



ANATOMICAL VARIATION IN THE BRANCHING PATTERN OF RADIAL NERVE AND ITS CLINICAL SIGNIFICANCE

Anatomy

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ABSTRACT

INTRODUCTION: Radial nerve is the continuation of the posterior cord of the brachial plexus in the Axilla. It is the nerve of extensor compartment of upper limb. Though, variation in the branching pattern of the posterior cord of the brachial plexus is common, variation in the branching pattern of the radial nerve is very rare. Radial nerve has a long and tortuous course in the upper limb. Injury to the nerve can occur due to various causes at many potential sites along its course. Signs and symptoms of radial neuropathy depend upon the site of injury. Injury to the nerve distal to innervation of triceps brachii results in loss of extensor function with sparing of function of the triceps resulting in the characteristic 'wrist drop'. **AIM AND OBJECTIVES:** This study was conducted to provide a thorough description of variation in the branching pattern of radial nerve along with its clinical significance. **MATERIAL AND METHODS:** This study was conducted on 22 (20 male, 2 female) formalin fixed human cadavers available in the Department of Anatomy, Osmania Medical College, Koti, Hyderabad. **RESULTS:** The radial nerve was having its origin from the posterior cord as its continuation, then it split into radial nerve proper and one accessory radial nerve. Branches of the radial nerve in the arm were given off from the accessory division and the radial nerve proper continued as the main radial nerve with normal course and relations in one of the male cadaver among 22 cadavers that is in 2.27% cases. **CONCLUSIONS:** Variation in the branching pattern of the radial nerve though rare, exists significant in the management of surgical exploration of the axilla or arm and is important in evaluating post-traumatic injuries and repair of peripheral nerve injuries and during flap dissections.

KEYWORDS

Radial Nerve, Accessory Division, Posterior Cord Of Brachial Plexus, Triceps Brachii

INTRODUCTION:

The radial nerve is the continuation of the posterior cord in the axilla with root values of C5, 6, 7, 8 and T1. The radial nerve is also known as the "great extensor nerve" due to its innervation of the triceps, wrist and finger extensors. It emerges below the latissimus dorsi between long and medial heads of triceps. Here it gives off the nerve to the long head of triceps, medial head of triceps (ulnar collateral nerve) and few cutaneous branches, then passes into the groove for radial nerve on the posterior surface of humerus, winding spirally round the posterior surface of the humerus in contact with the periosteum. In the groove the nerve gives off branches to the lateral and medial heads of triceps and anconeus. Then it pierces the lateral intermuscular septum to the lateral epicondyle. The nerve then divides in front of the lateral epicondyle into superficial and deep branches. The deep branch a motor nerve also known as posterior interosseous nerve twist around radius and supplies the extensor compartment of forearm and then dips in the interosseous membrane and ends at the wrist joint. Here a rare variation in the branching pattern of radial nerve in axilla is found during routine cadaveric dissection of brachial plexus.

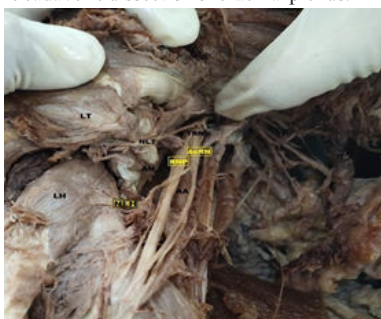


Fig: LT- Long head of triceps, NLT- Nerve to Long head of triceps, AN- Axillary Nerve, TRN- Main trunk of Radial Nerve, RNP- Radial Nerve Proper, AcRN- Accessory Radial Nerve, LH- Lateral head of triceps, NLH- Nerve to Lateral head of triceps, AA- Axillary Artery.

MATERIAL AND METHODS:

Twenty-Two (Twenty male and Two female) adult formalin fixed human cadavers from Department of Anatomy, Osmania Medical College, available during study period were taken. None of them had

any signs of surgery, wound scars or trauma in the Axilla or Arm.

During routine dissection, after removal of skin, loose connective tissue, fat and lymph nodes of axilla, brachial plexus was dissected on both right and left sides of the cadaver. The cords and the branches of the cords of the brachial plexus were identified. The radial nerve was originating from the posterior cord as one of the terminal branches in the infraclavicular part of the brachial plexus. Brachial plexus of each of the 44 upper limbs (both limbs of 22 cadavers) were studied meticulously.

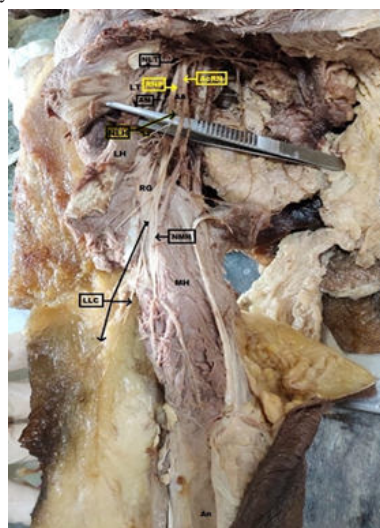


Fig: RNP- Radial Nerve Proper, AcRN- Accessory Radial Nerve, LT- Long head of triceps, NLT- Nerve to Long head of triceps, AN- Axillary Nerve, AA- Axillary Artery, LH- Lateral head of triceps, NLH- Nerve to Lateral head of triceps, RG- Radial Groove, MH- Medial Head, NMH- Nerve to Medial Head, LLC- Lateral Cutaneous Nerve of Arm, An- Anconeus.

RESULTS:

In the present study, in one of the upper limbs on the left sided axilla of an embalmed adult male cadaver that is unilaterally (2.27%), the radial nerve after having its origin from the posterior cord was splitting into

radial nerve proper and one accessory radial nerve after having a short course for 1 cm in the axilla. The accessory division was giving off the all the branches which are expected to have origin from the main radial nerve. Both the divisions had their course in the radial groove. The accessory division was giving off the muscular and cutaneous branches in the arm. The radial nerve proper continued as the main radial nerve in the radial groove and had a usual course in the rest of the upper limb. In the cubital fossa was radial nerve proper splitting into superficial and deep branches which had their further usual course. The origin, course and branching pattern of radial nerve on the right side of this cadaver was normal.

DISCUSSION:

Variations in the formation of radial nerve have been reported in literatures quite frequently, but variation in the branching pattern of the radial nerve is reported in very few cases. In one case there was a report that the posterior cord divided into two roots, enclosing the subscapular artery and the two roots fused to continue as radial nerve. Kuwar also reported in a case where the radial nerve had two roots arising from the posterior cord and the two roots were clasping the subscapular artery. Bertha et al. reported in one case instead of a single entity, the posterior cord had two parts as upper and lower; the upper posterior cord continued as axillary nerve and gave off the upper root of radial nerve, the lower posterior cord continued as the lower root of radial nerve and joined with the upper root to form radial nerve. There was a report in a case where the radial nerve was arising from the union of posterior division of inferior trunk and the middle trunk and there was no contribution from the superior trunk. Oluyemi et al. also have reported the radial nerve to have origin from the posterior aspect of the medial cord where the cords were found to be present as medial and lateral cords. In another case study there was accessory radial root which arose from the inferior trunk and was communicating with the root which had its origin from the posterior cord to form the radial nerve. These variations are not similar to the present study where the formation of radial nerve was as usual but the radial nerve itself was splitting into radial nerve proper and accessory radial nerve.

Identification of radial nerve is necessary during the posterior approach to the humerus to lessen the possibility of neurologic compromise. Lesions of the radial nerve at its origin from the posterior cord in the axilla may be caused by pressure from a long crutch (crutch palsy). Triceps is also involved when lesions occur at this level and is usually spared in the more common lesions of the radial nerve in the arm as it lies alongside the spiral groove, where the nerve is commonly affected by fractures of the humerus. Compression of the radial nerve against the humerus occurs if the arm is rested on a sharp edge such as the back of a chair (Saturday night palsy). Radial nerve can also be injured without visible external injuries like compression by the inter-muscular septum or by healing fracture callus. Rarely iatrogenic injuries also involved radial nerve during surgical procedures.

CONCLUSION:

Variation in the branching pattern of radial nerve relatively rare as compared to the other types of variations in the formation of radial nerve. But this knowledge is important for Surgeons, Orthopaedicians, and Neuro physicians as it provides the knowledge of course of radial nerve in axilla and posterior compartment of arm to prevent possible complications. Also, in evaluating post-traumatic injuries and repair of peripheral nerve injuries and during flap dissections.

REFERENCES:

1. Standring S. Gray's Anatomy. The Anatomical Basis of Clinical Practice. In: Johnson D, editor. Pectoral girdle and upper limb. 41th ed. Edinburgh: Churchill Livingstone; 2008. p. 781-829.
2. Sinmatamby, C. S. Last's Anatomy: Regional and Applied. 11th ed. London, Churchill Livingstone, 2006. pp.58-100.
3. Nurul-Huda, M. N.; San, A. A. & Fauziah, O. An Anomalous pattern of superficial branch of radial nerve - A cadaveric case report. *Int. J. Morphol.*, 32(1):29-31, 2014.
4. Seigerman DA, Choung EW, Yoon, RS, Lu M, Frank MA, Gaines LCDRRJ, et al. Identification of the Radial Nerve During the Posterior Approach to the Humerus: A Cadaveric Study. *J Orthop Trauma* 2012; 26:226-228.
5. Jamuna M. A rare variation of the branching pattern of radial nerve. *International Journal of Anatomical Variations* 2011; 4:22-24.
6. Bhat KMR, Girijavallabhan V. Variation in the branching pattern of posterior cord of brachial plexus. *Neuroanatomy*. 2008; 7: 10-11.
7. Kuwar RB, Bilodi AK. Clasp of subscapular artery by radial nerve. *Kathmandu Univ Med J (KUMJ)*. 2007; 5: 253-255.
8. Bertha A, Kulkarni NV, Maria A, Jestin O, Joseph K. Entrapment of deep axillary arch by two roots of radial nerve – an anatomical variation. *J Anat Soc India*. 2009; 58: 40-43.
9. Aktan ZA, Ozturk L, Bilge O, Ozer MA, Pinar YA. A cadaveric study of the anatomic variations of the brachial plexus nerves in the axillary region and arm. *Turk J Med Sci*. 2001; 31: 147-150.
10. Oluyemi KA, Adesanya OA, Ofusori DA, Okwuonu CU, Ukwanya VO, Om'iniabohs FA, Odion BI. Abnormal pattern of brachial plexus formation: an original case report. *The Internet Journal of Neurosurgery*. 2007; Volume 4: Number 2.
11. Romanes GJ. Cunningham's Manual of Practical Anatomy, Volume 1, upper and lower

- limbs. 15th ed. New York: Oxford medical publications; 2010. p.4-73.
12. Chang IT, Hohler AD. Bilateral radial nerve compression (crutch palsy): A case report. *J Neurol Neurophysiol* 2012; 3:3.
13. Snell RS. *Clinical Anatomy by Regions*. 9th ed. Philadelphia: Wolters Kluwer/Lippincott Williams and Wilkins; 2012. p. 430-431.
14. Drake RL, Vogl AW, Mitchell AWM. *Anatomy for Students*. 2nd ed. Edinburgh: Churchill Livingstone; 2010. p. 663-774.
15. Yakkanti MR, Roberts CS, Murphy JBS, Acland RD. Anterior transposition of the radial nerve-A cadaveric study. *Journal of Orthopedic Trauma* 2008; 22(10):705-708.
16. Raghavendra D R, Nirmala D, Maveshettar G F. STUDY OF VARIATION IN COURSE OF RADIAL NERVE IN AXILLA AND POSTERIOR COMPARTMENT OF ARM. *Int J Anat Res* 2018; 6(4.1): 5792-5796. DOI: 10.16965/ijar.2018.343