

## STUDY OF VARIATION IN COURSE OF RADIAL NERVE IN AXILLA AND POSTERIOR COMPARTMENT OF ARM

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### ABSTRACT

**Background:** 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.

**Objectives:** To know the course, and variations of radial nerve in the axilla, lower triangular space and posterior compartment of the arm

**Methods:** Dissection was done on 44 upper limbs from embalmed cadavers and 6 upper limbs from embalmed dead fetuses in the Department of Anatomy, J J M Medical College, Davangere. Dissection of Radial nerve and its branches in the axilla and posterior compartment of the arm was carried out according to Cunningham's manual of practical anatomy.

**Results:** In the present study, out of 50 specimens, Radial nerve(RN) originated from the posterior cord of brachial plexus at axilla, lies posterior to third part of axillary artery, descends behind the proximal part of brachial artery, passes through lower triangular space(LTS) and radial groove and accompanies the profunda brachii artery in 50 specimens(100%). 22 specimens (44%) showed high division of Radial nerve(RN) in to two divisions at axilla and lower triangular space (LTS). The relation between two high divisions of Radial nerve(RND) was anterior & posterior or medial & lateral. In all cases (100%), either anterior or lateral division continues as radial nerve in to anterior compartment of arm.

**Interpretation & Conclusion:** The present study is important for Surgeons, Orthopedicians, and Neurophysicians as it provides the knowledge of course of radial nerve in axilla and posterior compartment of arm to prevent possible complications.

**KEY WORDS:** Radial Nerve, Radial Groove, Wrist Drop.

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### INTRODUCTION

The radial nerve is the largest branch of the brachial plexus. It arises from the posterior cord [C5,6,7,8 (T1)]. Radial nerve is the continuation of the posterior cord of the brachial plexus in the axilla. It then passes in to the arm posterior to the brachial artery then passes

inferolaterally into the groove for the radial nerve on the posterior surface of the humerus winding spirally round the posterior surface of the humerus with the profunda brachii artery, in contact with the periosteum. The nerve then pierces the lateral intermuscular septum and descends in the anterior compartment [1].

The radial nerve is also known as the “great extensor nerve” due to its innervation of the triceps, wrist and finger extensors [2]. The radial nerve can be damaged in the axilla and in the spiral groove [3]. The most common site of radial nerve injury is in the radial groove [4]. The radial nerve is at risk during the posterior plating of the Humerus [5].

Identification of radial nerve is necessary during the posterior approach to the humerus in an effort to maintain its integrity and to lessen the possibility of neurologic compromise [6]. 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). Both these injuries cause weakness of brachioradialis with wasting and loss of the reflex. There is both wrist and finger drop due to weakness of wrist and finger extensors, as well as weakness of extensor pollicis longus and abductor pollicis longus. There may be sensory impairment or paraesthesiae in the distribution of the superficial radial nerve. However, due to nerve overlapping only a small area of anaesthesia usually occurs on the dorsum of the hand between the first and second metacarpal bones [7].

The knowledge of course of radial nerve in axilla and posterior compartment of arm is helpful for surgeons and orthopedicians in the management of upper arm injuries.

## METHODS

The specimens for this study were obtained from embalmed cadavers and embalmed dead fetuses from the Department of Anatomy, J.J.M. Medical College, Davangere. Among 50 upper limbs, 6 specimens were belong to embalmed dead fetuses. Study conducted over a period of two years. Dissection of Radial nerve in the axilla and posterior compartment of the arm was carried out according to Cunningham’s manual

of practical anatomy. The materials used for the study are scalpel, scissor, blunt, sharp and toothed forceps, photography kit.

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 identified behind the axillary artery. The long head of triceps brachii was exposed. Branches of radial nerve in axilla were identified and cleaned.

The cadaver was then pronated to expose the posterior aspect of the arm. The skin and superficial fascia were reflected from deep fascia by blunt dissection. The deep fascia over triceps brachii was incised. Long and lateral heads of the triceps were identified and cleared. Lower triangular space identified and cleared. Radial nerve identified in axilla and traced through lower triangular space as far as triceps. Lateral head of the triceps muscle divided and reflected to expose the radial nerve and profunda brachii artery in the groove for the radial nerve on the back of the humerus.

Course and variations of radial nerve in axilla and posterior compartment of arm noted. Photograph of each specimen was taken after dissection with digital camera.

## RESULTS

**Radial nerve-course:** In the present study, out of 50 specimens, Radial nerve (RN) originated from the posterior cord of brachial plexus at

axilla, lies posterior to third part of axillary artery, descends behind the proximal part of brachial artery, passes through lower triangular space(LTS) and radial groove and accompanies the profunda brachii artery in 50 specimens(100%).

**High division of radial nerve:** In the present study, out of 50 specimens, 22 specimens (44%) showed high division of Radial nerve( RND) in to two divisions. The site of high division of Radial nerve (RND) was axilla in 17 specimens (77.3%) and lower triangular space( LTS) in 5 specimens (22.7%). The relation between two high divisions of Radial nerve( RND) was anterior & posterior in 13 specimens (59.1%) and medial & lateral in 9 specimens (40.9%). In case of anterior & posterior high divisions of Radial nerve (RND), anterior division enters in to anterior compartment as Radial nerve( RN ) in 13 specimens(100%). In case of medial & lateral high divisions of Radial nerve(RND), lateral division enters in to anterior compartment as Radial nerve( RN) in 9 specimens (100%).

**Fig. 1 (49):** Radial nerve (RN) in axilla and lower triangular space(LTS).



**Fig. 2(14):** High division of Radial nerve (RND) in axilla.



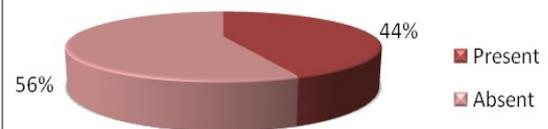
**Fig. 3(19):** High division of Radial nerve (RND) in lower triangular space(LTS).



**Table 1:** High division of radial nerve (RND).

High division of radial nerve	No of specimens	Percentage (%)
Present	22	44%
Absent	28	56%
<b>Total</b>	<b>50</b>	<b>100%</b>

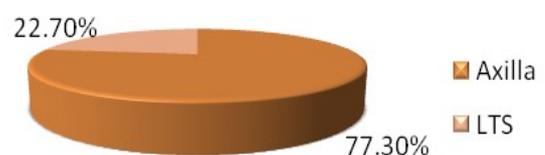
**Graph-1 : High division of radial nerve**



**Table 2:** Site of high division of radial nerve.

Site of high division of radial nerve	No of specimens	Percentage (%)
Axilla	17	77.30%
LTS (Lower triangular space)	5	22.70%
<b>Total</b>	<b>22</b>	<b>100%</b>

**Graph-2 : Site of high division of radial nerve**



## DISCUSSION

Pattanshetti reported that the radial nerve was present in all 60 limbs (100%) originated from posterior cord and was posterior to 3<sup>rd</sup> part of axillary artery.

The nerve then descended behind the brachial artery and entered the spiral groove by passing through lower triangular space. On reaching the lateral side of humerus it pierced the lateral intermuscular septum and came to lie in front of lateral epicondyle of Humerus [8]. Present study confirms the course of radial nerve in axilla and posterior compartment of arm.

In the present study, out of 50 specimens, 22 specimens (44%) showed high division of Radial nerve (RND) into two divisions. Pattanshetti mentions in her study that in one case (1.67%), there was high division of radial nerve (RND) in the arm before passing through the lower triangular space, to enter the spiral groove [8]. The incidence of high division of radial nerve (RND) was high in the present study (44%) as compared to the study of Pattanshetti (1.67%).

Jamuna, mentions in her case report, that radial nerve in the left sided axilla of an embalmed adult male cadaver, was having its origin from the posterior cord as a terminal branch and it split into anterior and posterior divisions after having a short course for 1 cm in the axilla. Both the divisions had their course in the radial groove. Branches of the radial nerve in the arm were given off from the posterior division and the anterior division continued as the main radial nerve with normal course and relations.<sup>9</sup> In present study, high division of Radial nerve (RND) into anterior and posterior division was observed in 13 specimens (59.1%). In case of anterior & posterior high divisions of Radial nerve (RND), anterior division enters into anterior compartment as Radial nerve (RN) in 13 specimens (100%). Present study confirms the existence of such variations of radial nerve. The radial nerve is at risk of injury with fractures of the humerus and with subsequent operative fixation in 2 areas. The first is along the posterior midshaft region for a distance of  $6.3 \text{ cm} \pm 1.7$  centered at the distal aspect of the deltoid tuberosity. The second is along the lateral aspect of the humerus in its distal third

from  $10.9 \text{ cm} \pm 1.5$  proximal to the lateral epicondyle to the level of the proximal aspect of the metaphyseal flare. The deltoid tuberosity is a consistent and practical anatomic landmark that can be used to determine the level of the radial nerve along the posterior aspect of the humerus during operative fixation from an anterior approach [10].

Hugon reports the following observation in his case report in a 27 year old man was admitted to a surgical emergency department after a car accident. The patient had humerus fracture that was rapidly reduced and stabilised using unreamed retrograde nailing with an Ender nail, with an acceptable result. During the postoperative evolution, as the patient came out of coma, a right radial Palsy was noticed. Radial nerve palsy persisted nine months after a diaphyseal fracture of the humerus. Radiographs and ultrasound examination showed that the radial nerve was transected and partially entrapped in the fracture callus. This double injury was confirmed and was repaired during subsequent surgical treatment. The patient regained a functional range of motion, and EMG shows progressive yet incomplete nerve regrowth [11].

Literature review shows involvement of radial nerve in various external injuries like fractures, pressure effects (crutches). 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. Hence the data obtained from the present study is essential for proper diagnosis, management and follow up of various conditions involving radial nerve.

## CONCLUSION

In the present study, out of 50 specimens, Radial nerve (RN) originated from the posterior cord of brachial plexus at axilla, lies posterior to third part of axillary artery, descends behind the proximal part of brachial artery, passes through lower triangular space (LTS) and radial groove and accompanies the profunda brachii artery in 50 specimens (100%).

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The present study is important for Surgeons, Orthopedicians, and Neurophysicians as it provides the knowledge of course of radial nerve in axilla and posterior compartment of arm to prevent possible complications.

**Conflicts of Interests: None**

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