

**Morphometric Study of Suprascapular Notch in Dry Adult Scapula**Sonal A Talokar<sup>1</sup>, Abhilasha M Wahane<sup>2</sup>, Rajashri N. Dange<sup>3</sup><sup>1</sup>Associate Professor Department of Anatomy, GMC, Nagpur, Maharashtra<sup>2</sup>Associate Professor, Department of Anatomy, GMC, Gondia, Maharashtra<sup>3</sup>Professor, Department of Anatomy, K M Medical College, Mathura, Uttar Pradesh

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**Abstract:**

**Introduction:** The suprascapular notch is a depression on the lateral part of the superior border of the scapula, situated medial to the coracoid process. It is bridged by the superior transverse scapular ligament. Suprascapular notch transmits the suprascapular nerve to the supraspinatus fossa and suprascapular vessels pass above the ligament. Various morphological variations of suprascapular notch have been identified as one of the causes of suprascapular nerve entrapment. Based on its shape, Rengachary et al. classified this notch into six types.

**Aim of Study:** To study morphometry and morphological variations of suprascapular notch in Indian dry scapulae and to analyze the incidence of completely ossified superior transverse scapular ligament with other ethnic populations which have been studied earlier.

**Materials and Methods:** A total of 100 human dry scapulae which were collected from the museum of Department of Anatomy, Govt. Medical College were analyzed. The suprascapular notch was classified according to Rengachary et al. The results of the present study were compared with the results of previous authors in different populations.

**Results:** In our study, out 100 scapulae, the incidence of various types of suprascapular notches were: Type I - 26%, Type II -28%, Type III -34%, Type IV -8%, Type V -4%, Type VI -0%.

**Conclusion:** Since ossification of superior transverse scapular ligament with formation of suprascapular foramen and other morphometric variations of suprascapular notch, are responsible for the suprascapular nerve entrapment syndrome, the knowledge of variations is essential for clinicians, for a proper diagnosis and suitable surgical intervention.

**Keywords:** Suprascapular Notch, Scapula, Suprascapular Nerve Entrapment.

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**Introduction**

The suprascapular notch (SSN) is a depression on the lateral part of the superior border of the scapula situated medial to the coracoid process. The suprascapular notch, transmits the suprascapular nerve (SN) to the supraspinous fossa [1,2]. The suprascapular notch is bridged by the superior transverse scapular ligament (STSL). This ligament is sometimes ossified and suprascapular notch is converted into the foramen.

Suprascapular nerve supplies motor branches to the supraspinatus and infraspinatus muscles, and sensory branches to rotator cuff muscles, and ligamentous structures of the shoulder and acromioclavicular joints. So, this notch is an important surgical landmark for the suprascapular nerve during arthroscopic shoulder operations [3,4].

Variations in the morphology of suprascapular notch have been identified as one of the causes of suprascapular nerve entrapment [5]. Rengachary et

al [6-8], classified this notch into six types, based on its shape and they also stated that the size of the suprascapular notch played a role in the predisposition for suprascapular nerve entrapment. According to their opinion, a small notch gave a greater chance of a nerve impingement than a large one. One of the clinically most important places on the scapula is the suprascapular notch. The suprascapular nerve run below this superior transverse scapular ligament, and above the ligament passes suprascapular vessels [9].

The SSN is the main site of compression of the SN. This pathology was first described as SN entrapment syndrome by Kopell and Thompson [10]. This disease is characterized by pain in the posterolateral region of the shoulder (characterized as a dull ache), atrophy of the supraspinatus and infraspinatus muscles and weakness of the arm's external rotation and abduction. [11-16] The present study was done to have better

understanding of pathogenesis of suprascapular nerve entrapment and for shoulder arthroscopic surgeries.

#### Aim of Study

To study morphometry and morphological variations of the suprascapular notch in central Indian dry scapulae and to analyze the incidence of completely ossified superior transverse scapular ligament with other ethnic populations which have been studied earlier.

#### Material and Methods

A total of 100 human scapulae of unknown ages and sexes, collected from the Museum of Department of Anatomy, Government Medical College were studied. Broken scapulae were excluded.

Suprascapular notch were classified into 6 types as follows. **Type I** –wide depression on superior

border. **Type II** -wide blunted V shaped notch. **Type III**–symmetrical and U shaped notch with parallel lateral margins. **Type IV** -small V shaped notch. **Type V** -U shaped notch with partial ossification of medial part of suprascapular ligament. **Type VI** -complete ossified ligament with bony foramen of variable size. We followed this classification. The following dimensions were measured with the digital Vernier calipers.

**Superior transverse diameter (STD):** It is the horizontal distance between superior corners of the SSN on the superior border of the scapula. **FIG 6**

**Maximum depth (MD):**The distance between the superior corners of the notch to the deepest point of the suprascapular notch. **FIG 6**

The data was analyzed statistically by using Graph pad prism software.



Figure. 1 Type I



Figure. 2 Type II



Figure. 3 Type III



Figure. 4 Type IV



Figure. 5 Type V

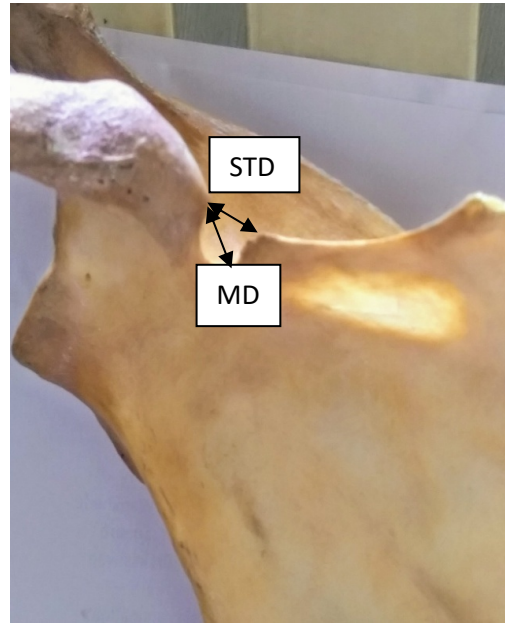


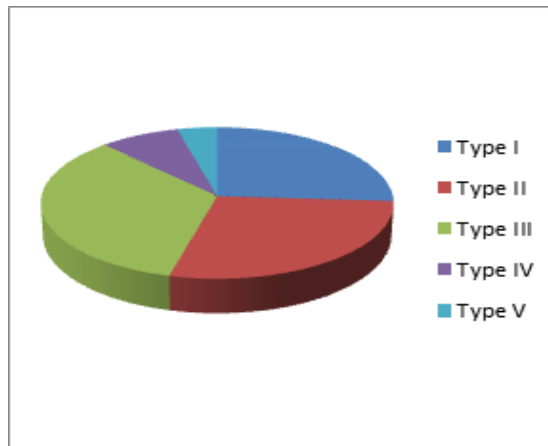
Figure. 6 Type VI

**Results**

In the present study, the incidence of various types of suprascapular notch was classified into six types based on **Rengachary classification** [6,7,8] (Table 1) Type I- 26%, Type II-28%, Type III-34%,Type IV 8%, Type V-4%Type VI-0%. U shaped notches were commonly observed followed by V-shaped notch. Complete ossification of the ligament was not observed.

**Table 1**

Sr.No.	Shape	Total(%)
1	Type I	26%
2	Type II	28%
3	Type III	34%
4	Type IV	8%
5	Type V	4%
6	Type VI	0%



In the present study, superior transverse diameter (STD) and maximum depth (MD) were measured in type II, III, IV, V suprascapular notch. The result was statistically analysed as shown in Table No. 2 and 3. It was found that STD in type III and IV had p value less than 0.05. So it was statistically significant. It was also found that 4 suprascapular notches of type III showed STD less than MD.

**Table 2: Superior Transverse Diameter (STD)**

Sr no.	Type of Notch	Range	STD MEAN± SD(mm)	p Value	S/NS
1	Type I	---	---	---	---
2	Type II	7.42- 13.62	10.83 ± 1.90	0.08	NS
3	Type III	6.37- 13.89	11.92 ± 2.03	0.001	S
4	Type IV	4.33- 7.01	6.09 ± 0.83	0.04	S
5	Type V	4.21-6.60	5.50 ± 0.98	---	---
6	Type VI	--	---	---	---

**Table 3: Maximum Depth (MD)**

Sr no.	Type of Notch	Range	MD MEAN± SD(mm)	p Value	S/NS
1	Type I	----	---	---	---
2	Type II	4.37- 9.12	6.97 ± 1.15	0.63	NS
3	Type III	5.74- 11.14	8.14 ± 1.13	0.36	NS
4	Type IV	3.35- 5.02	3.87 ± 0.55	0.08	NS
5	Type V	3.12- 5.12	4.25 ± 0.83	---	---
6	Type VI	---	----	---	---

**Discussion**

The present study was compared with various studies which have been done on suprascapular notch variations in different populations. Rengachary et al., [6] Ticker et al. [17], Bayramoglu et al. [18] , Natsis et al. [19], Sinkeet [20], Wang [21] and Polguy[22]. Depending on the shape of suprascapular notch and the degree of

ossification, Rengachary et al. [6] classified SSN into six types. Type I- Wide depression in the superior border of the scapula. Type II- Wide blunted V shape, Type III Symmetric U shape. Type IV-Very small V shape, often with a shallow groove for the suprascapular nerve. Type V- Partial ossified medial portion of the suprascapular ligament. TypeVI- Completely ossified suprascapular ligament forming foramen.

**Table 3:**

Author	Type of Notch					
	Type I	Type II	Type III	Type IV	Type V	Type VI
<b>Rengachary et al. 1976</b>	6%	24%	40%	13%	11%	6%
<b>Sinkeet et al. 2010</b>	22%	21%	29%	5%	18%	4%
<b>SangamM et al. 2013</b>	21%	8%	59%	2%	5%	1%
<b>Shalom E. P. et al. 2017</b>	9%	36%	38%	8%	6%	3%
<b>Present Study</b>	26%	28%	34%	8%	4%	0%

In the present study, we found that Type III was more prevalent followed by type II. This finding was similar to the findings of Rengachary et al. [6] and Shalom E.P. et al [24]. It differed from the studies of Sinkeet et al [20] and Sangam et al [23] which showed type I as more prevalent than type II(Table 4).This differences in the population could possibly be explained due to ossification of the coracoid process and epiphysis influencing the shape of the SSN. Odita et al [25] reported that this ossification appeared earlier in Nigerian infants than in Caucasians. In present study, we didn't get any scapula with completely ossified suprascapular ligament. So the least common was type VI which was similar to the findings of Rengachary et al [6], Sinkeet et al [20] andSangam et al [23]. The various studies showed that incidence of suprascapular foramen was different in different populations. In the present study, the dimensions of various types of suprascapular notches most commonly showed that STD was greater than MD except in 4 type III notches where STD was less than MD. Dunkelgrun et al [26] stated that type III

notches had a larger area than Type IV notches, leading to the conclusion that a V-shaped notch would be more likely associated with nerve entrapment. But no direct correlation between notch type and suprascapular nerve entrapment has been shown clinically [27]. P value is calculated for STD and MD in type II, III,IV notch. It was found that p value of STD in type III and IV was found to be 0.001 and 0.04 respectively. Hence it is statistically significant .

**Conclusion**

The anatomical variations of suprascapular notch plays an important role in etiology of suprascapular nerve entrapment. Since complete ossification of superior transverse scapular ligament with formation of suprascapular foramen and other morphometric variations of suprascapular notch,are responsible for the suprascapular nerve entrapment syndrome , knowledge on such variations is essential for clinicians, for a proper diagnosis and for planning surgical interventions.

**Abbreviations**

SSN - Suprascapular notch.

STSL - Superior transverse scapular ligament.

MD - Maximum depth.

STD - Superior transverse diameter.

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