normal course till the hand as per the description given in the textbooks. The right upper limb of the cadaver did not show any such variation of lateral cord and was absolutely normal in relation, formation, and branching pattern of brachial plexus. No other arterial or muscular variations were observed in either of the limb.

DISCUSSION

Coracobrachialis is flexor of the arm and this muscle is vulnerable to the injury from the retractors placed beneath coracoid process during shoulder reconstructive surgery. In the recurrent dislocation of shoulder and shoulder arthroscopies, the operative management by coracoid graft transfers could be the source of the lesions to the structures piercing the muscle.^[14,15] Coracobrachialis has been suggested for possible use as flap for coverage in infraclavicular defects of exposed axillary vessels, especially in post-mastectomy reconstructive surgery.^[16]

The interpretation of atypical course of lateral cord requires consideration of the development and innervation of upper limb musculature. Muscles of the limbs are derived from somatic precursor muscle cells from the ventrolateral edges of the somites opposite the developing limbs, which lie lateral to the neural tube and cause bulge in the overlying ectoderm. Somites have a specific effect on the position of the developing spinal nerves, which preferentially grow through the cranial half of the sclerotome. Spinal nerves are derived from two sources, motor nerve from the neural tube and the sensory nerves from the neural crest.^[9] The nerve cords from the spinal nerves that correspond to the early extent of limb buds grow distally to establish an intimate contact with the differentiating mesodermal condensations into intermuscular spaces and end in a pre-muscle mass. Sannes *et al.* in 2000^[17] suggested that the developing axons is regulated by expression of chemoattractants and chemorepulsants in an extremely coordinated and site-specific fashion. Any alterations in signaling between mesenchymal cells and neural growth cones can lead to significant variations and probably in this case the alteration in signaling caused the lateral cord to pass through the coracobrachialis muscle. Once

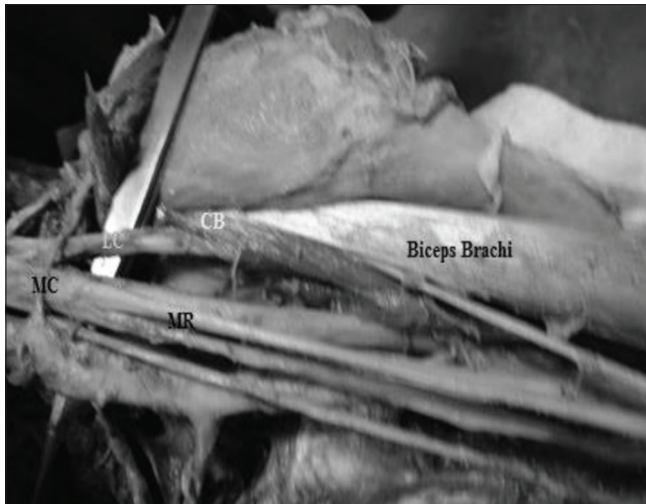


Figure 1: Left upper limb showing – MC – Medial cord, MR – Medial root of median nerve, LC – Lateral cord, CB – Coracobrachialis

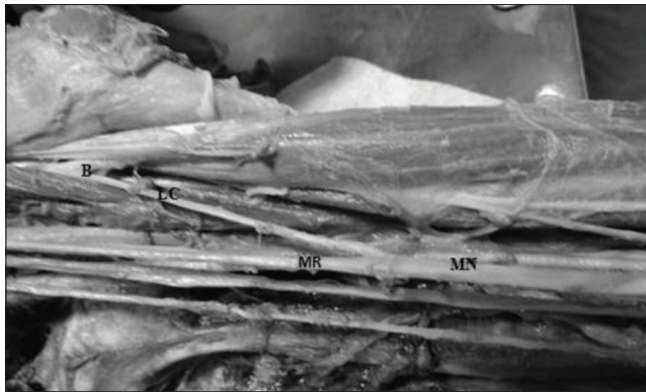


Figure 2: Left upper limb showing – MN – Median nerve, MR – Medial root of median nerve, LC – Lateral cord, B – brachialis

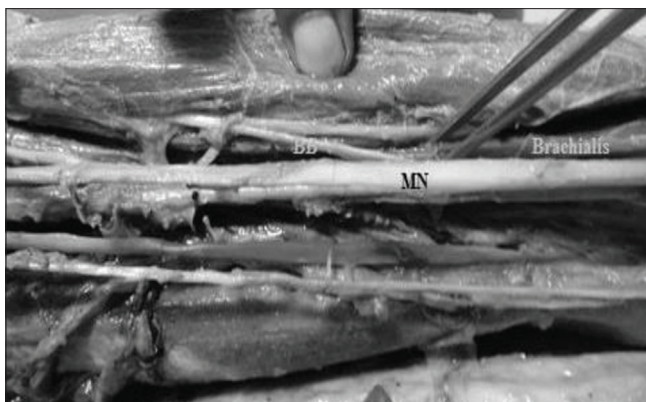


Figure 3: Left upper limb showing – MN – Median nerve, BB – Biceps brachii

formed any developmental differences would persist postnatally.^[18,19]

In this case study, the site of the formation of median nerve is much lower as compared to the usual site

of median nerve formation. Usually, the two roots (medial and lateral) are joining around the third part of axillary artery to form the median nerve.^[20] In our case, the two roots are coming as low as the insertion of coracobrachialis and then they are joining in front of brachial artery instead of axillary artery to form the median nerve. This may be due to the lower divisions and branches of the lateral cord. This will give rise to the varied presentation in high and low median nerve lesions than in the normal case.

CONCLUSION

The knowledge of course and distribution of the lateral cord of the brachial plexus as well as the low formation of the median nerve are important during exploration of neuronal tumor, shoulder arthroscopy, shoulder reconstructive surgery, and using the coracobrachialis flap for different surgical purposes.

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