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CORRELATION BETWEEN MORPHOMETRY OF SUPRASCAPULAR NOTCH AND OSTEOMETRIC PARAMETERS OF SCAPULA IN NORTH BENGAL REGION

Anatomy

Aradhana Sanga Medical Officer, Health and Family Welfare Jharkhand.

Saikat Kumar Dey* Medical Officer, West Bengal Health Services *Corresponding Author

ABSTRACT

INTRODUCTION: The suprascapular notch (SSN) entrapment neuropathy common in volleyball players presents with dull ache. The current study aims to find out if any, the correlation between SSN and scapular dimensions and analyse the relation between SSN dimensions and types of notches.

METHOD: 68 dried human scapula were examined for 4 scapular parameters and 2 SSN variables . SSN was classified according to Rengachary's method. For analysis mean, standard deviation, Pearson's correlation and p-value were calculated.

RESULT: 4.4% scapula had ossified superior transverse ligament. 21 (30.9%) scapula had MD > STD, 40 (58.8%) scapula had STD > MD and 4 (5.9%) sacapula had MD = STD. Type III had maximum (36.76%) and type IV had least (4.41%) frequency. The width/depth ratio was highest in type I.

CONCLUSION: Scapular dimensions had a weekly positive relation with SSN though not statistically significant. SSN dimensions with STD>MD were more in number than MD>STD.

KEYWORDS

Suprascapular Notch Classification, Scapular Dimensions, Scapular Index, Glenoid Index.

INTRODUCTION

Suprascapular notch (SSN) is situated in the lateral part of superior border of scapula at the base of the coracoids processs [1]. It gives passage to suprascapular nerve which passes beneath the superior transverse scapular ligament. Ligament when ossified converts notch into foramen. Kopell and Thompson et al [2] first described the nerve entrapment syndrome following which a great number of studies have been done on it. Aetiological factors responsible were found to be repetitive overhead activities like in volleyball players and baseball pitchers, pathological and iatrogenic factors like ganglion cyst [3], Ewing's sarcoma, chondrosarcoma and lipoma [4], anterior dislocation or direct trauma [5], or lesions during open surgical procedures [6].

Nerve entrapment is characterised by weakness of arm, difficulty in external rotation and abduction along with atrophy of infraspinatus and supraspinatus muscles making the study on suprascapular nerve entrapment clinically important. Rengachary [6] classified SSN into 6 types based on morphology and geometric features. In type I SSN there is a wide depression along superior border of the scapula, type II shows a wide and blunt notch, type III has a symmetrical U-shaped notch with parallel margins, type IV has a small V shaped notch, type V had a partially ossified notch and type VI formed a complete foramen due to ossification of superior transverse ligament. (Shown in Figure 1)

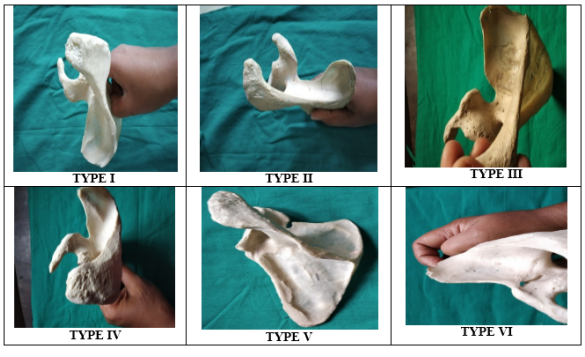

FIGURE 1: Types of suprascapular notch on the basis of Rengachaey's classification.

Previously innumerable studies have been done on suprascapular nerve neuropathy but only a few have been done regarding the potential correlation between SSN parameters and major scapular parameters. Hence in this study we would like to focus on this aspect and along with the relation of SSN dimensions with different types of notches.

MATERIALS AND METHODS

A total of 68 dried human scapula were obtained from Department of Anatomy, North Bengal Medical College, Darjeeling, West Bengal from January – june 2018 after excluding the broken, unossified scapulae.

Osteometric measurements were taken from the scapula for following parameter [7] (shown in Fig. 2a, 2b).

1) *MSL - Maximum scapular length*
   Maximum distance between superomedial and inferior angle.
2) *MSW - Maximum scapular width*
   Maximum diameter between the medial border of scapula, where the spine meets the body of the scapula and anterior lip of the glenoid cavity.
3) *MGL - Maximum glenoid length*
   Maximum distance from the inferior point on the glenoid margin to the most prominent point of the supraglenoid tubercle.
4) *MGW - Maximum glenoid width*
   Maximum breadth of the articular margin of glenoid cavity perpendicular to MGL.

The following indices were calculated using above values [8]:

5) *Scapular index*- MSW/MSL*100
6) *Glenoid index*- MGW/MGL*100

The SSN dimensions taken were [7] (shown in Fig 2c):

7) *MD - Maximal depth*

The maximum value of the longitudinal measurements taken in the vertical plane from an imaginary line between the superior corners of the notch to the deepest point of SSN.

8) *STD - Superior transverse diameter*

Horizontal measurements between the corners of the SSN on the superior border of the scapulae.

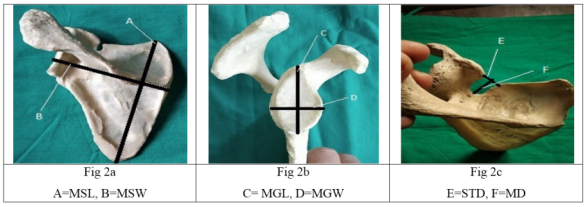

Fig 2a	Fig 2b	Fig 2c
A=MSL, B=MSW	C= MGL, D=MGW	E=STD, F=MD

FIGURE 2: Showing scapular and suprascapular notch measurements. (A= maximum scapular length, B= maximum scapular width, C= maximum glenoid length, D= maximum glenoidal width, E= superior transverse diameter, F= maximum depth)

SSN was classified accordingly to Rengachary's [6] system which was used for comparison of result. For each class a wide/depth ratio was also analysed. All measurements were taken twice using Vernier

Calliper. Data was analyzed using descriptive statistics for Mean and Standard Deviation (SD). The correlation between SSN measurements and osteometric parameters of scapula was examined using Pearson's correlation and p value in SPSS version 20. P value of <0.05 was accepted as statistically significant.

RESULT

In the present study bony foramen was present in 3 scapula (4.4%). In 21 scapula (30.9%) the MD was longer than STD, 4 scapula (5.9%) had MD equal to STD and 40 scapula (58.8%) had STD longer than MD. As shown in table 1, in scapula with longer MD the MSL, MGL were higher while in scapula with higher STD the MSW, MGW, SI and GI were higher.

TABLE 1: Measurements and indices of the scapula. (SD= standard deviation, SI= scapular index, GI= glenoid index)

PARAMETERS	MD>STD		STD>MD	
	MEAN	SD	MEAN	SD
MSL	14.52	1.72	13.88	1.11
MSW	9.61	0.85	9.63	0.57
MGL	3.8	0.4	3.66	0.46
MGW	2.42	0.24	2.47	0.25
SI	66.74	6.44	69.52	4.3
GI	63.82	5.11	68.45	13.72

The Pearson's correlation indexes are shown in table 2 to assess the correlation between the SSN dimensions and scapular parameters found a weak correlation between STD MGW, SI and GI but this was not statistically significant. Weak correlation was also found between MD of SSN and all other scapular parameters except GI but again they were not statistically significant.

On examining the frequency and percentage of different types of SSN, type III was most prevalent among the population as shown in table 3. Mean and standard deviation of SSN dimensions for each notch type is shown in table 4. These were further used to analyse the correlation between width/depth ratio and all notch types. Type I was seen to have the highest ratio followed by type II, III IV, V and VI in descending order. The Figure 3 thus shows the trend denoting no statistically significant relation between the various types of notches.

TABLE 2: Correlation indexes between the dimensions of the scapula and the dimensions of the suprascapular notch.

PARAMETERS	DEPTH OF SUPRASCAPULAR NOTCH (MD)		SUPERIOR TRANSVERSE DISTANCE OF SUPRASCAPULAR NOTCH (STD)	
	Pearson's coefficient	P value	Pearson's coefficient	P value
MSL	0.078	>0.05	0.183	>0.05
MSW	0.092	>0,05	0.142	>0.05
MGL	0.044	>0.05	0.158	>0.05
MGW	0.162	>0.05	0.108	>0.05
SI	0.122	>0.05	0.119	>0.05
GI	0.150	>0.05	0.052	>0.05

TABLE 3: Depicting frequency and percentage of various types of Suprascapular notches.

Type of SSN	FREQUENCY	PERCENTAGE
I	11	16.18%
II	16	23.53%
III	25	36.76%
IV	9	13.24%
V	4	5.88%
VI	3	4.41%

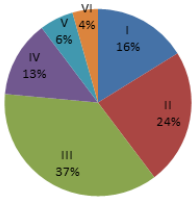

TABLE 4: Analysis of dimensions of suprascapular notch types.

TYPE		Mean	SD	STD/MD
Type I	MD	0.83	0.34	1.71
	STD	1.42	0.72	
Type II	MD	0.8	0.29	1.55
	STD	1.29	0.36	
Type III	MD	0.89	0.28	0.97
	STD	0.86	0.48	
Type IV	MD	0.77	0.24	0.81
	STD	0.62	0.2	
Type V	MD	0.65	0.33	0.72
	STD	0.47	0.24	
Type VI	MD	0.7	0.21	0.38
	STD	0.27	0.05	

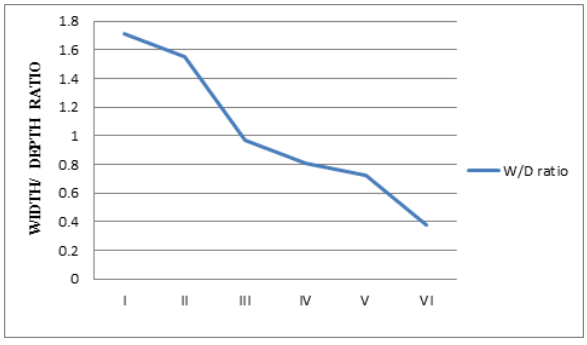

FIGURE 3: Relationship between width/ depth ratio and suprascapular notch type.

DISCUSSION

- The incidence of completely ossified superior transverse ligament was found to be in a range of 3.7% to 12.5% from various studied literatures. 3.7% was found by Edlson [9] and maximum of 12.5% was found by Urguden et al [10].
- MD of SSN was found by Hrdicka [11] and Olivier [12] as type IV and by Rengachaey et al [6] and Natsis et al [13] as type III. Rengachaey et al [6] found such cases to contribute 48%, Natsis et al [13] found it 41.85%, Polguj M [8] found it 24.4%. In our study we found it to be 30.9%.
- STD of SSN was found by HrdickA [11], Olivier [12], Rengachaey et al [6] and Natsis et al [13] as type III with a frequency of 31% by Rengachaey et al [6] , 41.85% by Natsis et al [13], PolguJ [8] 57.7%. In our study it was found to be 58.8%.
- Correlation analysis found a weak correlation of STN and MSL and GI while MD did correlate with GI but these could not be considered as predictive parameter to determine the dimension of the SSN. Polguj et al [8] found a direct correlation between MSL and MD and an inverse correlation between SI and MD. According to Albino P [14] scapular dimension were not related to characteristics of SSN same as in our study.
- The SSN features taken into consideration in this study was according to Rengachary's [6] classification, Natsis et al [13] also classified SSN into V classification based on vertical and transverse depth of SSN and absence/presence of notch and foramina. Polguj et al [8] again classified SSN on basis of an extra parameter, the middle transverse diameter. He subdivided the type I and III also but Rengachaey's. classification was fully assessed as compared to others, hence it is used here as a standard. Accordingly type III was considered most common and typeVI (4.41%) the least.On analysis of Width/Depth ratio trends (indicative of the area occupied by the notch) we found VI, V, IV types having least ratio in ascending order hence making type VI more likely favorable for SSN entrapment.

CONCLUSION

Finally, from the above study we conclude that scapula with STD>MD were more than MD>STD. Weak correlation was found between STD and MGW, SI and GI, and between MD and other scapular parameters except GI however they were not statistically significant. Type III SSN was commonly found in our study with type I having the highest width/depth ratio.

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