



**ORIGINAL RESEARCH PAPER**

**Anatomy**

**Anatomy of the Axillary Nerve: A fetal Study in Indian Population**

**KEY WORDS:** Axillary Nerve, Fetus, Intramuscular Injections.

**Mr. Rupinder Singh.**

Demonstrator, Department of Anatomy. Government Medical College and Hospital – 32. Chandigarh 160030

**Dr. Mahesh Kumar Sharma**

Professor & Head, Department of Anatomy Government Medical College and Hospital – 32. Chandigarh 160030

**Ms Ramandeep Kaur**

Demonstrator, Department of Anatomy Government Medical College and Hospital – 32. Chandigarh 160030

**Dr. Arun Sharma**

Demonstrator, Department of Anatomy Government Medical College and Hospital – 32. Chandigarh 160030.(Corresponding Author).

**ABSTRACT**

**Introduction-** Axillary nerve is the nerve of upper limb arising from posterior cord of the brachial plexus. It supplies the main abductor of arm and is injured during vaccination and intramuscular injections in shoulder region.  
**Material and methods-** 60 fetal shoulders were dissected out to understand the anatomy and position of the axillary nerve in 2nd and 3rd trimester spontaneously aborted fetuses.  
**Results-** The thickness of axillary nerve as it diverged from posterior cord was found 1.09mm and 1.30mm in second and third trimester fetuses respectively. The distances of axillary nerve from the anterior and posterior acromial tips was also measured. The Anterior and posterior axillary nerve indices were also calculated.  
**Conclusion-** We found that both the indices were one-fourth of the arm length. The indices and anatomy of axillary nerve may be useful for the pediatric surgeons and orthopedic surgeons while performing surgeries in the axilla and arms of the newborns or early childhood.

**Introduction**

Axillary nerve (AN) is an important nerve as it supplies the deltoid- a main abductor of the arm. It is a branch of posterior cord of the brachial plexus.[1] Anterior branch of AN contains fibres for supplying anterior and middle deltoid, while the posterior branch contains part or all nerve fibres to the posterior deltoid muscle, teres minor and an area of skin over the deltoid region along with the shoulder joint. [2] AN is vulnerable to damage during shoulder arthroscopic and open surgical procedures.[3] Sometimes the anterior branch of the AN is injured during vaccine administration[4]. Lack of the proper anatomical knowledge may lead to injury of the AN during intramuscular injections in the deltoid muscle. [5] A deep knowledge of AN is required in arthroscopic shoulder surgery.[6] Very less information is available on the anatomy of the AN in the fetuses.

**Aims and objectives**

The goal of the present study was to study the anatomy and analyse the morphometry of AN and study the variations if any.

**Materials and methods**

The material comprised of 30 (18 males and 12 females)spontaneously aborted fetuses sent by obstetrics and gynaecology department to the department of anatomy, Government Medical College and Hospital-32, Chandigarh for routine autopsy.The fetuses with various gross upper limb anomalies were excluded from the study.Out of 30 fetuses 13 (5 females and 8 males) belonged to second trimester (ST) were grouped as "A" and 17 (7 females and 10 males) belonged to trimester third (TT) were grouped as "B".The sex of fetuses was noted and labelled with suffix "M" for male and "F" for female to note the variations according to the sex if present. Prior to autopsy, consent form to do additional research was obtained from the parents/gurdians. As per standard autopsy protocol, the gestational age, antenatal history, parental information was recorded. Before autopsy some anthropometric parameters were measured.

After the autopsy was done the arm lengths (AL) of the fetuses starting from the tip of the acromian process till the lateral epicondyle of the fetuses were measured. The AN was dissected bilaterally according to the steps as discussed following. The delto

pectoral groove (DPG) was identified. the cephalic vein and AN were seen in the DPG The clavicular and acromial origins of the deltoid muscle were detached to observe the course of the AN. The thickness of the AN was measured at the point where it diverged from the posterior cord before it gave any branch. Distances between the anterior and posterior acromial tips(AT) and the AN were measured with the digital vernier calliper. The mean distances (MD) of AN from the acromial tips were calculated. Also the mean arm lengths of both sides were calculated so as to find the anterior and posterior indices according to the given formulae-

Anterior index = Distance of AN from anterior AT/ arm length  
 Posterior index = Distance of AN from posterior AT/ arm length

Also comparison was made between MD's for AN of the male and female fetuses for both the trimesters.

**Results**

No sexual dimorphism or asymmetry between the female and male fetuses was observed in the present study.

Course- In each case AN was single trunk diverging from the posterior cord and later dividing into anterior and posterior branches in the quadrangular space. The anterior branch in each case was winding around the surgical neck of the humerus and supplied the deltoid and area of skin above it.The posterior branch was supplying the teres minor and was continuing as upper lateral cutaneous nerve of the arm.

Anthropometric measurements - The mean lengths of arm were found to be 32.84 mm for right side and 32.81mm for left side in ST while they were 51.50 mm for right side and 51.24 mm for left side in TT fetuses (Table no -1) .The mean thickness of the AN was found to be 1.09 mm in ST and 1.30 mm in TT . The mean distace of AN from Anterior AT was found to be 8.13 mm for right side and 8.11 mm for left side in ST and 12.60 mm for right side and 12.53 mm for left side in TT fetuses (Table no -2).The mean distace of AN from posterior AT was found to be 8.16mm for right side and 8.14mm for left side in ST and 12.63mm for right side and 12.58 mm for left side in TT fetuses (Table no -2).Anterior Axillary Nerve index was found to be 0.25 in both the right and left side in ST and 0.24 on both right and left sides for TT. No differences were observed between an anterior and posterior axillary indices of the

same side. Anterior and the posterior axillary nerve indices were found to be nearly one-fourth of the actual arm length in each case.

**Table no-1**

Mean length of arms (mm)

Trimester	Right arm	Left arm
Second	32.84	32.81
Third	51.50	51.24

**Table no-2**

Mean distances of AN from anterior and posterior AT (mm)

Trimester	Anterior AT		Posterior AT	
	Right	Left	Right	Left
Second	8.13	8.11	8.16	8.14
Third	12.60	12.53	12.63	12.58

**Discussion**

The present study was done in the 30 fetuses . Though a lot of work has been done by the previous workers on the AN in the cadavers but in fetuses still the data is very less. Due to paucity of the literature we were hardly able to compare our findings with the sufficient earlier studies.

In 2012, Wozniak examined 220 fetal brachial plexuses . He found the thickness of AN to be 0.77mm on left and 0.78mm on right side[7]. However the exact points where the measurements were taken were not mentioned. In 2015, Uluer Tugba studied the anatomy and morphometric features of AN in 35 fetal shoulders [8]. The results in the present study were very similar to those found by Uluer Tugba. He noted the thickness of AN just after its divergence from the posterior cord of brachial plexus to be 1.05mm in ST and 1.32mm in TT which was very similar to the present study as shown in the Table-3

**Table-3**

Comparison of the thickness of AN

Authors (Year)	Thickness (mm)	
	Second Trimester	Third Trimester
Uluer Tugba (2015)	1.05	1.32
Present Study (2017)	1.09	1.30

The mean anterior and posterior AN indices were also nearly same as that found in the present study as shown in the table no 4.

**Table -4**

Comparison of mean AN indices

Study (Year)	AN indices in ST and TT			
	Anterior		Posterior	
	ST	TT	ST	TT
Uluer Tugba (2015)	0.24	0.23	0.27	0.25
Present Study (2017)	0.25	0.24	0.25	0.24

**Conclusion**

In the present study the mean thickness of AN was found to be 1.09mm and 1.30mm in the ST and TT respectively. The mean anterior AN indices were found to be 0.25mm in ST and 0.24mm in TT. The mean posterior AN indices were 0.25mm and 0.24mm respectively. No variation in the course of AN was found. The present study would be useful for the anatomists, pediatric and orthopedic surgeons performing surgeries in the axillary region during early childhood in brachial plexus reconstruction, proximal humeral fracture repair. Also this knowledge may prevent the AN injury during vaccine administration.

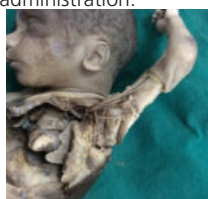


Figure 1- Showing Axillary nerve (AN)



Fig. 2- Showing distance of Axillary nerve from Anterior Acromial tip



Figure 3- Showing thickness of AN

**Bibliography**

1. Johnson D, Ellis H. Pectoral Girdle and Upper limb. In: Standring S, editor. Gray's Anatomy: The anatomical basis of clinical practice: 39th edition. Philadelphia: Churchill livingstone Elsevier: 1949.p. 847-8.
2. Zhao X, Hung LK, Zhang GM, Lao J. Applied anatomy of the axillary nerve for selective neurotization of the deltoid muscle. Clin Orthop Relat Res. 2001 Sep;(390):244-51.
3. Apaydin N, Uz A, Bozkurt M, Elhan A. The anatomic relationships of the axillary nerve and surgical landmarks for its localization from the anterior aspect of the shoulder. Clin Anat 2007; 20(3): 273-7.
4. Cook IF. An evidence based protocol for the prevention of upper arm injury related to vaccine administration (UAIRVA). Hum Vaccin 2011 Aug; 7(8):845-8.
5. Davidson LT, Carter GT, Kilmer DD, Han JJ. Iatrogenic axillary neuropathy after intra muscular injections of the deltoid muscle. Am J Phys Med Rehabil. 2007;86(6):507-11.
6. Nassar JA, Wirth MA, Burkhart SS, Schenck RC Jr. Morphology of the axillary nerve in an antero-inferior shoulder arthroscopy portal. Arthroscopy. 1997 Oct;13(5):600-5.
7. Wozniak J, Kedzia A, Dudek K. Mathematical models of brachial plexus development during the fetal period: Clinical aspects. Adv Clin Exp Med. 2012;21:151-167.
8. Uluer T, Aktekin M, Kurtoglu Z, Buluklu S, Karsiyaka D et al. Axillary nerve course and position in the fetal period. Neuro S. 2015 Oct; 20(4): 396-9.