

## THE MORPHOLOGICAL AND MORPHOMETRIC STUDY OF SUPRASCAPULAR NOTCH AND ITS VARIATIONS

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### ABSTRACT

The Suprascapular notch is situated in the lateral part of the superior border of the scapula, just adjacent to the base of Coracoid process. The notch is bridged by the superior transverse scapular ligament (STSL) which some time ossifies and is attached laterally to the root of the coracoid process and medially to the limit of the notch. A number of variations occur in the shape of suprascapular notch, from a discrete notch to "J" shaped, "V" shaped, "U" shaped or "O" shaped (i.e. as a complete foramen).

To study morphological and morphometric variations of suprascapular notch of Indian population.

We studied 140 dried scapula bone and measurements of SSN were done using digital vernier calipers. We used the Rengachary classification for this study. The following measurements were The superior transverse diameter - maximum distance between superior most edges of suprascapular notch (SSN). The inferior transverse diameter - maximum distance between the edges of the curved arch at the base of the SSN. The results of our study were: J-shaped -28%, U-shaped-26%, V-shaped -15%, Partial-ossification-7%, Indentation-10%, Absent-9%, Complete ossification- 2%. Type IV supra scapular notch was found to be the most prevalent type amongst all shapes. We also found that the characteristics of the scapula (dimensions) are related to the characteristics of the supra scapular notch (type and dimensions) and there is a distinct difference between right and left side scapula.

**KEYWORDS:** Supra scapular notch, Scapula, Superior transverse diameter, Vertical diameter, Supra scapular ligament.

### INTRODUCTION

The scapula is a large flattened and triangular bone which lies on the postero- lateral aspect of the thorax, against second to the seventh ribs. The Suprascapular notch is situated in the lateral part of the superior border of the scapula, just adjacent to the base of Coracoid process. (1)

The notch is bridged by the superior transverse scapular ligament (STSL) which some time ossifies and is attached laterally to the root of the coracoid process and medially to the limit of the notch. (2)

A number of variations occur in the shape of suprascapular notch, from a discrete notch to "J" shaped, "V" shaped, "U" shaped or "O" shaped (i.e. as a complete foramen). Various authors have classified the suprascapular notch into different types. Authors like Olivier (4) have divided it into 5 types and like Rengachary (5) has divided into 6 types.

In all these types the notch can be more or less open, narrower or wider. Extrinsic compression or traction on the suprascapular nerve may result in suprascapular neuropathy.

The compression of this nerve may occur at two

distinct locations: the suprascapular notch and the spinoglenoid notch.

### MATERIALS AND METHOD

A study includes 140 dried scapula bone irrespective to sex and age which are based on inclusion and exclusion criteria. We used Rengachary classification of morphologically different variations of suprascapular notches. The measurements of SSN were made using digital vernier calipers and these were recorded in millimeters (resolution of 0.01 mm).. The following measurements were taken: The superior transverse diameter - maximum distance between superior most edges of suprascapular notch (SSN). The inferior transverse diameter - maximum distance between the edges of the curved arch at the base of the SSN. The data was analyzed statistically by using ANOVA- test.

### OBSERVATIONS AND RESULTS

Table-1 shows varies type of supra scapular notches we found in our study: J-shaped -28%, U-shaped-26%, V-shaped -15%, Partial-ossification-7%, Indentation-10%, Absent-9%, Complete ossification- 2% as shown in Table-1, along with the percentages of right and left side scapula.

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S/N	Shape of Suprascapular notch	Total Number	Right Scapula	Left Scapula
1	J-shape	40(28.57%)	22(55%)	18(45%)
2	U-shape	37(26.42%)	20(54%)	17(45.94%)
3	V-shape	21(15%)	11(52.38%)	10(47.61%)
4	Incomplete suprascapular foramen	10(7.14%)	6(60%)	4(40%)
5	Indentation	15(10.71%)	6(40%)	9(60%)
6	Absent	13(9.28%)	6(46.15%)	7(53.84%)
7	Complete suprascapular foramen	4(2.85%)	1(25%)	3(75%)

Table- 1. Classification of scapulae (n=140) according to shape of Suprascapular Notch.

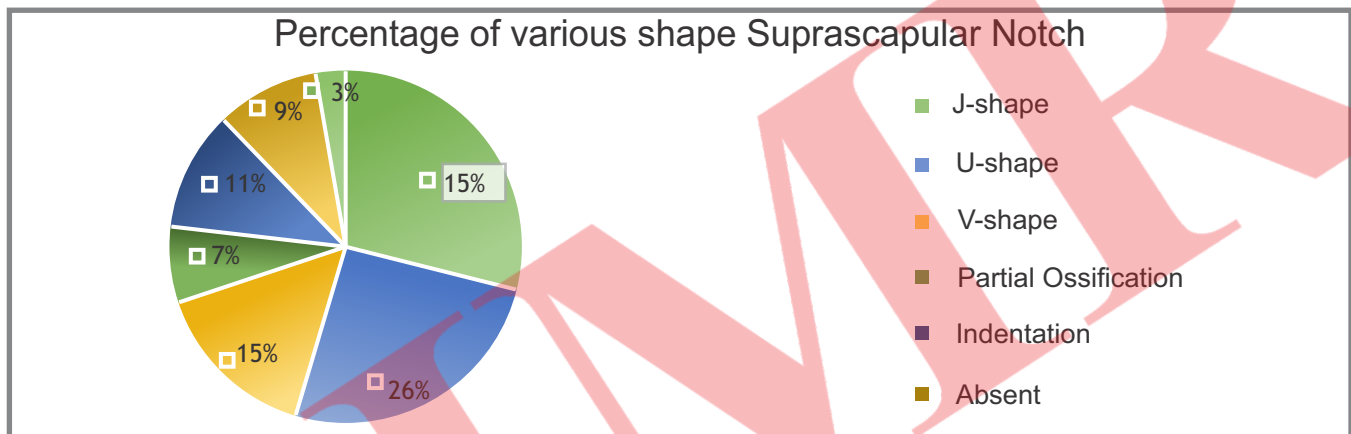


Fig. 1: Showing Percentage of various shape Suprascapular Notch.

The mean transverse diameter and vertical length of the supra scapular notch in the present study was  $10.81 \pm 0.32$  mm and  $8.17 \pm 0.23$  mm respectively. The range of transverse diameter was 0.5-33 mm and of vertical length was 0.5-16 mm as shown in Table-2 and Fig. 2.

S/N	Parameters	Range(mm)	Mean $\pm$ SD (mm)
1	Transverse Diameter	0.5-33	$10.81 \pm 0.32$
2	Vertical Length	0.5-16	$8.176 \pm 0.23$

Table-2. Shows the range, mean and SD of measurements of supra scapular notch.

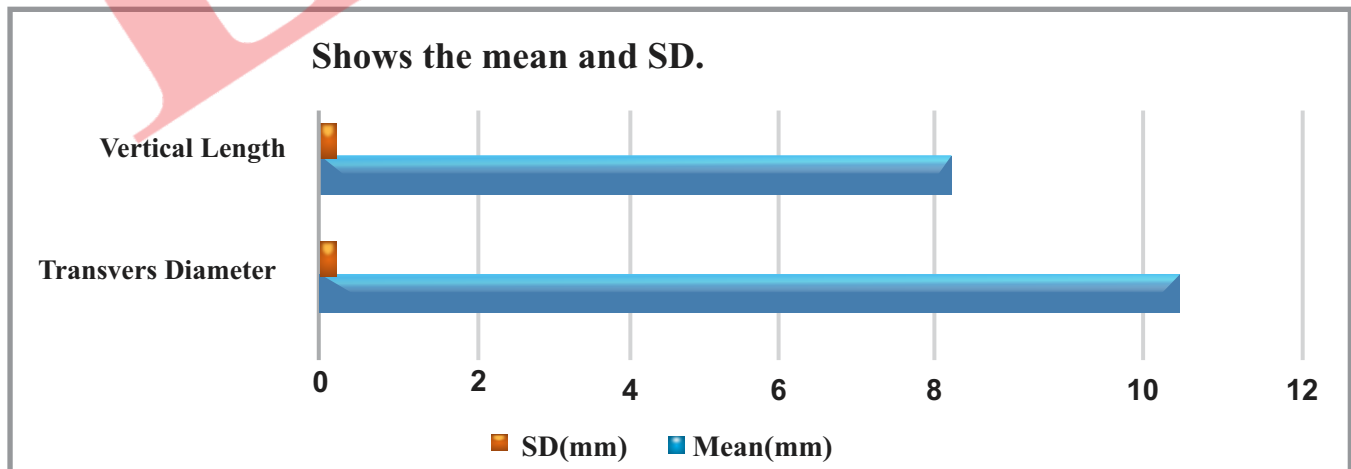


Fig. 2: Shows the range, mean and SD of measurements of supra scapular notch.



**A. Absent suprascapular notch (type I)**



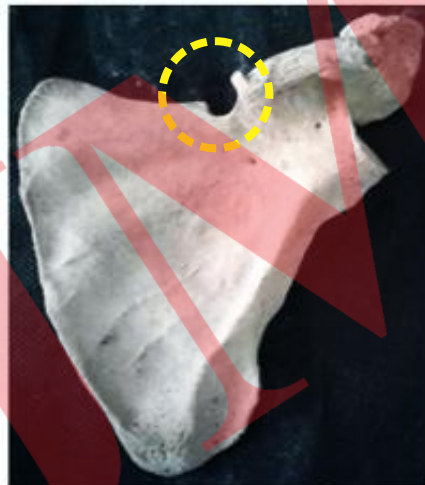
**B. Indentation suprascapular notch (type I)**



**C. V-shaped suprascapular notch (type II)**



**D. U-shaped suprascapular notch (type III)**



**E. J-shaped suprascapular notch (type IV)**



**F. Incomplete suprascapular foramen (type V)**



**G. Complete suprascapular foramen (type VI)**

**Fig. 3: Showing the various shapes of suprascapular notch.**

**DISCUSSION**

In the present study, the incidence of morphological variations in the suprascapular notch is Type IV>Type III>Type I>Type II> Type V> Type VI. This finding is very close to the findings of Paolo Albino et al (11). Also in the present study, Type IV i.e. J- shaped suprascapular notch, has the highest rate i.e. 28.57% which is similar to the findings of Paolo Albino et al.(11) and Apurba Patra et al.(25) i.e. 31% and 39.09% but Rengachary et al.(5), Sinkeet et al.(9) Vandana R. et al.(10), Usha Kannan et al.(13), Udayasree L et al.(14), G.H.E.S. Hassanein et al.(23), Manmeet kour et al.(24), S. Vedha et al.(32), Reddy et al.(28) described the highest rate of Type III suprascapular notch and Iqbal k. et al.(8), Krishna Gopal et al.(18) and Manikum et al.(22) described the highest rate of Type II suprascapular notch whereas in the present study the incidence rate of Type III, Type I and Type II is 26.42%, 20% and 15% and Type V and Type VI is 7.14% and 2.85%. Type III described the

second highest rate and Type VI described the lowest incidence rate among all finding of the present study.

**CONCLUSION**

Type IV supra scapular notch was found to be the most prevalent type amongst all shapes. This study also found that the characteristics of the scapula (dimensions) are related to the characteristics of the supra scapular notch (type and dimensions). Our findings demonstrated that there is a distinct difference between right and left side scapula. Type III was the second most common type and the least was found to be type VI. Though, it was a small study, but on the basis of the conclusions drawn, further research into this area of classification is required to investigate different shapes of the suprascapular notch. A larger sample size for better external validity and also the knowledge of anatomical variations of SSN is required for better understanding of the location and source of entrapment syndrome So that these

Author	Population	Type IV	Type III	Type II	Type I	Type V	Type VI
<b>Present study</b>	North India	28.57%	26.42%	15%	20%	7.14%	2.85%
<b>Rengachary et al (1979)<sup>(5)</sup></b>	America	3%	48%	31%	8%	6%	4%
<b>Sinkeet et al (2010)<sup>(9)</sup></b>	Kenya	5%	29%	21%	22%	18%	4%
<b>Iqbal k. et al(2010)<sup>(8)</sup></b>	Pakistan	–	13%	20%	18%	–	–
<b>Vandana R. et al (2013)<sup>(10)</sup></b>	South India	–	35%	5.2%	4.5%	3%	12.6%
<b>Paolo Albino et al (2013)<sup>(11)</sup></b>	Italy	31%	22.8%	19.8%	12.4%	10%	3%
<b>Usha Kannan et al (2014)<sup>(13)</sup></b>	South India	4%	52%	10%	20%	4%	10%
<b>Udayasree L et al. (2014)<sup>(14)</sup></b>	South India	21.4%	47.6%	4.7%	11.9%	4.7%	9.5%
<b>Krishna Gopal et al. (2014)<sup>(18)</sup></b>	North India	12.5%	25%	41.7%	15.8%	1.7%	3.3%
<b>Manikum et al (2015)<sup>(22)</sup></b>	South Africa	18%	5%	65%	5%	7%	–
<b>G.H.E.S. Hassanein et al. (2015)<sup>(23)</sup></b>	Egypt	31.58%	60.53%	7.89%	8.24%	–	2.35%
<b>Manmeet kour et al (2016)<sup>(24)</sup></b>	India	–	46.6%	8.24%	13.3%	–	3.2%
<b>Apurba Patra et al. (2016)<sup>(25)</sup></b>	India	39.09%	31.81%	9.09%	11.81%	3.63%	4.54%
<b>S. Vedha et al (2017)<sup>(32)</sup></b>	South India	5.2%	37.2%	5.6%	21.2%	5.2%	9.2%
<b>Reddy et al. (2017)<sup>(28)</sup></b>	South India	–	44.3%	41.5%	6.6%	4.7%	2.8%

*Table 3: Comparison with the previous studies*

variations could be kept in mind during surgical or arthroscopic shoulder procedures to prevent suprascapular nerve injuries.

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