

Case Report

Multiple Interneural Communications of Brachial Plexus-Anatomical Description and Clinical Significance

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Abstract

Brachial plexus blockade requires efficient and thorough understanding of the detailed anatomy of the plexus and the variations associated with the plexus. Anomalies associated with the branches of the plexus may complicate attempts of nerve blockade for anesthesia. The present study reports a rare neural communication between ulnar and radial nerves, observed in the left axilla at high humeral level, 6cm distal to tip of coracoid process of scapula and 2.8cm proximal to the entry of the radial nerve into the radial groove. The communicating ramus also gave a branch to the medial head of triceps brachii. Musculocutaneous and median nerve connection was also observed in the arm, 9cm distal to the tip of coracoid process. The studies regarding the communication between ulnar and radial nerve are rare and the coexistence of this variation along with median and musculocutaneous nerve communication is unique. Knowledge of such rare variations and anomalies are important to minimize the possible complications of regional anesthesia and surgery. The present report is a humble attempt to reinforce awareness of such neural variations among clinicians.

Keywords: brachial plexus, median, musculocutaneous, nerve, radial, ulnar

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Introduction

Detailed understanding of brachial plexus and its anatomic variations is extremely important for effective nerve blockade in this region. The present study depicts a unique case of radio ulnar communication in the left axilla. Many authors have reported communications between the branches of brachial plexus (1,2). However, literature regarding communication between the branches of medial and posterior cords of brachial plexus is rare, thus quantifying a need for further research of such variations and anomalies.

The study aims to report this unusual variation so as to assist the anesthetists in their attempt to block the nerves and orthopaedicians in assessing sensorimotor symptoms while diagnosing nerve injuries.

Case Report

The present variation of brachial plexus was incidentally observed during routine dissection of the left upper limb of a 50-year-old female cadaver. A rare communication between radial and ulnar nerves was observed in the left axilla at high humeral level, 6 cm distal to tip of coracoid process of scapula (Fig. 1). This communicating twig (* in Fig 1) commenced from the radial nerve, 2.8cm proximal to its entry into the spiral groove. The communicating ramus joined the ulnar nerve 3cm proximal to the point where the latter pierced medial intermuscular septum. This communication, measuring 6.5cm in length, was placed posteromedial to distal part of axillary artery and proximal part of brachial artery. It also gave a branch to medial head of triceps brachii (# in Fig 1); the latter was given 0.3cm

distal to the origin of communication and measured 4cm in length. The medial head of triceps was also supplied by a branch, given directly by radial nerve in the axilla. Additionally, the dissection also displayed a communication between musculocutaneous nerve (MCN) and median nerve (MN) in the left arm, 9cm distal to the tip of coracoid process of scapula (@ in Fig. 1). This communicating branch, 3.5cm in length, was given off from MCN after the latter pierced the coracobrachialis muscle. It joined the MN 13cm distal to the formation of the nerve by union of medial and lateral roots. The other branches of brachial plexus and adjoining vessels including axillary artery and vein displayed usual anatomy. No unusual anatomical variation was detected in the right arm.

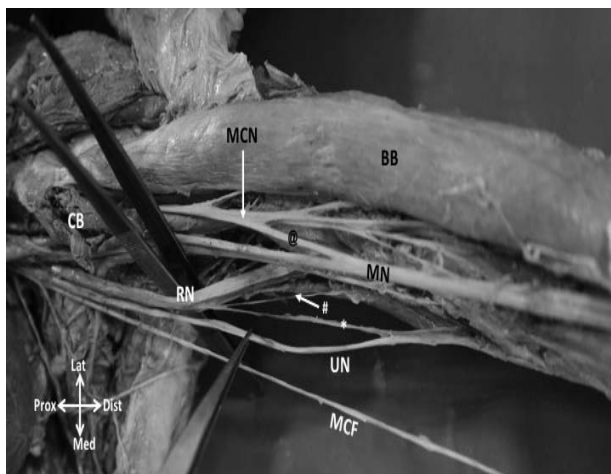


Figure 1: Left arm (anteromedial view) showing: CB – coracobrachialis muscle; BB – biceps brachii muscle; MN – median nerve; MCN – musculocutaneous nerve; RN – radial nerve; UN – ulnar nerve; MCF – medial cutaneous nerve of forearm; @ – communication between MCN and MN; * – communication between RN and UN; # – branch from * to triceps brachii; Lat – lateral; Med – medial; Prox – proximal; Dist – distal

Discussion

Various communications between different branches of brachial plexus and its cords have been reported in previous studies (1,2). However, communication between radial nerve and ulnar nerve is a rare finding. Literature suggests that the branches of brachial plexus develop in two planes - anterior and posterior. The nerves of the medial and lateral cords belong to the anterior plane and nerves of posterior cord belong to the posterior plane. Communications and variations are most frequently observed between the nerves of the same plane, thus explaining the common occurrence of communications between lateral and medial cords and their branches and rare occurrence of radioulnar

communications (1). The uniqueness of the present investigation lies in the fact that the radioulnar communion encountered in the arm also provided a twig to the medial head of triceps brachii. To the best of our knowledge, this finding has not been reported earlier. The medial head of triceps thus is observed to receive nerve supply from three different sources, from the radial nerve in axilla and in spiral groove, and another branch from the communication between radial and ulnar nerve in the arm. In view of its innervation, the medial head of triceps brachii can justifiably be designated as a composite muscle. The anatomical scenario of present report also suggests that in the event of injury to radial nerve, the medial head of triceps brachii would be spared. Moreover, the authors strive to report this unusual neural variation in an attempt to provide anatomists a base for further studies in this direction.

The dissection also displayed a communication between MCN and MN. The musculocutaneous – median nerve communication has been classified into different types. Type I being where MCN communicates with MN before piercing coracobrachialis muscle, Type II where MCN communicates with MN after piercing coracobrachialis and Type III where MCN does not pierce coracobrachialis (1). According to this classification, our study displays Type II communication between MCN and MN.

Such variations can be described on the basis of embryological development of nerves of brachial plexus. Site specific expression of some chemotactic factors govern the path taken up by developing axons. Any deviation in such signalling pathways which regulate the neuronal growth cones and mesenchymal cells can result in significant variations. The developmental differences once formed would persist postnatally (3,4,5,6). Thus, the lack of coordination between the formation of the limb muscles and their innervation may result in the appearance of aberrant communications between different cords and their branches.

Further some investigators have considered the theory of ontogeny recapitulating phylogeny for the interpretation of the nerve anomalies of the arm (7). Studies report the presence of such communications in monkeys and apes. Their occurrence in humans depicts the primitive motor supply of muscles of upper limb (3).

Anatomic variations of peripheral nerves are important for Orthopedic Surgeons, Neurophysicians, Physiotherapists and Radiologists. Awareness of such unusual neural variations as noted in the present study may prove valuable in diagnosing peripheral

neuropathies and in nerve grafting. Further their knowledge is of immense importance in planning radical neck dissections, managing shoulder joint trauma and in treatment of fracture of surgical neck of humerus. Also, their proper understanding helps orthopedic surgeons in assessing sensorimotor symptoms while diagnosing nerve injuries. It has been stated that anomalous origin, course and distribution of the various branches of brachial plexus and its cords may succumb to iatrogenic injuries and entrapment neuropathies (8). Such neural variations if ignored, may pose problems for the radiologists and anesthetists leading to ineffective nerve blockade. Moreover, the treatment of complex regional pain syndrome can be complicated due to unusual communications between the branches of brachial plexus because they carry the sympathetic supply to the upper limb.

In summary, the knowledge of anatomical aberrations in the brachial plexus are extremely important for diagnosing peripheral neuropathies, nerve grafting and for effective peripheral nerve blockade in this region. This report is a humble attempt to delineate the potential clinical implications and possible embryological explanation of the said variations along with a brief description of their phylogenetic basis.

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