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A Morphometric Analysis of Suprascapular Notch & its Clinical Significance in East Godavari Region

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Abstract

The suprascapular notch is present along the superior border of the scapula and is converted into a foramen by the ossification of the superior transverse scapular ligament which joins the two corners of the notch. This particular notch allows the passage of the suprascapular nerve to the suprascapular fossa and is responsible for the motor nerve supply to the surrounding muscles. There are variations in the shape of the notche. Just below the superior transverse scapular ligament passes the anterior coracoscapular ligament which also ossifies in some cases. The ossification of these two ligament leads to narrowing of the suprascapular notch and coverting it to a foramen. This is one of the important cause of the suprascapular nerve entrapement. The knowledge of the morphometric details of the suprascapular notch is very promising in understanding the cause of the suprascapular nerve entrapement & its subsequent treatment. The present study was conducted using 69 dried scapula in the GSL Medical College Rajahmundry. Various moprphometric parameters of the suprascapular notch were measured & grouped into 6 types based on Rengachary 's studies. In this study type III is the commonest (36%) followed by type II (35%), type I (10%), type IV (7%) and type V (7%). Only 5% of the scapulae presented with the complete ossification of the suprascapular ligament converting the notch into foramen. The knowledge of the variation in the occurrence of the suprascapular notch and their association with the cause of the suprascapular nerve entrapement has drawn the attention of many surgeons enabling them for the proper diagnosis and its treatment.

Keywords: Superior Transverse Scapular Ligament; Anterior Coracoscapular Ligament; Suprascapular Notch; Suprascapular Nerve Entrapement.

Introduction

The scapulae is a triangular bone lying over the posterolateral aspect of the chest wall providing wide area for muscular attachments and helping in various movements around the shoulder. The suprascapular notch is a notch present along the superior border of the scapula close to the roots of coracoid process at the lateral end. This notch vary in shapes and sizes. The notch is bridged by the superior transverse scapular ligament (suprascapular ligament) which is attached laterally to the roots of the coracoid process. Sometimes this particular ligament will undergo partial or complete ossification converting the notch into a foramen. The foramen formed by the bridging of the suprascapular ligament will transmits the suprascapular nerve whereas the suprascapular vessels passes backwards above the ligament [19].

The anterior coracoscapular ligament is present just below the superior transverse ligament and it may undergo ossification in some cases [2].

For the above mentioned reason the suprascapular notch or foramen serves as an important landmark of the suprascapular nerve while performing various arthroscopic procedures [4]. The variations in the morphological parameters of the suprascapular notch is the one of the leading cause of the suprascapular nerve entrapment [8,9]. The suprascapular nerve entrapment will present as pain in the posterolateral region of the shoulder, weakness in the arm with difficulty inmovements mainly for the external rotation and abduction, also presents with atrophy of supraspinatus and infraspinatus muscles [1,5]. This syndrome is mostly seen in individuals with repetitive and forceful overhead movements like weight lifters, volley ball players aswell as it affects

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certain group of people whoare involved with works involving abduction and external rotation [8,9,14].

The detailed morphometric knowledge of the suprascapular notch has gained much of a interest to surgeons allowing them to justify as one of the important cause of nerve entrapement and can be applied for its treatment [3,21].

Material and Methods

The present study was undertaken on 69 washed and dried human scapulae in the Department of Anatomy G.S.L Medical College Rajahmundry. Age and sex were not considered. Bones with deformed surfaces and broken bones were excluded from the study. Each scapulae was grossly examined, analysed and measured using Vernier calliper & classified according to study brought forward by Rengachary et al [15]. According to him the suprascapular notch was classified into 6 groups by measuring the morphological details of the notch [15].

The following measurement were taken in the study-

1. Superior transverse diameter (STD) – horizontal distance between the superior edges of the notch on the superior border.
2. Maximum depth (MD) – distance between the upper border to the lower point of the suprascapular notch.
3. Middle transverse diameter (MTD) –horizontal distance between the two lateral walls of SSN at the midpoint of Maximum depth.

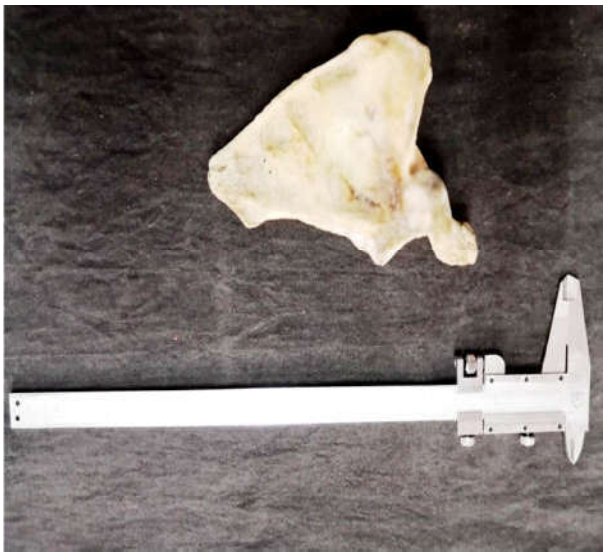

Fig. 1: All measurement taken with the help of Vernier calliper.

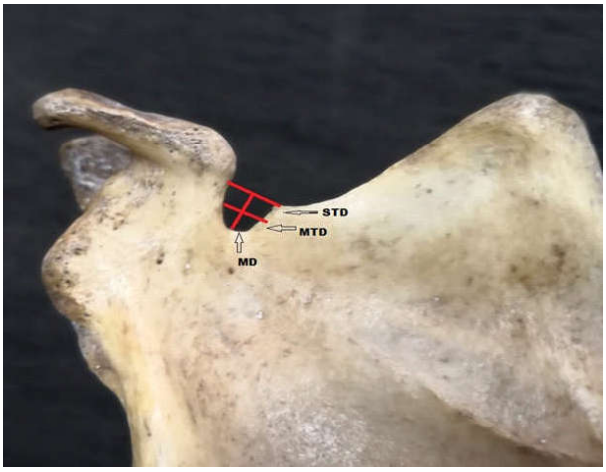

Fig. 2: Measurement of STD, MTD & MD

According to Rengachary et al Suprascapular notch can be classified into 6 types:

Type I - absence of notch.

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 – completely ossified suprascapular ligament forming foramen.

In the present study morphometric details of type II, type III, type IV and type V were taken into consideration as in type I the suprascapular notch was significantly absent and in type VI due to presence of complete ossification of the ligament the measurement could not be taken.

Fig. 3: Type I–No suprascapular notch

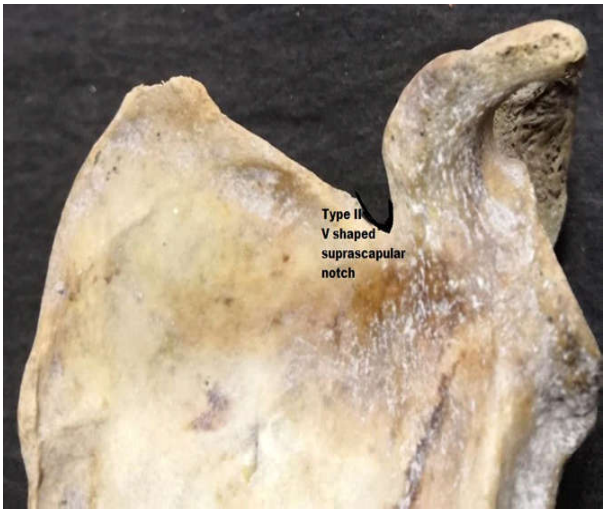

Fig. 4: Type II – V Shaped suprascapular notch

Fig. 5: Type III – U shaped suprascapular notch

Fig. 6: Type IV- small v shaped suprascapular notch

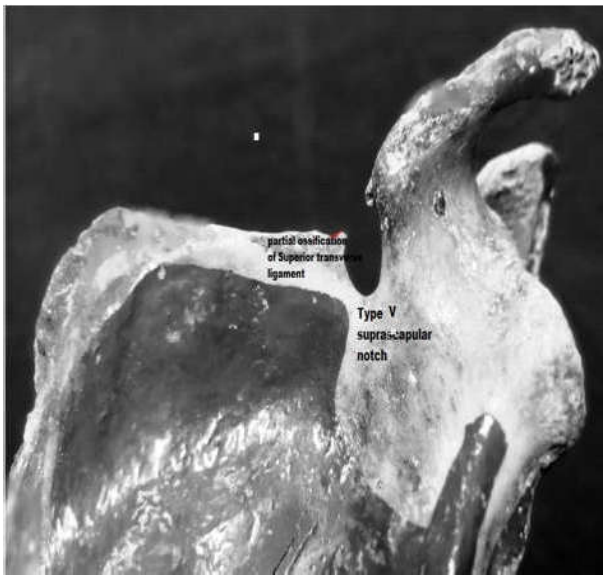

Fig. 7: Type V – partial ossification of suprascapular ligament.

Fig. 8: Type VI – complete ossification of suprascapular ligament forming suprascapular foramen

Results

In the present study, 69 dried scapulae were observed and the morphometric measurement of the suprascapular notch was taken. Based upon Rengachary et al studies, the suprascapular notch was classified into 6 types.

Morphological analysis and measurement of the suprascapular notch in this study depicts that type III is the commonest (36%) followed by type II (35%), type I (10%), type IV (7%) and type V (7%). Only 5% of the scapulae presented with the complete ossification of the suprascapular ligament converting the notch into foramen.

Table 1: Various types of suprascapular notch in the present study

S. No	Type	Total%	Number
1.	Type I	10%	7
2.	Type II	35%	24
3.	Type III	36%	25
4.	Type IV	7%	5
5.	Type V	7%	5
6.	Type VI	5%	3

Table 2: Morphometric measurement of the suprascapular notches

S. No.	Side	Type	STD(mm)	MD(mm)	MTD(mm)
1.	L	Type II	10	8	7
2.	R	Type III	9	6	7
3.	L	Type III	12	4	9
4.	R	Type V	7.6	8.1	8
5.	L	Type III	10	4	8
6.	R	Type III	12	7	13
7.	L	Type III	11	7	8
8.	R	Type III	12	8	8
9.	L	Type IV	7.2	4.1	5.7
10.	R	Type I	-	-	-
11.	L	Type IV	7.5	4.8	5.3
12.	L	Type I	-	-	-
13.	L	Type VI	-	-	-
14.	R	Type III	11.5	7.9	8.9
15.	R	Type III	10.9	7.5	8.1
16.	R	Type III	12.1	6.9	7.9
17.	L	Type III	10.5	7.3	8.2
18.	R	Type II	13.7	6.7	9.8
19.	R	Type III	11.1	8.6	7.9
20.	R	Type III	10.6	8.1	7.8
21.	R	Type III	11.7	7.9	7.7
22.	L	Type III	10.2	8.2	7.9
23.	L	Type III	11.6	8.7	7.5
24.	R	Type VI	-	-	-
25.	R	Type II	13.9	6.7	10.1
26.	L	Type II	13.1	7	9.8
27.	R	Type III	11.6	8.7	7.5
28.	R	Type II	14.1	7.2	9.5
29.	L	Type II	12.9	6.9	9.6
30.	L	Type II	14.3	7.5	10
31.	R	Type I	-	-	-
32.	R	Type II	12.8	6.9	9.8
33.	L	Type II	13	7.6	9.2
34.	L	Type II	12.9	6.6	10.2
35.	R	Type IV	8.3	5.5	4.5
36.	R	Type II	13.5	6.9	9.7
37.	L	Type II	13.9	7.5	10
38.	R	Type II	13.4	6.8	9.7
39.	L	Type III	11.6	8.7	7.5
40.	R	Type II	12.8	6.9	9.7
41.	R	Type II	11.9	7	10.2
42	R	Type II	13.8	7.3	9.8
43.	L	Type II	12.9	6.7	10.4
44.	L	Type I	-	-	-
45..	R	Type II	13.8	7.1	9.8
46.	L	Type V	8.7	7.5	7
47.	R	Type II	12.9	7.3	9.8
48.	R	Type II	13.2	6.9	10.6
49.	L	Type III	11.3	8.8	7.8
50.	R	Type I	-	-	-
51.	R	Type II	13.8	6.5	9.9
52.	L	Type II	14.1	7.3	10.2

53.	R	Type VI	-	-	-
54.	L	Type V	8.9	9.1	7.5
55.	R	Type IV	8.1	5.2	4.7
56.	R	Type III	11.7	8.5	7.7
57.	L	Type II	12.8	7.2	9.5
58.	L	Type III	11	8.7	7.9
59.	R	Type III	10.9	8.5	7.5
60.	L	Type IV	8.2	4.9	4.7
61.	R	Type III	11.6	8.6	7.8
62.	L	Type V	8.7	9	7.5
63.	L	Type III	11.3	9.1	8.1
64.	R	Type III	10.9	8.6	7.5
65.	L	Type II	12.9	6.8	9.5
66.	L	Type I	-	-	-
67.	R	Type III	11.2	8.3	7.7
68.	R	Type V	8.9	9	7.6
69.	L	Type I	-	-	-

Table 3: Comparison of present study with previous one showing different type of suprascapular notches.

Researches	Notch					
	Type I	Type II	Type III	Type IV	Type V	Type VI
Rengachary et al	8%	31%	48%	3%	6%	4%
Sangam M et al	21%	8%	59%	2%	5%	1%
Sinkeet et al	22%	21%	29%	5%	18%	4%
Muralidhar	21.15%	8.65%	59.61%	2.88%	5.76%	1.93%
Natsis et al	8%	31%	48%	3%	6%	4%
Paolo Albino	12.4%	19.8%	22.8%	31.1%	10.2%	3.6%
Present study	10%	35%	36%	7%	7%	5%

Disscussion

Various studies has been conducted by number of researches pointing the occurrence of different shapes of the suprascapular notch and the partial or complete ossification of the superior transverse ligament STSL converting the notch into a foramen. Micha Polguj e al presented a study showing the coexistence of the suprascapular notch and suprascapular foramen supported by radiological data [13]. Similarly Natsis et al founded in 1% of cases the coexistence of the suprascapular notch and the foramen with complete ossification of Anterior coracoscapular ligament [11]. The presence of ossified anterior coracoscapular ligament was described as a bonybridge that divides the notch reducing the area of passage of suprascapular nerve (36%) [17]. Here only 2 cases were reported with the similar features.The presence of the partial or complete ossification of the superior transverse scapular ligament and anterior coracoscapular ligament were responsible for narrowing of the suprascapular notch and converting it to a foramen thereby causing Suprascapular nerve entrapement.

In the present study of 69 dried scapulae, only 5% of cases presented with the complete ossification of the superior transverse ligament converting the notch into foramen ,which is close to the studies done by Rengachary et al 1976 (6%), Natsis et al 2007 (4%) and Sinkeet et al 2010 (4%) [11,15,18]. Only 7% of the cases presented with partial ossification of the superior transverse ligament ,this was nearly similar to studies done by Rengachary et al (6%) and Muralidhar (5.76%) [10,15]. Absence of the notch was found to be in 10% of cases which is very low as compared to the study brought up by Sinkeet et al (22%) and Sangam M et al (21%) [16,18]. Various studies by different researches showed that type 3 was the commonest type. In the present study 36% of cases were of type III followed by type II that accounts for 35% which was supported by the studies done by Rengachary et al, Natsis et al, Paolo Albino et al. [11,12,15]. The fact that type IV- small v shaped notch has a narrow area for the passage of the suprascapular nerve leading to its entarpement was supported by the studies done by Dunkelgrun et al [6].

Conclusion

As the suprascapular nerve entrapement is most frequently associated with the narrower suprascapular notch and formation of suprascapular foramen due to the ossification of the superior transverse scapular and anterior coracoscapu-

larligament. The Knowledge of types of the suprascapular notch would be helpful for understanding the cause of the suprascapular nerve entrapement supported by various radiological modalities and subsequent treatment.

Abbreviations

STD – Superior transverse diameter

MD – Maximum depth

MTD – Middle transverse diameter

References

1. Antonoiou J, Tae SK, Wiliams GR, Bird S, Ramsey MJ, Iannotti JP. Suprascapular neuropathy. Variability in the diagnosis, treatment, and outcome. Clin Orthop Rel Res. 2001;386:131-8.
2. Avery BW, Pilon FM, Barclay JK .Anteriorcoracoscapular ligament and suprascapular nerve entrapement.Clin Anat. 2002;15(6):383-386.
3. Bhatia DN, de Beer JF, van Rooyen KS, du Toit DF. Arthroscopic suprascapular nerve decompression at the suprascapular notch. Arthroscopy. 2006;22 (1009):1013.
4. Biglani LU, Dalsey RM, MCCann PD, April EW. An anatomical study of suprascapular nerve.Arthroscopy 1990;6:301-305.
5. Cummins CA, Messer TM, Nuber GW. Suprascapular nerve entrapment. J Bone Join Surg. 2000; 82-A:415-24.
6. Dunkelgrun M, Iesaka K, Park SS, KummerFJ, Zuckerman JD. Inter observer reliability and intra observer reproducibility in suprascapular notch typing. Bull Hosp Joint Dis. 2003;61:118-122.
7. Edeland HG, Zachrisson BE. Fracture of the scapular notch associated with lesion of the suprascapular nerve. ActaOrthop Scand. 1975;46(758):763.
8. Gelberman RH, Verdeck WN, Brodhead WT. Supraclavicular nerve entrapment syndrome. J Bone Joint Surg Am 1975;57:119.
9. Holzgraefe M, Kukowski B, Eggert S. Prevalence of latent and manifest suprascapular neuropathy in high-performance volleyball players. Br J Sports Med 1994; 28:177-9.
10. Muralidhar Reddy Sangam. A Study on the Morphology of the Suprascapular Notch and its Distance from the Glenoid Cavity. JClinDiagn Res. 2013;7(2):189-92.
11. Natsis K, Totlis T, TsikarasP, Appell HJ, Skandalakis P, Koebke J. Proosal for classification of the suprascapular notch:a study on 423 dried scapulas.Clin Anat. 2007;20:135-39.
12. Paolo Albino, Stefano Carbone, Vittorio Candela, Valerio Arceri, Anna Rita Vestri, Stefano Gumina. Morphometry of the suprascapular notch: correlation with scapular dimensions and clinical relevance. BMC Musculoskeletal Disord. 2013;14:172.
13. Polguj M, Jedrzejewski KS, Podgorski M, Topol M. Morphometric study of the suprascapular notch:proposal of classification. SurgRdiol Anat. 2011;33(9):781-787.
14. Post M, Mayer J. Suprascapular nerve entrapment. ClinOrthopRelat Res 1987;223:126-36.
15. Rengachary SS, Neff JP, Singer PA, Brackett CF Suprascapular entrapment neuropathy. A clinical, anatomical and comparative study, Part I. Neurosurgery 1979;4:441-446.
16. Sagam M, Sri Saradadevi S, Krupadanam K, Anasuya K. A Study on the Morphology of the Suprascapular Notch and ts Distance from the Glenoid Cavity. Journal of Clinical and Diagnostic Research. 2013;7(2):189-192.
17. Saritha S. Coexistance of suprascapular notch and suprascapular foramen, a rare anatomical variation and its clinical correlation.International Journal of Medical Science and clinical intervention. 2014; 1(02):65-68.
18. Sinkeet SR, Awori KO, Odula PO, Ogeng'o JA, Mwachaka PM. The Suprascapular notch: Its Morphology and distance from the glenoid cavity in a Kenyan population. Folia Morphol. 2010;69:241-5.
19. Standring S. Shoulder girdle and arm. Gray's Anatomy: The anatomical basis of clinical practice. 41st edition; 48:802.
20. Vastamaki M GH. Suprascapular nerve entrapment. Clin Orth Rel Res. 1993;297(135):143.
21. Zehetgruber H, Noske H, Lang T, Wurnig C. Suprascapular nerve entrapment: a meta-analysis. IntOrthop. 2002;26:339-43.