

Original research article

Morphological and morphometric study of suprascapular notch in human dry scapulae of north Karnataka population

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Abstract

Introduction: The suprascapular notch is present just beside the base of the coracoid process on the superior border of the scapula. It forms a crucial landmark for surgeries involving Suprascapular nerve entrapment. The **aim** of present study was to find out variations in shape and measurements of Suprascapular notch in dry scapulae and compare it with previous studies.

Materials and Methods: The study was carried out on 300 adult human dry scapulae in the Department of Anatomy, Navodaya medical college, Raichur district, North Karnataka from November 2021 to December 2021. The suprascapular notch was classified using Natsis *et al* and Iqbal *et al* classification. The morphometric analysis of suprascapular notch was done for vertical depth (VD), maximum transverse diameter (MTD) and distance from supraglenoid tubercle to the base of the suprascapular notch and morphological study of various shapes were noted down.

Results: The mean vertical depth was 5.04 mm (range= 1-14 mm), transverse diameter was 9.12 mm (range= 4-23mm)and distance from supraglenoid tubercle to the base of the notch was 30.385 mm (range= 21-39 mm).It was classified as type-I (5.67%), type-II (70%) type-III (11.67%) type-IV (8.33%) and type-V (2%) according to Natsis et al classification. A new finding was observed in the present study i.e MTD=VD in 2.335%

Conclusion: The present study has given information on morphology and morphometry of suprascapular notch which may be helpful for clinicians in planning the surgical procedures accordingly to avoid induced suprascapular nerve damage.

Keywords: Scapular notch, Scapula, Transverse diameter and Vertical diameter.

Introduction

The scapula is a thin bone placed on the posterolateral aspect of the thoracic cage, it extends from the second to the seventh rib. It has two surfaces, three angles and three borders^[1].The thinnest and shortest of the three borders is the superior border,its anterolateral end near the root of coracoid process has a deficient portion called Suprascapular notch^[2].The suprascapularnotch is classified into five major types due to its anatomical disparity^[3].The notch is converted into the foramen by superior transverse ligament and serves for the passage of Suprascapular nerve^[4].The nerve after coming out of the foramen gives motor branches to muscles arising from supraspinous and infraspinous fossa and sensory branches to rotator cuff muscles. The variation in the configuration of notch can cause suprascapular nerve entrapment syndrome. This syndrome leads to vague pain on the posterolateral aspect of shoulder joint and atrophy of Supraspinatus and Infraspinatus muscles^[5, 6, 7]. The formation of suprascapular foramen because of the ossification of superior transverse scapular ligament (STSL) may also lead to nerve entrapment syndrome^[8].

Hence the present study is carried out in Raichur district of North Karnataka in order to study the various parameters of suprascapular notch and its importance in nerve entrapment.

Aims and Objectives

The aim of this study is to record the degree of morphological variations in shape and measurements of suprascapular notch in dry scapulae among population of Raichur district and compare it with incidence

among various races of world.

Materials and Methods

This Cross-sectional study was performed on 300 adult human dry scapulae of both sexes collected from the osteology museum, Department of Anatomy, Navodaya medical college, Raichur district, North Karnataka. The study was done over a period of two months from November 2021 to December 2021. As the study was conducted on anonymous human scapula bones, ethical clearance was not considered.

Sample size

It included 300 adult dry human scapulae. (148 right, 152 left).

Inclusion criteria

Only adult human dry Scapulae in good condition were selected for study.

Exclusion criteria

The Scapulae that were impaired, deformed and deficient were excluded from the study.

Method

The study sample included random collection of 300 adult human dry human Scapulae (148 right, 152 left). Morphological and morphometric analysis of Scapulae was carried out in the department of Anatomy, Navodaya medical college, Raichur, Karnataka. Every scapula was studied in detail to find out various shapes of suprascapular notches on the superior border. Representative photographs of the different shapes of suprascapular notches were taken using a digital camera.

The different shapes of suprascapular notch for the study were classified as ‘U’ ‘J’ ‘V’ ‘Indentation’ ‘Complete ossification of STSL’ and ‘Absence of notch’ based on gross examination^[9].



Fig 1:U- shape



Fig 2: J-shape



Fig 3: V- shape



Fig 4: Indentation



Fig 5: Complete ossification of STSL

Fig 6: Absence of notch

Statistical analysis

The morphological and morphometric data measured was tabulated in excel sheet to analyze the descriptive statistical data like percentage, mean and standard deviation using SPSS software version 22.

Results

A total of 300 human scapulae were studied, of which 152 (50.67%) belonged to the left side and 148 (49.33%) to the right. 5 different types of Scapulae were classified (Natsis *et al.* classification) based on observation of scapula for the presence or absence of notch and morphometric analysis.

Table1: Distribution of suprascapular notch according to Natsis *et al.*, classification

Types	Description	Number	Percentage
Type-I	Without a discrete notch	17	5.67
Type-II	(MTD > VD)	210	70.00
Type-III	(MTD < VD)	35	11.67
Type-IV	Bony Foramen	25	8.33
Type-V	Bony Foramen and notch	6	2.00
	MTD = VD	7	2.33

The morphometric analysis of suprascapular notch was done for vertical depth (VD), maximum transverse diameter (MTD) and distance from supraglenoid tubercle to the base of the suprascapular notch. 17 scapulae (5.67%) observed without a discrete notch were contemplated as type-I while the rest 283 (94.33%) as other four types. 210 scapulae (70%) in which the mean transverse diameter of the notch was longer than the vertical diameter (MTD>VD) were classified as Type-I. 35 (11.67%) scapulae with VD>MTD were classified as Type-III while Type-IV with suprascapular foramen only without a visible notch was observed in 25 scapulae (8.33%). Type-V i.e. presence of both notch and foramen together in the same scapula was observed in 6 (2%) bones in the present study (Table/Fig-7).

Table2: Distribution of supra scapular notch according to shape (Iqbal *et al.* classification)

Shape	Number	Percentage
Absence of notch	17	5.67
U - Shape	114	38.00
V - Shape	19	6.33
J - Shape	110	36.67
O - Shape foramen or completely ossified	31	10.33
Indentation	9	3.00

According to Iqbal *et al.* classification (Table/Fig-8), the most common type of supra scapular notch found was U-shaped (38%) (Figure-1), followed by J-shaped (36.67%) (Figure-2) and V-shaped (6.33%) (Figure-3). 9 scapulae (3%) had indentation (Figure-4) along the superior border while complete ossification of STSL was found in 31 (10.33%) scapulae (Figure-5). In 17 scapulae (5.67%) there was no notch (Figure-6).

Table3: Comparison of various parameters of supra scapular notch

Parameter	Right					Left				
	N	Mean	Sd	Min	Max	N	Mean	Sd	Min	Max
Vertical depth (vd)	108	5.22	2.56	1	14	144	4.86	2.8	1	14
Maximum transverse diameter (mtd)	108	9.25	3.96	4	23	144	8.99	3.77	4	19
Distance of the base of notch from supraglenoid tubercle to the	121	30.65	2.8	21	36	154	30.12	3.4	23	39

The mean vertical depth (VD) was 5.04 mm (range= 1-14 mm) in the present study. On the right side, it was 5.22mm (range= 1-14 mm) whereas on the left side, it was 4.86 mm (range= 2.42-13.84 mm). Thus, right side had more depth compared to the left. The mean maximum transverse diameter (MTD) was 9.12 mm (range= 4-23mm). On the right side, it was 9.25 mm (range= 4-23 mm) whereas on the left side, it was 8.99 mm (range= 4-19 mm). So it was higher on the right side. The mean distance from the base of suprascapular notch to the supraglenoid tubercle was 30.385 mm (range= 21-39 mm). On the right side, it was 30.65 mm (range= 21-36 mm) whereas on the leftside, it was 30.12mm (range= 23-39 mm). Thus, it was slightly higher on the right side (Table/Fig-9).

Discussion

The study of suprascapular notch present on the superior border of scapula has been studied by various researchers across the world. The knowledge about the morphology of suprascapular notch and its variations is essential as it helps to know the cause of suprascapular nerve entrapment and understand its correlation with it^[10, 11].

Suprascapular notch where vertical depth (height) is reduced may subsequently narrow the suprascapular foramen leading to suprascapular nerve entrapment^[9].

Rengachary *et al.*^[12] found that suprascapular nerve entrapment was an acquired neuropathy secondary to the nerve compression in the suprascapular notch.

Iqbal *et al.*^[9] observed that Indentation was most common type at the site of suprascapular notch followed by ‘J’ and ‘V’ shaped notches. He also found a considerable number of scapula in which the notch was absent.

In the present study out of 300 scapulae, ‘U’ shape (38%) was found to be the most common followed by ‘J’ shaped (36.67%) and ‘V’ shaped (6.33%) suprascapular notches. Absence of notch was noticed in 17 scapulae (5.67%).

Table4: Distribution of different types of suprascapular notch in various population using Natsis *et al.* classification.

Authors	Population	Type 1	Type 2	Type 3	Type 4	Type 5	MTD=VD
Natsis <i>et al.</i> ^[3] (2007)	Greek	8.3%	41.85%	41.85%	7.3%	0.7%	-
Wang <i>et al.</i> ^[13] (2011)	Chinese	28%	58.16%	28.23%	3%	0%	-
Mahdy <i>et al.</i> ^[14] (2013)	Egyptian	6.0%	45.45%	43.93%	3.03%	1.5%	-
Soni <i>et al.</i> ^[15] (2012)	Indian	5%	72%	20%	3%	0%	-
Sutheria <i>et al.</i> ^[16] (2013)	Indian	6.06%	45.45%	43.93%	3.03%	1.5%	-
Rajoria Sushil Raj <i>et al.</i> ^[17] (2019)	Indian	2%	77.6%	20.4%	1.6%	0%	-
Present study	Indian	5.67%	70%	11.67%	8.33%	2%	2.33%

In the present study mean VD was 5.04mm, mean TD was 9.12mm and mean distance from the base of suprascapular notch to supraglenoid tubercle was 30.385mm.

The present study found that type 2 (MD >VD) was the most common type (70%) followed by type 3 (11.67%) and type 4 (8.33%). The type 5 was least common. In the present study a new type i.e MTD = VD was observed that was not found in previous studies.

The findings of the present study were consistent with that of Soni *et al.*, Sutheria *et al.* and Rajoria Sushil *et al.* in Indian population and with Mahdy *et al.* and Wang *et al.* in Egyptian and Greek population respectively. Natsis *et al.* reported equal proportion of type 2 and type 3 and least common type as type 5.

Conclusion

The analysis of suprascapular notch based on shape and dimensions would help the Clinicians, Surgeons and Orthopaedician to understand the possible causative factors in suprascapular nerve entrapment. It will also help in planning of surgical procedures accordingly to avoid induced suprascapular nerve damage.

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