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Original Research Article

AXILLARY NERVE INDEX IN PREDICTING THE POSITION OF ANTERIOR TRUNK OF AXILLARY NERVE –A CROSS SECTIONAL CADAVERIC STUDY

M. Thuslima[1], N.Suresh[2], Roopa Ravindranath[3], Lakshmi.T.A[4]

[1]Assistant Professor, Department of Anatomy, Government Medical College, Omandurar Government Estate, Chennai, India.
[2]Assistant Professor, Department of Anatomy, AIIMS, Madurai, India.
[3]Additional Professor, Anatomy, CDSIMER Dr Chandrama Dayanand Sagar Institute of medical education and research, Ramanagara district, Harohalli, Kanakapura, Karnataka, India.
[4]Associate Professor, Department of Anatomy, St. John's Medical College, Bangalore, India.

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Corresponding Author:
Dr. Lakshmi.T.A,
Email:l akshmita2003@yahoo.com.

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Abstract

Background: Injuries to the Axillary nerve make up 6% of all brachial plexus injuries. The current study attempts to furnish morphometric data of the precise location of the anterior trunk of axillary nerve, that could reduce the incidence of iatrogenic nerve damage. **Aim & Objectives:** The aim of this study was to determine the exact anatomical location of anterior trunk of axillary nerve in relation to the surface landmarks. The specific objectives were to determine the distance of the nerve from acromion (A), distance of the nerve from the point of insertion of deltoid (B), to calculate Axillary nerve index (AI) (AI = A/(A+B)) and to check for any gender & side difference in the above parameters. **Material and methods:** A cross sectional analytical study was done on sixty cadaveric upper limbs from Departments of Anatomy, St. St John's Medical College, Bangalore. The cadavers were dissected and the required measurements were made using digital vernier calipers of 0.01mm accuracy. **Results:** The mean value for the distance of the nerve from the tip of acromion was 6.3cms, ranging from 4.1 to 8 cms. The mean distance of the nerve from the point of insertion of deltoid was 8.49 cms, ranging from 5.89 to 11.2 cms. The mean value of axillary nerve index obtained from this study is 0.4351. There was no significant gender difference or side difference in the mean values of the above parameters. **Conclusion:** Any manipulation in the shoulder region less than 4cms and beyond 8cms perpendicularly below the tip of acromion minimizes the risk of injuring the anterior trunk of axillary nerve. The mean value of axillary nerve index obtained from this study was 0.4351. This multiplied by the deltoid length predicts the location of the nerve below the acromion.

INTRODUCTION

Injuries to the Axillary nerve make up 6% of all brachial plexus injuries.[1] Injury to the anterior trunk of the axillary nerve, as it passes around the humerus and innervates the anterior and middle deltoid, results in the devastating loss of upper arm flexion power.[2,3]The axillary nerve index is useful for the clinician to estimate the position of the axillary nerve at the time of surgery. It was defined as the ratio of the distance between the acromio-clavicular joint and the main anterior trunk of the axillary nerve along the anterior clavicular line by the deltoid length.[2]The figure estimated by multiplying the axillary nerve index with the deltoid length predicts the location of the anterior trunk of the axillary nerve.

MATERIALS AND METHODS

The sex of the cadavers was noted. The deltoid muscle was then gradually dissected from the clavicle, acromion, and scapular spine. The dissection of the axillary nerve deep to the deltoid was performed beginning from its emergence from the quadrangular space. The dissection was done as meticulously as possible to leave the nerve in its native atmosphere and not affect its position. The position of the anterior branch of the nerve was marked by a transcutaneous pin to represent its position on the skin perpendicular to the tip of the lateral edge of the acromion. The deltoid muscle was reflected back to its original anatomic position following the specific needle landmark. With the arms positioned along the side of the body, the

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distances A and B (Fig: 1 &2) were measured with digital vernier calipers of 0.01mm accuracy.

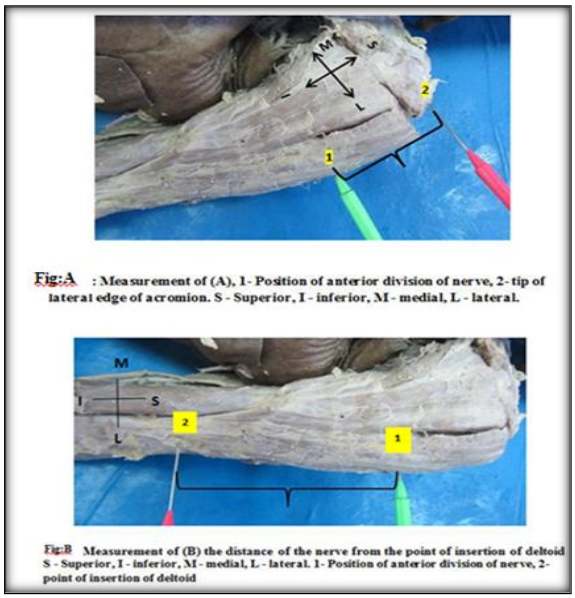

Fig:A : Measurement of (A), 1- Position of anterior division of nerve, 2- tip of lateral edge of acromion. S - Superior, I - inferior, M - medial, L - lateral.

Fig:B Measurement of (B) the distance of the nerve from the point of insertion of deltoid S - Superior, I - inferior, M - medial, L - lateral. 1- Position of anterior division of nerve, 2- point of insertion of deltoid

RESULTS

The mean value for the distance of the nerve from the tip of acromion (A) was 6.3cms, ranging from 4.1 to 8 cms. The mean distance of the nerve from the point of insertion of deltoid (B) was 8.49 cms, ranging from 5.89 to 11.2 cms. The mean value of axillary nerve index (AI) obtained from this study is 0.4351. There was no significant gender difference or side difference in the mean values of distance of the nerve from the tip of acromian. There was no gender difference or side difference in the mean value of the distance of the nerve from the point of insertion of deltoid muscle. There is no gender difference in the mean value of axillary nerve index. There was no significant gender difference or side difference in the mean values of the above parameters as the p value is more than 0.005

Table 1: Gender difference in the mean values of A,B & AI

Parameter	Males (n= 36) Mean ± SD	Females (n= 24) Mean ± SD	p value (Independent sample t test)
A (distance of the axillary nerve from the tip of acromion) (n= 60)	64.18 ± 7.8	61.51 ± 10.69	0.269
B (distance of the nerve from the point of insertion of deltoid) (n= 60)	86.74 ± 13.6	82.32 ± 13.02	0.217
AI(Axillary nerve index) (n= 60)	0.4269 ± 0.038	0.4475 ± 0.121	0.346

Table 2: Mean values of A, B & AI

Parameter	Mean ± SD (mm)	95% CI
A (distance of the axillary nerve from the tip of acromion) (n= 60)	63.11 ± 9.11	60.7-65.4
B (distance of the nerve from the point of insertion of deltoid) (n= 60)	84.97 ± 13.49	81.4 – 88.4
AI (Axillary nerve index) (n= 60)	0.4351 ± 0.082	0.4139 – 0.4564

DISCUSSION

Most surgical approaches to the shoulder split the deltoid muscle putting the axillary nerve at risk. It is therefore extremely important to be aware of the precise location of the axillary nerve within the operative field.[4]Even though greater and lesser tubercles serve as better landmarks to identify the nerve intra operatively, in any trauma involving their fracture, they cannot be used as reference to identify the nerve. In which case, acromion is only used to locate the position of the nerve. Hence in our study we used the most easily clinically palpable portion of the acromion- its tip as the landmark, which also serves as reference for most of the Trans deltoid procedures.[5]The anterior branch of axillary nerve lies at a variable distance distal to the tip of acromion at every point along its course. The standard deltoid-splitting method used in shoulder fracture reconstruction has been limited, because of the perceived risk of injury to the anterior branch of the axillary nerve. This also limits the distal extension of the incision, which may sometimes be required to insert a plate for fixation of proximal humerus fractures.[6,7,8,9]The position of the anterior trunk of axillary nerve from the acromion was dependent on the length of the deltoid muscle. In our study the deltoid length was measured as the distance from the tip of the acromion to the point of insertion of deltoid(A+B). It was more close to the acromion in individuals with shorter deltoid length. The shorter the deltoid length, the greater is the

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danger of damaging the nerve at a short distance from the upper border of the muscle.

CONCLUSION

The above values are a gist of the results of this study that provides a database for the axillary nerve morphology in the Indian population. The values of the distance of the nerve from acromion are especially important considering the number of intramuscular injections given into the deltoid muscle. Any manipulation in the shoulder region less than 4cms and beyond 8cms perpendicularly below the tip of acromion minimizes the risk of injuring the anterior trunk of axillary nerve. The mean value of axillary nerve index obtained from this study was 0.4351. This multiplied by the deltoid length predicts the location of the nerve below the tip of acromion. There was no significant difference between males and females in the mean values of the distance of nerve from tip of acromion, distance of nerve from point of insertion of deltoid and axillary nerve index.

REFERENCES

1. Marios Loukas, Joanna Grabska, Shane Tubbs, Nihal Apaydin, Robert Jordan.Mapping the axillary nerve within the deltoid muscle. Surgical and Radiologic Anatomy. 2009; 31(3):43-47
2. John A. Nassar, Michael A. Wirth, Stephen S. Burkhart, Robert C. Schenck, Jr.Morphology of the Axillary Nerve in an Antero inferior Shoulder Arthroscopy Portal. The Journal of Arthroscopic and Related Surgery, 1997; (13) 5:600-605
3. Rockwood CA. The shoulder: Facts, confusions, and myths, lnt Orthop 1991; 15:401-405
4. Abbas Rashid, Hani Abdul-Jabar, Francis Lam. Nerve injury associated with shoulder surgery. Current Orthopaedics, 2008; 22:284 – 288
5. Vladimir Rotari, Charbel D. Moussallem, FEBOT, Emmanuel David, Patrice Mertl, and Eric Havet. Position of the Anterior Branch of the Axillary Nerve in Relation to the Humeral Bone Length. Am J Orthop. 2012; 41(10):452-455
6. Lukman A.K. Khan, C. Michael Robinson, Elizabeth Will, Roger Whittaker.Injury, Int. J. Care Injured. 2009; 40: 181–185
7. Burkhead WJ, Scheinberg RBG. Surgical anatomy of the axillary nerve. J Shoulder Elbow Surg 1992; 1:31–6
8. Kontakis GM, Steriopoulos K, Damilakis J, Michalodimitrakis E. The position of the axillary nerve in the deltoid muscle. A cadaveric study. Acta Orthop Scand 1999; 70:9–11
9. Kulkarni RR, Nandedkar AN, Mysorekar VR. Position of the axillary nerve in the deltoid muscle. Anat Rec 1992; 232:316–7.

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