ORIGINAL RESEARCH PAPER

Volume-8 | Issue-8 | August - 2019 | PRINT ISSN No. 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

COMMUNICATING FIBERS BETWEEN BRACHIALIS AND BRACHIORADIALIS MUSCLES - MEDIAL HEAD OF BRACHIORADIALIS MUSCLE? WITH COMMUNICATION BETWEEN MUSCULOCUTANEOUS, MEDIAL AND ULNAR NERVES - A CASE REPORT

Anatomy

Dr. Motiram Ramji Khandode Senior Resident, Department of Anatomy, Maulana Azad Medical College, New Delhi 4100 002

Dr. Sumedh Sonavane* Associate Professor, Department of Anatomy, Topiwala National Medical College, & BYL Nair Hospital Mumbai *Corresponding Author

ABSTRACT

During routine classroom dissection, conducted for undergraduate medical students, we encountered, anatomical variation of some lateral fibers of the brachialis muscle merges with brachioradialis muscle, suggesting the small medial head of the brachioradialis muscle associated with communication between musculocutaneous, median and ulnar nerves. Radial nerve passes between these two heads of brachioradialis muscle and median nerve at its immergence give communicating branch to ulnar nerve, musculocutaneous nerve also gives communicating branch to median nerve at the level of insertion of coracobrachialis muscle. Knowledge regarding presence of radial nerve in between two heads of brachioradialis muscle and communications between musculocutaneous, median and ulnar nerves is immense important for radial nerve entrapment for clinicians and axillary surgeons. Possible embryological explanation and clinical importance have been discussed.

KEYWORDS

Brachialis; Brachioradialis; Radial nerve entrapment, Axillary Surgeons

INTRODUCTION

Brachioradialis is the most superficial muscle along the radial side of the forearm, and forms the lateral border of the cubital fossa/elbow pit. Its proximal attachment is from superior two-thirds of the lateral supracondylar ridge of the humerus. The muscle fibers end above mid-forearm level in a flat tendon which inserts on the lateral side of the distal end of the radius, usually just proximal to its styloid process. Often the proximal fibers of Brachioradialis attached to brachialis but rarely reported. We report some lateral fibers of the brachialis muscle merges with brachioradialis muscle, suggesting the small medial head of the brachioradialis muscle and radial nerve passes between these two heads. Median nerve at its immergence give communicating branch to ulnar nerve, musculocutaneous nerve also gives communicating branch to median nerve at the level of insertion of coracobrachialis muscle. Hence there may be radial nerve entrapment between these two heads of brachioradialis muscles.

Anatomy of Brachioradialis Muscle:

Brachioradialis is the most superficial muscle along the radial side of the forearm, and forms the lateral border of the cubital fossa/elbow pit. Its proximal attachment is from superior two-thirds of the lateral supracondylar ridge of the humerus. The muscle fibers end above mid-forearm level in a flat tendon which inserts on the lateral side of the distal end of the radius, usually just proximal to it styloid process. In rare instances it is double or absent. Often the proximal fibers of Brachioradialis attached to brachialis but rarely reported [1]. In 1925, Jackson wrote the brachioradialis (Supinator Radii Longus) flexes the forearm at elbow. This action is strongest when forearm is pronated. It acts as a supinator only when the arm is extended in pronated position. It then helps to put the arm in semi-pronated position. While forearm flexed and supinated, it acts as a pronator [2]. This looks to be in general disagreement with most modern opinions which states that it is an elbow joint flexors only,[3,4] with previous researchers opinion gave name as supinator longus. [5] McMinn conceded that the brachioradialis has some weak pronating action when fully supinated position. [3]

Anatomy of Median, Musculocutaneous and Ulnar nerves:

The median nerve is usually formed just lateral to third part of axillary artery by the union of its medial and lateral roots coming from medial and lateral cords of brachial plexus respectively. It then descends down in front of arm and crosses brachial artery from lateral to medial side and enters in cubital fossa along with the brachial artery.

The musculocutaneous nerve is a branch of lateral cord of brachial plexus. It pierces the coracobrachialis muscle and enters front of the arm. It supplies the biceps, brachialis and coracobrachialis muscles. The ulnar nerve is a branch of medial cord of brachial plexus. [1]

Case Report

The present report describes a case of right sided variation in communicating fibers between brachialis and brachioradialis muscles (fig. no.1) associated with communications between median, radial and ulnar nerves (fig. no. 2) found during classroom dissection of right sided axilla and arm at Topiwala National Medical College Mumbai in 60 years male cadaver. Some lateral fibers of the brachialis muscle merges with brachioradialis muscle, suggesting the small medial head of the brachioradialis muscle and radial nerve passes between these two heads.

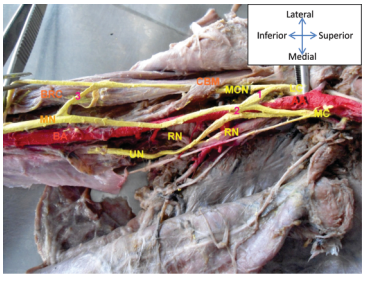

Fig. No. 1. Showing Photograph of Communication between musculocutaneous, median, and ulnar nerves. [MC - Medial Cord, LC - Lateral Cord, MCN - Musculocutaneous Nerve, RN - Radial Nerve, UN - Ulnar Nerve, MN - Median Nerve, AA - Axillary Artery, BA - Brachial Artery, CBM - Coracobrachialis, BRC - Brachialis, 1 - Lateral root of Median Nerve, 2 - Communication between Median and Ulnar nerves, 3 - Communication between Musculocutaneous and Median Nerves

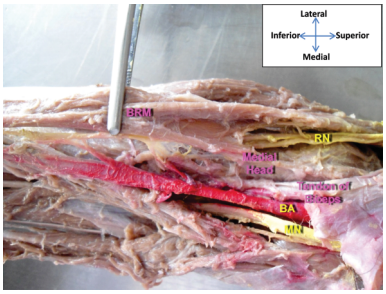

Fig. No. 2. Photograph showing Radial Nerve (RN) passing between two heads of Brachioradialis Muscle (BRM).

DISCUSSION:

The present case reports median nerve at its immergence give communicating branch to ulnar nerve, musculocutaneous nerve also gives communicating branch to median nerve at the level of insertion of coracobrachialis muscle (fig. no. 1) In addition to this some lateral fibers of the brachialis muscle merges with brachioradialis muscle,

(fig. no.2) suggesting the small medial head of the brachioradialis muscle and radial nerve passes between these two heads. Hence there may be radial nerve entrapment between these two heads of brachioradialis muscles.

It is important to be aware of such variations while planning a surgery in the region of axilla or arm, as these nerves are more liable to be injured during surgical procedures.

The embryological basis for formation of anomalous nerve plexuses not fully understood. Various theories have been proposed like cell signaling. During fifth week of intrauterine life development, the axons of nerve grow distally to establish contact with growing limb bud, improper singling may lead to anomalous nerve plexuses [6]

The factors which lead the nerve growth are chemo-attractants/netrins and repellant like semaphorins and ephrins which ultimately direct cell processes to for appropriate site. [7]

Another theory suggests that improper balance of calcium which is required for the guidance molecule to work effectively and stabilize microtubules. Microtubules misalignment lead to the development of nerve in new direction forming the anomalous nerve plexuses in the body [8]

Brachial plexuses is a network supplying to upper limb with root value C5 to T1.

Priti Chaudhary and et. al reported communication between median nerve and musculocutaneous nerve observe in 10% of cases studied in 60 cadavers. [9]

Ontogeny

The presence of the communications may be attributed to the random factors influencing the mechanism of formation of the limb muscles and the peripheral nerves during the development of embryonic life. Significant variations in the nerve patterns may be a result of the altered signaling between the mesenchymal cells and neuronal growth cones and once formed antenatally persist postnatally.

Sannes et al and Abhay et al [10] these may be due to circulatory factors at the time of fusion of the brachial plexus cords Kosugi et al, [11]. Iwata [12] believed that the human brachial plexus appears as a single radicular cone in the upper limb bud, which divides longitudinally into ventral and the dorsal segments. The ventral segments give roots to the median and the ulnar nerves with musculocutaneous nerve arising from the median nerve. He further kept the possibility of failure of the differentiation as a cause for some of the fibers taking an aberrant course as a communicating branch. Chiarapattanakom et al [13] are of the opinion that the limb muscles develop from the mesenchyme of local origin, while axons of spinal nerves grow distally to reach the muscles and/or skin. They blamed the lack of coordination between the formation of the limb muscles and their innervation for appearance of a communicating branch.

Phylogeny

Chauhan and Roy strongly recommend the consideration of the phylogeny and the development of the nerves of the upper limb for the interpretation of the anomalous nerve of the arm. Considering the communication between the musculocutaneous and the median nerve as a remnant from the phylogenetic or comparative anatomical point of view and that the ontogeny repeats/recap the phylogeny, they feel that the variations seen are the result of the developmental anomaly. [14]
Presence/finding of medial head of brachioradialis muscle can be well understood on embryological basis. The muscles of superior extremity take origin from muscle primordia which develop from mesoderm. Further the formation of skeletal elements the single muscle mass start to develop/shape up into different muscles. Thus due to failure to the muscle primordial at certain places lead to formation of such kind of muscular variation.[15]

CONCLUSION

It is important to be aware of variable communicating fibers between brachialis and brachioradialis muscle and passing course of radial nerve between two heads of brachioradialis muscle can be cause for nerve entrapment. Communications between musculocutaneous, median and ulnar nerves should be kept in mind while planning a surgery in the region of axilla or arm, as these nerves are more liable to be injured during surgical procedures. Clinicians, axillary surgeons should be aware of such variations.

List of Abbreviations used:

AA - Axillary Artery, BA - Brachial Artery, BRC - Brachialis, BRM - Brachioradialis muscle, CBM - Coracobrachialis muscle, Fig - Figure, MC - Medial cord, MCN - Musculocutaneous nerve, LC - Lateral cord, UL - Ulnar nerve

Competing interests:

None to disclose

Acknowledgements

Our sincere thanks to Department of Anatomy Topiwala National Medical College Mumbai and Dissection Hall staff who made brilliant work of preservation of cadaver and made it available for dissection; without their unconditional support this work would have been a distant reality. Author is also thankful to authors and publishers of those articles or books that are cited in references from where the literature has been reviewed and discussed.

End notes

REFERENCES

1. Sushan Standring Gray's Anatomy, 41th Edt.; Churchill Livingstone 2015, pp. 851
2. Jacson C. Morris human anatomy. Philadelphia: P Blakistons Sons and Company 1925:pp.416-422
3. McMinn RWH Last's anatomy regional and applied. London: Churchill Livingstone, 19994: p. 989
4. O Rahilly R. Anatomy - a regional study of human structure, 5th Edt. Philadelphia: WB Saunders, 1986:p.126
5. Piersol G. Human anatomy. Philadelphia: Liippincott, 1293:pp. 586-598
6. Tatar I, Brohi R, Sen F, Tonak A, Celik H. Innervation of the coraco-brachialis muscle by a branch from the lateral root of the median nerve. Folia Morphol (Warsz) 2004; 63(4):pp. 503-506.
7. Budhiraja V, Rastogi R, Asthana AK, Sinha P, Krishna A, Trivedi V. Concurrent variations of median and musculocutaneous nerves andtheir clinical correlation-a cadaveric study. Italian Journal of Anato-my and Embryology 2011; 116(2): 67.
8. Schoenwolf GC, Bleyl SB, Brauer PR, Francis-west PH. Developmentmof the peripheral nervous system. In: Schoenwolf GC, Editor. Larsen's Human Embryology. Philadelphia.
9. Priti Chudhary et. al. 'Communication Between Musculocutaneous and Median Nerve - Different Types and Their Incidence in North Indian Population, Indian Journal of Clinical Practice, September 2013: Vol. 24, No. 4, pp. 364-371.
10. Sannes HD, Reh TA, Harris WA. Axon growth and guidance. In: Development of Nervous System. Academic Press: New York 2000:pp.189-97.
11. Kosugi K, Mortia T, Yamashita H. Branching pattern of musculocutaneous nerve. Cases possessing normal biceps brachii. Jikeakai Med J 1986;33:pp.63-71.
12. Iwata H. Studies on the development of the brachial plexus in Japanese embryo. Rep Dept Anat Mie Prefect Univ Sch Med 1960;13:129-144. Cited by Prasada Rao PV, Chaudhary SC. Communication of the musculocutaneous nerve with the median nerve. East Afr Med J 2000;77(9):pp.498-503.
13. Chiarapattanakom P, Leechavengvongs S, Witoonchart K, Uerpairojkit C, huvasethakul P. Anatomy and internal topography of the musculocutaneous nerve: the nerves to the biceps and brachialis muscle. J Hand Surg Am 1998;23(2):pp.250-5.
14. Chauhan R, Roy TS. Communication between the median and musculocutaneous nerve: a case report. J Anat Soc of India 2002;51(1): pp.72-5.
15. Langman J. Medical embryology. 2nd Edt., Baltimore, Williams and Wilkins.1969:pp.143-146.