



STUDY OF ORIGIN OF BRANCHES OF THE RADIAL NERVE IN THE AXILLA, A CADAVERIC STUDY

Anatomy

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ABSTRACT

Background: Radial nerve is the continuation of the posterior cord of the brachial plexus in the axilla. **Objectives:** To know the mode of origin of branches of the radial nerve in the axilla. **Methods:** Dissection was done on 44 upper limbs from embalmed adult cadavers and 6 upper limbs from embalmed dead fetuses in the Department of Anatomy, JJM Medical College, Davangere. Dissection of Radial nerve and its branches in the axilla was carried out according to Cunningham's manual of practical anatomy. **Results:** The order of origin of the branches of the radial nerve in the axilla was posterior cutaneous nerve of arm(PCNA), nerve to long head of tricep(NLHT) and ulnar collateral nerve(UCN). Two types of common trunks were observed. Common trunk 1 (CT1) dividing to give nerve to long head of tricep(NLHT) and ulnar collateral nerve(UCN) in 2 specimens (4%). Common trunk 2 (CT2) dividing to give nerve to long head of tricep(NLHT), ulnar collateral nerve(UCN) and posterior cutaneous nerve of arm (PCNA) in 1 specimens (2%). The origin of Nerve to long head of triceps (NLHT) was directly from the radial nerve (RN) in 47 specimens (94%), through common trunk 1 (CT1) in 2 specimens (4%) and through common trunk 2 (CT2) in 1 specimens (2%). The origin of ulnar collateral nerve (UCN) was directly from the radial nerve (RN) in 47 specimens (94%), through common trunk 1 (CT1) in 2 specimens (4%) and through common trunk 2 (CT2) in 1 specimens (2%). The origin of Posterior cutaneous nerve of arm(PCNA) was directly from the radial nerve (RN) in 49 specimens (98%) and through common trunk 2 (CT2) in 1 specimens (2%). **Interpretation and Conclusion:** The present study is important for Surgeons, Orthopedicians, and Neurophysicians as it provides the knowledge of mode of origin of branches of radial nerve in the axilla.

KEYWORDS

Radial nerve, Triceps brachii, Axilla

INTRODUCTION

Radial nerve is the continuation of the posterior cord of the brachial plexus in the axilla [1]. Muscular branches in the axilla and posterior compartment of arm supply triceps and anconeus in medial and posterior groups. Medial muscular branches arise from the radial nerve on the medial side of the arm. They supply the medial and long heads of triceps. With the profunda brachii artery radial nerve inclines dorsally, assing through the triangular space. Here it supplies the long head of triceps. The branch to the medial head is a long, slender filament which, lying close to the ulnar nerve as far as the distal third of the arm, is often termed the 'ulnar collateral nerve'[2]. The posterior cutaneous nerve of arm arises in the axilla, pierces the deep fascia below the posterior axillary fold, and supplies the skin of the back of the arm from the insertion of the deltoid to the olecranon [1].

The radial nerve is also known as the "great extensor nerve" due to its innervation of the triceps, wrist and finger extensors [3]. The radial nerve can be damaged in the axilla. The radial nerve can be badly damaged in the axilla by fractures and dislocations of the proximal end of the humerus. When the humerus is displaced downward in dislocations of the shoulder, the radial nerve, which is wrapped around the back of the shaft of the bone, is pulled downward, stretching the nerve in the axilla excessively [4]. 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) [2].

The knowledge of mode of origin of branches of radial nerve in axilla is helpful in assessing the radial nerve injuries and their management and also to avoid iatrogenic injury during humerus fracture fixation, humerus dislocation and other surgical procedures. Hence the study of the radial nerve is undertaken, the results of this study may be useful in various surgical procedures in axilla and evaluating the radial nerve injuries and their management for Surgeons, Orthopedicians, and Neurophysicians.

MATERIALS AND METHODS

The study was conducted at Department of Anatomy, J.J.M. Medical College, Davangere. 50 upper limb specimens fixed in 10% formalin solution were procured from the Department of Anatomy. Among them 6 specimens were belong to embalmed dead fetuses. Among 50 specimens, 25 belongs to right side and 25 belongs to left side. Among 25 cadavers used, 22 were male cadavers and 3 were female cadavers. Study was conducted over a period of two years. Dissection of Radial nerve and its branches in the axilla was carried out according to Cunningham's manual of practical anatomy.

The upper limb in each supine cadaver was abducted and laterally rotated. Skin was incised from manubrium sterni to both xiphoid process of sternum as well as acromion process of scapula. Further, the skin was incised from xiphoid process extending upwards and laterally, along the floor of axilla, to the middle of the arm. Incision was further extended from middle of the arm up to apex of cubital fossa. The skin and superficial fascia were reflected from the deep fascia by blunt dissection.

The deep fascia was then incised to expose muscles. The pectoralis major and minor muscles were reflected laterally to expose axilla. The axilla was dissected by removing loose connective tissue and fat. The axillary fascia was then incised and lymph nodes were removed to expose the cords of brachial plexus.

The coracobrachialis and short head of biceps brachii muscle were then exposed. Axillary artery and vein and the large nerves surrounding them were exposed. Radial nerve was identified behind the axillary artery. The long head of triceps brachii was exposed. Branches of radial nerve in the axilla were identified and cleaned.

The mode of origin of branches of the radial nerve in the axilla were noted. Photograph of each specimen was taken after dissection with digital camera.

RESULTS

The order of origin of the branches of the radial nerve in the axilla was posterior cutaneous nerve of arm(PCNA), nerve to long head of tricep(N-LHT) and ulnar collateral nerve (UCN).(**Figure 1**). Two types of common trunks were observed. Common trunk 1 (CT1) dividing to give nerve to long head of tricep(NLHT) and ulnar collateral nerve(UCN) in 2 specimens (4%) (**Figure 2**). Common trunk 2 (CT2) dividing to give nerve to long head of tricep(NLHT), ulnar collateral nerve(UCN) and posterior cutaneous nerve of arm (PCNA) in 1 specimens (2%) (**Figure 3**).

The origin of Nerve to long head of triceps (NLHT) was directly from the radial nerve (RN) in 47 specimens (94%), through common trunk 1 (CT1) in 2 specimens (4%) and through common trunk 2 (CT2) in 1 specimens (2%). The origin of ulnar collateral nerve (UCN) was directly from the radial nerve (RN) in 47 specimens (94%), through common trunk 1 (CT1) in 2 specimens (4%) and through common trunk 2 (CT2) in 1 specimens (2%). The origin of Posterior cutaneous nerve of arm(PCNA) was directly from the radial nerve (RN) in 49 specimens (98%) and through common trunk 2 (CT2) in 1 specimens (2%)(**Table 1**).

DISCUSSION

Moore KL mentions, the radial nerve is the terminal branch of the posterior cord of the brachial plexus [5]. Snell RS mentions, the radial nerve is the largest branch of the brachial plexus. In the axilla, branches are given to the long and medial heads of the triceps, and the posterior cutaneous nerve of the arm is given off [4].

Datta AK mentions, radial nerve provides three branches in the axilla, two muscular and one cutaneous. Muscular branches to long head of triceps and medial head of triceps (ulnar collateral nerve) and cutaneous branch supplies the skin of the dorsal surface of the arm upto the olecranon process [6]. Present study has similar findings.

Yadav et.al mentions in their case report, that there was a unilateral connection between ulnar and radial nerves at high humeral levels on the left arm of 50 year old male cadaver. The connection was 6 cm long and 3 mm wide, it was anteromedial to distal part of the axillary artery and proximal of the brachial artery. There were no abnormalities detected on right side [7]. Present study has not found communicating branches of radial nerve in the axilla.

de Seze et al. mentions in their study, branch supplying the long head of triceps brachii arose from the axillary nerve but not from the radial nerve [8]. Nanjundaiah reports, bilateral variation in their case report in an adult male cadaver aged 60-70 years. The motor branch to the long head of the triceps was arising from the axillary nerve bilaterally, instead of its usual origin from radial nerve.

The axillary nerve after passing through the quadrangular space instead of bifurcating, was trifurcating into the anterior branch, the posterior branch and a branch to the long head of triceps [9]. Sawant reports, in his case report. in a right arm of 70 year old embalmed male cadaver, The axillary nerve was giving the motor branch to the long head of the triceps muscle [10]. In the present study, nerve to long head of triceps originated from the radial nerve in all specimens.

Prasad M mentions, different branching patterns of radial nerve to triceps brachii muscle in her study on 28 upper limbs from adult cadavers [11]. Present study has focused to determine mode of origin of radial nerve in the axilla, which is very essential for proper diagnosis, management and follow up of various conditions involving radial nerve branches in the axilla.

CONCLUSION

The order of origin of the branches of the radial nerve in the axilla was posterior cutaneous nerve of arm (PCNA), nerve to long head of tricep (N-LHT) and ulnar collateral nerve (UCN). Two types of common trunks were observed. Common trunk 1 (CT1) dividing to give nerve to long head of tricep (NLHT) and ulnar collateral nerve (UCN) in 2 specimens (4%). Common trunk 2 (CT2) dividing to give nerve to long head of tricep (NLHT), ulnar collateral nerve (UCN) and posterior cutaneous nerve of arm (PCNA) in 1 specimens (2%).

Conflicts of interests : None

Table 1: Mode of origin of branches of radial nerve (RN) in the axilla. (CT1: common trunk 1, CT2: common trunk 2, NLHT: nerve to long head of tricep, UCN: ulnar collateral nerve, PCNA: posterior cutaneous nerve of arm)

Radial Nerve branch	Origin	Number of specimens	Percentage (%)
NLHT	Radial nerve(RN)	47	94
	RN – by CT1 (NLHT, UCN)	2	4
	RN – by CT2 (NLHT,UCN,PCNA)	1	2
UCN	Radial nerve(RN)	47	94
	RN – by CT1 (NLHT, UCN)	2	4
	RN – by CT2 (NLHT, UCN,PCNA)	1	2
PCNA	Radial nerve(RN)	49	98
	RN – by CT2 (NLHT, UCN,PCNA)	1	2

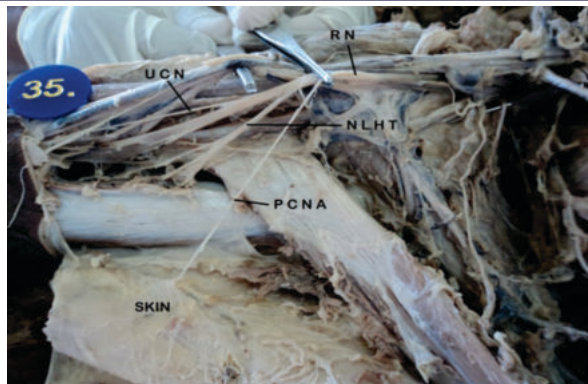


Figure 1: The order of origin of the branches of the radial nerve in the axilla was posterior cutaneous nerve of arm (PCNA), nerve to long head of tricep (NLHT) and ulnar collateral nerve (UCN).

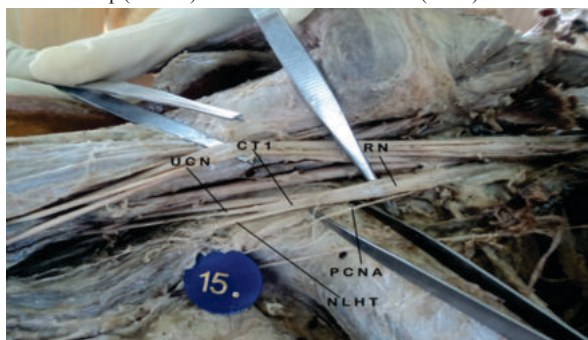


Figure 2: Common trunk 1 (CT1) dividing to give nerve to long head of tricep (NLHT) and ulnar collateral nerve (UCN)



Figure 3: Common trunk 2 (CT2) dividing to give nerve to long head of tricep (NLHT), ulnar collateral nerve (UCN) and posterior cutaneous nerve of arm (PCNA)

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