Morphological Variation of Suprascapular Notch in Population of Eastern India and its Clinical Significance

ABSTRACT

Introduction: Suprascapular notch is present at the lateral part of the superior border of scapula which is bridged by superior transverse scapular ligament. The suprascapular nerve runs below the ligament and the transverse scapular vessels over it. The ligament sometimes becomes ossified and impinges the underlying nerve which causes paralysis of both supraspinatus and infraspinatus muscles.

Aim: To study the morphological variation of suprascapular notches in dry human scapulae.

Materials and Methods: This observational cross-sectional study was carried out on 102 adult dry human scapulae (62 right, 40 left) collected from the 1st year MBBS students of different Medical colleges of West Bengal from August 2020 to March 2021. The shapes of suprascapular notch, presence of ossified ligaments were observed. Superior Transverse Diameter (STD), Middle Transverse Diameter (MTD), Maximum Depth (MD) of the suprascapular notch, distance from the deepest point of suprascapular notch to supraglenoid tubercle and distance between the spinoglenoid notch to the posterior rim of glenoid cavity were measured and statistically analysed. Classification of the suprascapular notch was done based on Rengachary classification.

Results: Type III notch was most common (n=52). One scapula had small U-shaped notch with lateral part of the ligament ossified and another had U-shaped notch with both medial and lateral part of the ligament ossified but they failed to join. In Type I and Type VI there were no such diameters like STD or MTD but for other types STD was more than MTD. The distance between suprascapular notch and supraglenoid tubercle was variable-type VI had minimum and type I had the maximum distance. The distance between the medial wall of the spinoglenoid notch and the posterior rim of glenoid cavity was least in type I and highest in type III.

Conclusion: This study showed that type III was the most common suprascapular notch. The present study also compared the findings with other previous studies and found that percentage of presence of suprascapular foramen in this eastern Indian population was higher than southern Indian population.

INTRODUCTION

The brachial plexus formed by the ventral primary rami of C5, C6, C7, C8 and T1 innervates all the muscles, joints and skin of the upper limb. It has roots, trunks, divisions and cords. The suprascapular nerve (C5,C6) usually arises as the first branch of the upper trunk but it frequently springs directly from the ventral primary ramus of C5 [1]. The nerve passes backward above the clavicle and disappears beneath the anterior border of trapezius. It enters through suprascapular foramen below the superior transverse scapular ligament and supplies supraspinatus and winds round the spinoglenoid notch below the inferior transverse scapular ligament to supply infraspinatus. Suprascapular nerve entrapment occurs when there is compression of nerve while passing through the bony suprascapular notch [2,3]. Complete ossification of the superior transverse scapular ligament converts the notch into foramen and it is the most important predisposing factor for the compression of the nerve [4].

The famous orthopaedic surgeon Andre Thomas first described the mechanism leading to the development of the suprascapular nerve entrapment syndrome in the year 1936. He depicted that as the suprascapular nerve passed through the two osseo-fibrous openings, the suprascapular and spinoglenoid notches, they represent rings over which the nerve is pulled. So, the concomitant extension and external rotation of the arm had led to traction and friction of the nerve in the narrow tunnel, causing paralysis of that nerve [5].

In arthroscopic shoulder operation the suprascapular notch also acts as important landmark to locate suprascapular nerve [6]. The shape of suprascapular notch plays very important role for compression of this nerve. In the whole population, approximately 1-2% all shoulder pain is caused by the suprascapular nerve entrapment [2]. Suprascapular nerve entrapment was also described in many previous studies. The impingement of suprascapular nerve causes difficulty in external rotation and abduction, and atrophy of the infraspinatus and supraspinatus muscles. This entrapment syndrome is most frequently found in people who do a lot of work requires extreme abduction and external rotation [7].

Depending upon the vertical length, transverse diameter and shape of the notches, various research workers classified them in many ways [8,9]. In current study, suprascapular notch was classified based on classification done by Rengachary SS et al., [2].

Similar studies were also done on the Indian population though they were very few in number [10-14]. They all reported that the most common type was type III except the study done by Gopal K et al., where they got type II as the most common one [14]. But in eastern Indian population similar studies are lacking. So, the present study was conducted to determine whether any variation of suprascapular notch is prevalent among the eastern Indian population.

MATERIALS AND METHODS

An observational cross-sectional study was done on 102 adult dry human scapulae of unknown age and sex. All the bones were collected from different medical colleges of West Bengal so that they represented the eastern Indian population. As the study was conducted on dry scapulae it was suggested by Ethical Clearance Committee of the institute.
Committee of various colleges to take permission from the head of the department and the verbal permission was received from the Head of the Department of respective colleges. The study was conducted from August 2020 to March 2021.

Inclusion criteria: Human adult undamaged dry scapulae irrespective of gender and side were included in the study.

Exclusion criteria: Bones with any damage or having pathological changes like fracture were excluded in the study.

**Study Procedure**

The suprascapular notches were identified and they were classified on the basis of classification done by Rengachary SS et al., [2]. The suprascapular notches and the following diameters related to the notches were measured with the help of vernier calipers [Table/Fig-1-4):

1. **Superior Transverse Diameter (STD):** The maximum distance between the superior points on the either side of the notch.
2. **Middle Transverse Diameter (MTD):** The maximum distance between the middle points on the margins of either side of the notch.
3. **Maximum Depth (MD):** The vertical distance from the deepest point of the notch to the STD.
4. **Safe zone distance:** [a] Distance of suprascapular notch from the margin of the glenoid cavity; and [b] the distance between the medial wall of the spinoglenoid notch to the posterior margin of the glenoid cavity. In type I and type VI all the measurements could not be taken.

**RESULTS**

In the present study, total 102 dry scapulae were observed and measurements were taken. Based on Rengachary classification, the percentage of various types of Suprascapular notches were calculated. The [Table/Fig-5] shows that type III was most common followed by type II.

The [Table/Fig-7] shows that the distance between suprascapular notch and supraglenoid tubercle of various types of scapula.

**STATISTICAL ANALYSIS**

All data were compared and analysed descriptively. The Statistical Package for Social Sciences (SPSS) version 16.0 was used.

The distance between the medial wall of the spinoglenoid notch and the posterior rim of glenoid cavity was also measured. It was least in type I. It was highest in type III [Table/Fig-8].
Types of notches | Mean (mm)±SD | Range (mm) |
--- | --- | --- |
I | 12.35±3.1819 | 10.1-14.6 |
II | 15.8±1.831 | 13.6-18.2 |
III | 17.185±1.525 | 14.7-18.5 |
IV | 16.06±1.7009 | 14.4-17.8 |
V | 13.9±0.424 | 13.6-14.2 |
VI | 14.1±0.1732 | 13.9-14.2 |

**DISCUSSION**

Shapes of suprascapular notches have been studied by different workers among different population. The present study among eastern Indian population, type III was most common type followed by type II, type IV, type VI. Percentage of Type I and Type V was same. The [Table/Fig-9] shows that type III was most common type found in most of the studies done by previous authors [2,9-11,14-21].

**CONCLUSION(S)**

From the present study, it was found that type III notch was most common in eastern Indian population like most other regions of India. The percentage of ossification of suprascapular ligament was more in the eastern part. Two special types were also found where both medial and lateral part of the ligament was ossified. Comparing this study with others, it is suggested that incidence of ossification of suprascapular ligament is more in the eastern part of India. Variations were also observed in respect to safe zone distance. Further studies are recommended with larger number of samples, data on the morphological variations of the suprascapular notches during evaluation of the cases of suprascapular nerve entrapment were not correlated with the findings of the osteological studies [27].

**REFERENCES**

• For any images presented, appropriate consent has been obtained from the subjects. NA

• Was informed consent obtained from the subjects involved in the study? NA

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