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Communicating Branch of Casserio's Nerve and Caput Accessorium of Biceps Brachii - A Case Report

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Abstract: ***Casserio's Nerve (Musculocutaneous nerve (MCN)), a branch from the lateral cord of the brachial plexus, supplies the muscles of the front of arm, which include biceps brachii, brachialis and coracobrachialis [1]. In this case report, a rare communication between MCN and Median nerve (MN) was observed bilaterally along with a supernumerary head of biceps brachii (caput accessorium) in the left upper limb [2]. These anatomical variations are of great significance when we consider the number of operative procedures routinely done following trauma around these areas. Compression and entrapment neuropathies are of concern in such variations as the site of lesion and clinical features may be difficult to understand.***

Keywords: Musculocutaneous nerve, Median nerve, Communication, Biceps brachii, Supernumerary head.

1. Introduction

The brachial plexus is anatomically defined as the nerve network originating from the ventral rami of the spinal nerves C4 or C5 to T1 or T2. MCN is derived from lateral cord of brachial plexus, it conveys fibers of C5, C6 and C7 roots. The nerve initially accompanies the lateral side of the axillary artery, pierces the coracobrachialis muscle, then pass downwards and laterally across the front of arm between biceps brachii and brachialis. Just below the elbow, it pierces the deep fascia lateral to tendon of biceps brachii and continues as lateral cutaneous nerve of forearm. The nerve supplies the coracobrachialis, biceps brachii, brachialis, gives an articular twig to elbow joint, a nutrient branch to humerus and supplies the skin of the anterolateral region of forearm up to the base of the thenar eminence [3]. Biceps brachii, a muscle of anterior compartment of arm takes its origin by two heads, short head in combination with coracobrachialis muscle from the coracoid process and a long head from the supraglenoid tubercle of the scapula. Although anatomical variations of brachial plexus and supernumerary head of the biceps brachii are not rare, the combination of both variations and the bilateral variability is a rare occurrence.

2. Case Report

The following variations were observed in an adult male cadaver during dissection of upper limb for undergraduate teaching at Government Medical College Kottayam. In the right upper limb, the MCN and MN originated normally from the brachial plexus. The MCN, lying lateral to axillary artery gave a branch to coracobrachialis muscle, pierced the same and descended down. In its course it supplied the biceps brachii and further down the MCN divided into two divisions medial and lateral, both divisions were of the same thickness. The medial division was a communicating branch to MN and the lateral division supplied the brachialis and continued downward as lateral cutaneous nerve of forearm.

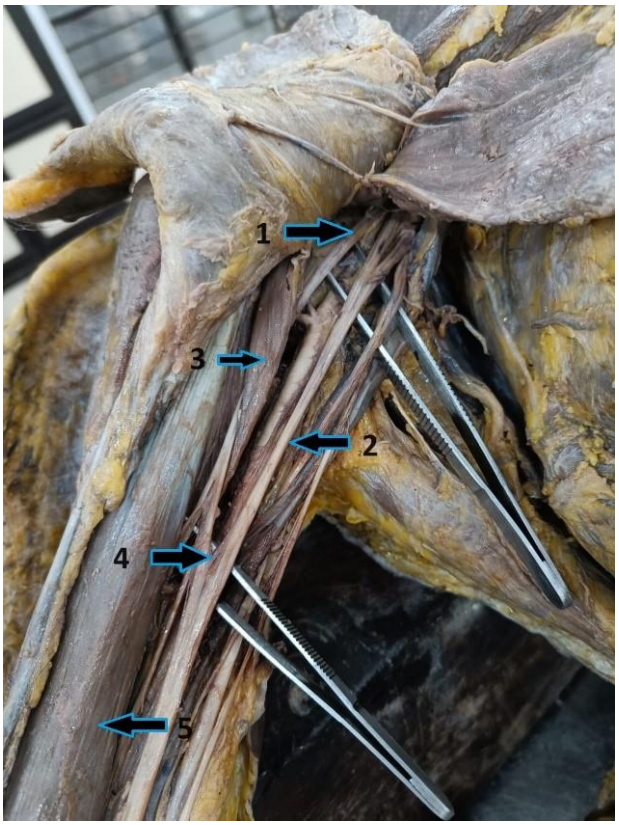

Figure 1: Right upper limb (1: Musculocutaneous nerve, 2: Median nerve, 3: Coracobrachialis muscle, 4: Communicating branch, 5: Biceps brachii muscle).

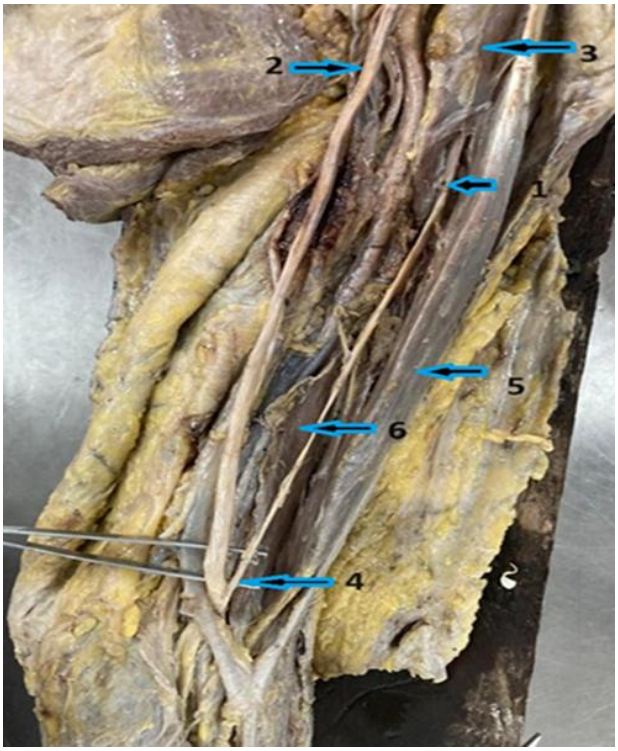

Figure 2: Left upper limb (1: Musculocutaneous nerve, 2: Median nerve, 3: Coracobrachialis muscle, 4: Communicating branch, 5: Biceps brachii muscle, 6: Supernumerary head)

The communicating branch from MCN was directed medially downwards and joined the MN in the middle of arm. The remaining course of median nerve was normal. In the left upper limb, the MCN and MN had a normal origin from brachial plexus. The MCN, after piercing the coracobrachialis, supplied the short and long head of biceps. The nerve then divided into two divisions, medial and lateral. The lateral division supplied the supernumerary head, biceps brachii and brachialis whereas the medial division further divided into two, one passed between the supernumerary head and biceps brachii and continued as lateral cutaneous nerve of forearm and the other division communicated with the median nerve in cubital fossa. In addition to this communication a supernumerary head of biceps brachii was identified in the left upper limb. The supernumerary head took its origin from middle of shaft of humerus below the insertion of coracobrachialis and fused with the biceps tendon and was inserted into the radial tuberosity and bicipital aponeurosis.

3. Discussion

Anatomical variation is a normal presentation of body structure with morphological features different from those described in the literature [4]. In general, variations are classified into two groups: one is in the nerve course or distribution and the other is associated with structures surrounding the nerve (e. g., accessory muscles, ligaments, or osseous foramina) [5]. Around 29 forms of brachial plexus was listed by Kerr et al in 175 cadavers dissected between 1895 and 1910 [6]. The course of the MCN and its relationship with the coracobrachialis muscle was first observed by an Italian Anatomist Giulio Cesare Casserio (1561 - 1616), student of the anatomist Girolamo Fabrici d'Acquapendente from Padua [1]. The incidence of communications between the MCN and MN varied between 13.9 and 41.5% [7]. Le Minor, (1992) classified the communication into 5 types, Type I - No communication between MN and MCN, Type II - Fibres of medial root of MN pass through the MCN and join the MN in the middle of the arm. Type III - Lateral root fibres of MN nerve pass along MCN and after some distance leave it to form lateral root of MN, Type IV - MCN fibres join the lateral root of median nerve and after some distance the MCN arises from MN, Type V - MCN is absent and entire fibres of MCN pass through lateral root and fibres to the muscles supplied by MCN branch out directly from MN [8]. Veinreratos and Anagnostopolou classified the communication into 3 types. In type I, the communication was proximal to the entrance of the MCN into the coracobrachialis muscle, in type II the communication was distal to the coracobrachialis muscle and in type III the nerve as well as the communicating branch did not pierce the muscle [9]. Choi et al classified into three types. In type I, the MCN and MN were fused; in type II, there were one communicating branch between the MCN and MN and in type III, two communicating branch were present between MCN and MN [10]. According to these classifications our case report belonged to type II, Le Minor, Veinreratos and Anagnostopolou and Choi et al systems of classification.

Kosugi et al in their dissection of 546 upper limbs (273 cadavers), supernumerary heads of the biceps brachii were found in 75 limbs (13.7%) and communication between the MCN and the MN was found in 43 out of the 75 limbs (57.3%) [11].

Dussin et al identified a third head of the biceps brachii originating from the fibers of the brachialis muscle, as well as a communicating branch between the MCN and the MN in the same limb [12].

A variation where there is a combination of communication between MCN and MN and supernumerary head of biceps brachii as such is rare. In our case it presented with bilateral variability.

Developmental basis of the variation:
The upper limb buds appear by day 24 of intrauterine life [13]. The axonal outgrowth into the limb buds starts by around day 35–38 of intrauterine life and by 37 - 42 days the axonal outgrowth has already reached the point where the ulnar, median and musculocutaneous nerve bundles divide. The muscles develop from the mesenchyme of paraxial mesoderm in the fifth week of intrauterine life and axis artery of upper limb is derived from seventh cervical intersegmental artery. Regional expression of five Hox D (Hox D 1 to Hox D 5) genes is responsible for upper limb development. Brachial plexus axon bundles grow out into an environment of chemical signals in which numerous obstacles like geometry of arm bud, cartilaginous bone precursors and vessels are present. When these factors are constant, the brachial plexus will have the normal plexus outline, while any variability in these factors gives rise to typical variations in brachial plexus. The communication between MCN and MN was described as a split of the C567 axon bundle (lateral cord) around a vessel, probably a vein, as occurred in 54% of brachial plexus in a study by Leijnse et al [14], however remnants of intersegmental arteries, position of subclavian artery, any

artery passing through split in C567a (lateral cord) are also attributed to variations of the brachial plexus [15]. According to the Recapitulation Theory by Ernst Haeckel, 1866 that Ontogeny Recapitulates Phylogeny, these variations may be because of a developmental anomaly since many studies of comparative anatomy have observed the existence of similar connections in monkeys and other primates, thus this connections may represent the primitive nerve supply of the anterior compartment muscles. [16] - [17].

Another association is the presence of the third head of biceps brachi (caput accessorium) and the communicating branch as seen in this case report. The muscles of upper limb develop as two mesenchymal condensations, dorsal (for supinator - extensor muscle group) and ventral (flexor pronator muscle group) the developing nerves do not penetrate this condensation due to high levels of glycosaminoglycans. However, at places where a nerve can pierce a mesenchymal condensation, the nerve will modify the development of that muscle. This cause changes in muscle growth regulatory genes, such as Pax 3 and Myf 5, and transcription factors, such as Myo D [12].

Another view is that, the third head of the biceps muscle was considered as a part of brachialis muscle that was separated by the musculocutaneous nerve, where its lower insertion migrated from ulna to radius.

4. Conclusion

Neuromuscular variations of the upper limb are not uncommon. Knowledge of these variations is important for anatomists, surgeons and radiologists. The presence of supernumerary head of biceps brachii muscle increases its kinematics and can also increase the power of flexion and supination of the forearm. The presence of both variations can increase the incidence of compression and entrapment neuropathies. Similarly hypertrophy of the third head of the biceps brachii can compresses the communicating branch. Since fibers of MN are passing through this communication, the compressive symptoms can simulate carpal tunnel syndrome. This can make the diagnosis difficult. Conventional surgical methods cannot correct the compression, leading to poor surgical outcomes. Unilateral occurrence of third head can mimic soft tissue tumour. Even mobilization of these supernumery head is required for adequate exposure in shoulder dislocation or fracture shaft of humerus. Thus, it is important for the clinicians to know about the neuromuscular variations and the information's on one such variation given in this case report will be useful.

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