



STUDY OF VARIATIONS IN THE ORIGIN AND DISTANCE OF ORIGIN OF AXILLARY NERVE OF THE POSTERIOR CORD OF BRACHIAL PLEXUS

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ABSTRACT

Background: Variations in the origin of axillary nerve from the posterior cord of brachial plexus and its distance of origin from mid clavicular point are important during surgical approaches to the axilla and upper arm, administration of anesthetic blocks, interpreting effects of nervous compressions and in repair of plexus injuries. The patterns of branching show population differences. Data from the South Indian population is scarce.

Objective: To describe the variations in the origin of the axillary nerve from the posterior cord of brachial plexus and its distance of origin from mid-clavicular point in the South Indian population.

Materials and methods: Forty brachial plexuses from twenty formalin fixed cadavers were explored by gross dissection. Origin and order of branching of axillary nerve and its distance of origin from mid-clavicular point was recorded. Representative photographs were then taken using a digital camera (Sony Cybershot R, W200, 7.2 Megapixels).

Results: In forty specimens studied, 87.5% of axillary nerve originated from the posterior cord of brachial plexus and in 12.5% of specimens axillary nerve took origin from common trunk along with thoracodorsal or lower subscapular nerve or both. In 32.5% of the specimens axillary nerve had origin from posterior cord of brachial plexus at a distance of 4.6-5.0cm from mid-clavicular point.

Key words: Posterior cord, Axillary, common trunk, mid clavicular point

INTRODUCTION

The brachial plexus is a complex network of nerves which extends from the neck to the axilla and supplies motor, sensory and sympathetic fibres to the upper extremity.

The brachial plexus is formed by platuing of ventral rami of the lower four cervical and the first thoracic nerves. The plexus extends from the inferior lateral portion of the neck downward and laterally over the first rib, posterior to the clavicle and enters the axilla. The brachial plexus is divided into supraclavicular part and infraclavicular part. The infraclavicular part consists of three cords-lateral, medial and posterior. The posterior cord runs posterior to the second part of the axillary artery behind the pectoralis minor muscle and gives off the following branches – upper subscapular nerve, thoracodorsal nerve, lower subscapular nerve, axillary nerve and then continues as a large terminal branch, the radial nerve.

The axillary nerve is variable in its origin, course and supply to the muscles; its variations become important as it is involved fracture of surgical neck of humerus and quadrangular space syndrome.

Descriptions of nerve variations are useful in clinical/surgical practice since an anatomical variation can be the cause of a nerve palsy syndrome due to a different relation of a nerve and a related muscle.

Knowledge of variations in the branching pattern of axillary nerve from posterior cord of the brachial plexus is highly important in the surgical exploration of axilla, fracture of surgical neck of humerus, shoulder dislocation, and infraclavicular brachial plexus block.

Anatomical variations in the origin of axillary nerve have been described by many authors, although these have not been extensively catalogued. These may be due to an unusual formation during the development of the trunks,

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divisions, or cords and they usually occur at the junction or separation of the individual parts. For a surgeon, to know the variational patterns of the axillary nerve at his finger's ends is essential in the light of not only the frequency with which the surgery is performed in the axilla and the surgical neck of the humerus and the rapid development of microsurgical techniques but also to give explanations when encountering an incomprehensible clinical sign.

Thus knowledge of variations in the branching pattern of axillary nerve from the brachial plexus and its distance of origin from fixed point that is mid-clavicular point is important to anatomists, radiologists, surgeons and anaesthesiologists and has gained importance due to the wide use and reliance on computer imaging in diagnostic medicine.

Literature on the variations in the origin of axillary nerve from the posterior cord of the brachial plexus and its distance of origin from mid-clavicular point among Indians is scanty and altogether lacking in South Indians. The present study describes the variations in the branching pattern of axillary nerve from the posterior cord of the brachial plexus observed in South Indian population.

MATERIALS AND METHODS

SOURCE OF DATA:

The specimens for the study were obtained from the Department of Anatomy, S.S.I.M.S & R.C, Davangere, Karnataka.

Requisite consent had been obtained from the Head of the Department to conduct the study.

SAMPLE SIZE:

The study was carried out on forty upper limbs of adult human cadavers of both sex and age group between 30-60 years.

INCLUSION CRITERIA:

- All normal cadavers were included for the study.

EXCLUSION CRITERIA:

- Deformed or traumatized upper limbs were excluded from the study.

MATERIALS:

1. Dissection instruments
2. Measuring scale
3. Geometric radius
4. Sony cyber shot camera.

DISSECTION PROCEDURE

The cadaver was positioned in supine position with upper limb abducted at 90degrees. The incision made on the skin over lateral part of thoracic wall in the mid axillary line at the level of nipple which is carried up to the lateral wall of axilla at the junction of anterior 2/3 and posterior 1/3. The loose connective tissue, fat, and lymph nodes from the axilla were removed to expose its contents. The axillary artery and vein and the large nerves surrounding them were exposed. The smaller tributaries of the vein were removed in order to get a clear view of the nerves.

The radial nerve was identified behind the artery. It was traced upwards and at the lower border of subscapularis, the axillary nerve was seen passing backwards with the posterior humeral circumflex artery.

The pectoralis minor was cut across and the axillary vessels were followed to the outer border of the first rib. The anterior surface of subscapularis was exposed and the upper subscapular nerves entering it were identified. The upper and lower subscapular and thoracodorsal nerves were traced to their origin from the posterior cord of the brachial plexus.

The distance of origin of axillary nerve from mid-clavicular point was noted and the origin of axillary nerve was studied.

Representative photographs were taken using a Sony Cybershot R (DSC W50, 7.2 MP) digital camera

RESULTS

In the current study, the number of axillary nerves is same on both right and left side. Majority of the axillary nerve have origin from posterior cord in 87.5% of specimens (Fig.1). In 12.5% of specimens the nerve take origin from common trunk along with the thoracodorsal nerve (Fig.2) and with both lower subscapular nerve thoracodorsal nerve as common trunk (Fig.3). In 32.5% of specimens axillary nerve had origin at a distance of 4.6 – 5.0 cm, 30% of axillary nerve showed origin at a distance of 5.1 – 5.5 cm, 20% of axillary nerve took origin at a distance of 4.1 -4.5 cm, 10% at a distance of more than 6cm and 7.5% at a distance of 5.6 – 6.0 cm Table (1) and Graph (1).

DISCUSSION

Brachial plexus forms the innervations of the upper limb.

During the early stages of development the upper limb buds lie opposite the lower five cervical and upper two

Table 1: Showing frequency distribution of origin and distance of origin of AXILLARY NERVE

	Number	Percentage
Side:		
Right	20	50
Left	20	50
Origin:		
Posterior cord	35	87.5
Common trunk	5	12.5
Distance:		
4.1 – 4.5 cm	8	20
4.6 – 5.0 cm	13	32.5
5.1 – 5.5 cm	12	30
5.6 – 6.0 cm	3	7.5
> 6.0 cm	4	10

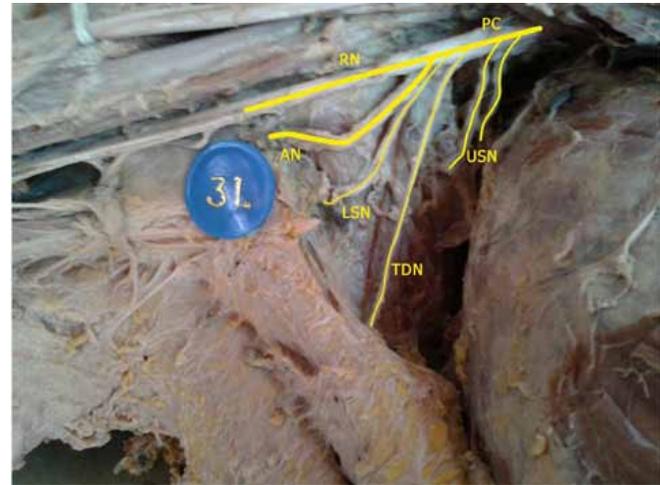


Figure 1: Showing origin of axillary nerve from posterior cord

PC- Posterior cord, USN- Upper subscapular nerve, TDN- Thoracodorsal nerve, LSN- Lower subscapular nerve, AN- Axillary nerve, RN- Radial nerve.

Graph 1: Showing Frequency of Origin of Axillary Nerve

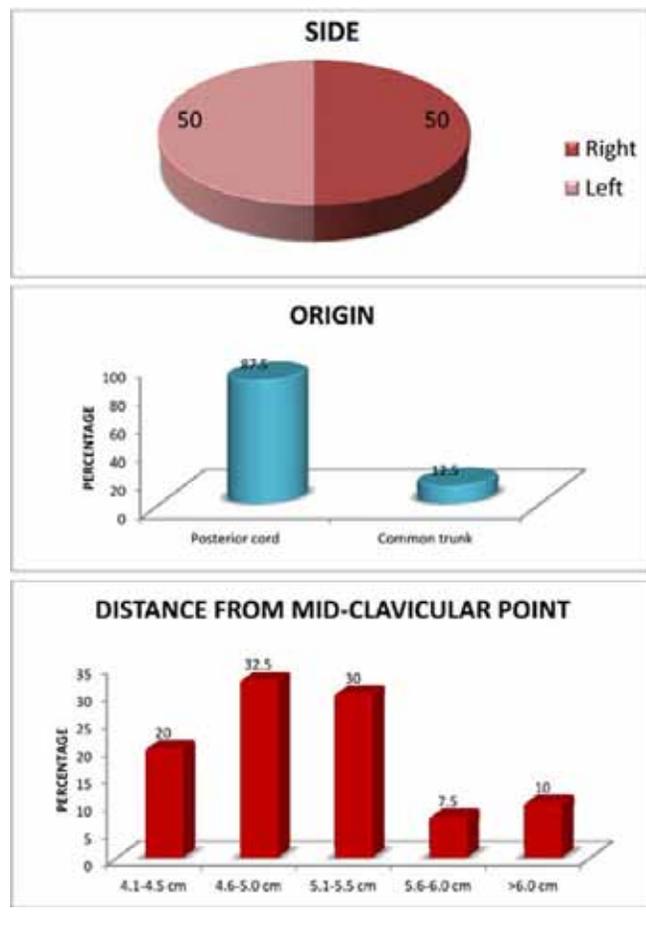


Figure 2: Showing origin of axillary nerve from common trunk along with thoracodorsal nerve.

PC- Posterior cord, USN- Upper subscapular nerve, TDN- Thoracodorsal nerve, LSN- Lower subscapular nerve, AN- Axillary nerve, RN- Radial nerve.

but soon these branches unite to form large dorsal and ventral nerves for the extensor and flexor musculature of the upper extremity respectively. Immediately after the nerves enter the limb bud, they establish an intimate contact with the differentiating mesodermal condensations and the early contact between the nerve and muscle cells is a prerequisite for their complete functional differentiation.²

Several signalling molecules and transcription factors have been identified which induce the differentiation of the dorsal and ventral motor horn cells. Misexpression of any of these signalling molecules can lead to abnormalities in the formation and distribution of particular nerve fibres.³

thoracic segments. As soon as the limb buds form, the ventral primary rami of the spinal nerves penetrate into the mesenchyme of the limb bud.¹Atfirst each ventral ramus enters with isolated dorsal and ventral branches,

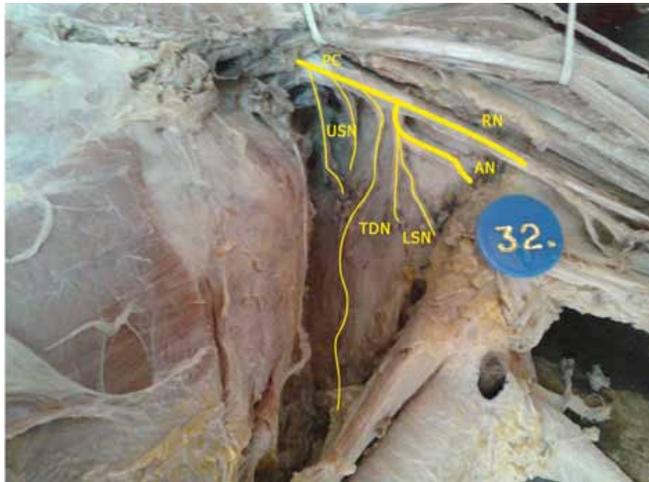


Figure 3: Showing origin of axillary nerve from common trunk along with lower subscapular nerve and thoracodorsal nerve .

PC- Posterior cord, USN- Upper subscapular nerve, TDN- Thoracodorsal nerve, LSN- Lower subscapular nerve, AN- Axillary nerve, RN- Radial nerve.

In the current study among 40 specimens, axillary nerve has origin from posterior cord in 87.5% of specimens, from common trunk in 12.5% of specimens.

In the present study, out of 40 specimens 32.5% of axillary nerve had origin at a distance of 4.6 – 5.0 cm, 30% at a distance of 5.1 – 5.5 cm, 20% at a distance of 4.1 – 4.5 cm, 10% at a distance of more than 6cm and 7.5% at a distance of 5.6 – 6.0 cm.

In a case reported by Bhat KMR and Girijavallabhan V the posterior cord was splitting into thick posterior and thin anterior roots, enclosing the subscapular artery near its origin. The two roots, after enclosing the subscapular artery were fused to continue as radial nerve. The upper subscapular nerve was arising from the main trunk of the posterior cord. Thoracodorsal nerve, lower subscapular nerve and the axillary nerve were originating from thick posterior root of the cord.⁴ No such variation was encountered in the present study.

Priti Chaudhary et al observed in a study of 60 brachial plexus, the axillary nerve being normal in origin as one of the terminal branches of the posterior cord in 59 (98.33%); in one limb, (1.66%), it was found to originate from the posterior division of the upper trunk (root value-C5,6).⁵

Muthoka et al mentioned in their study of 75 posterior cords that the axillary nerve originated from the posterior

cord in 97.3% cases while two (2.7%) cases had a supra-clavicular origin.⁶

Variant origin of axillary nerve of such a kind was not observed in the present study.

CONCLUSION

Majority of axillary nerves in studied population display a wide range of variations in the origin and distance of origin. This knowledge is pertinent for clinicians, anesthesiologists while administering brachial plexus blocks and orthopaedic surgeons exploring axilla during surgery on the neck of humerus. Further study of variations in the diameter of axillary nerve along its course is recommended.

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