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Original Research Article

MORPHOMETRIC STUDY OF SUPRASCAPULAR NOTCH IN DRY SCAPULAE BONES

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ABSTRACT

Background: Suprascapular nerve most commonly compressed at the level of suprascapular notch (SSN) and spinoglenoid notch. Variation in morphological features of SSN and spinoglenoid notch plays a crucial role in suprascapular nerve entrapment syndrome.

Objective: Present study was conducted to find out the variation in morphology and dimension of SSN and to determine posterior safe zone for shoulder joint procedures from posterior approach.

Materials and Methods: In the present study 83 dry scapulae of south Karnataka region were studied and classified the SSN based on various shapes according to Iqbal et al and measurements according to Natis et al, along with this, the mean distance from SSN to supraglenoid tubercle and mean distance between posterior rim of glenoid cavity and medial wall of spinoglenoid notch at the base of scapular spine were also measured .

Result: Based on Iqbal et al classification 'U' shaped notch found to be more common (43.37%) and 'V' shaped notch and indentation found to be least common(3.6%). Complete ossification were observed in 3 scapulae bone(3.6%). Based on Natsis classification most common was found to be type –II (TD>VL) (84%) and type VI and IV were not observed. Mean distance between SSN and supraglenoid tubercle was 31.08 mm and mean distance between posterior rim of glenoid cavity and medial wall of spinoglenoid notch at base of scapular spine was 14.26mm.

Conclusion: Since variation in morphologoy of suprascapular notch and ossification of superior transverse suprascapular ligament(STSL) can be a factor for suprascapular nerve entrapment syndrome and safe zone for different population varies. Hence knowing variations in shape and size of SSN, safe zone for different population is helpful. So this study may be useful for clinicians for better diagnosis and management. Still more population specific studies are required related to the morphology of suprascapular notch.

KEY WORDS: Suprascapular Notch, Suprascapular Nerve Entrapment Sundrome, Superior Transverse Suprascapular Ligament.

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INTRODUCTION

Suprascapular notch is located in the superior border of scapula separating superior border from root of coracoids process. The free margins of notch are bridged by the STSL and deep to it passes the suprascapular nerve [1]. Suprascapular nerve entrapment syndrome is relatively uncommon but it can be a significant cause of shoulder pain and dysfunction which was first described by Kopell and Thompson in 1959 [2]. This disease is characterized by pain in the posterolateral region of the shoulder (characterized as a dull ache), atrophy of the infra and supraspinatus muscle and weakness of arm's, external rotation and abduction [3]. Traction neuropathy may occur following excessive nerve excursion during over head sports [4]. Since the literature focused on suprascapular notch and nerve entrapment in Indian population is less, the present study is undertaken to know more regarding suprascapular notch.

MATERIALS AND METHODS

The present study was conducted on 83 dry scapulae in the department of Anatomy Shridevi institute of medical sciences, Tumkur, the following four parameters were recorded

1. Shape of suprascapular notch on visual observation

2. Dimensions of notch, superior transverse diameter(TD) and vertical length(VL).

3. Distance between SSN and supraglenoid tubercle.

4. Distance between posterior rim of glenoid cavity and medial wall of spinoglenoid notch at base of scapular spine.

Shape was recorded on gross examination and classified into different types as proposed by Iqbal et al [5]. Photographs of various notch types were taken using digital camera (Fig.1a-g).

Dimensions of SSN like TD and VL of notch were measured in millimeters(mms) using digital sliding vernier caliper and SSN were classified into 5(five) types based on Natsis classification [6]. Scapulae with indentation, absence notch, complete ossification(CO), partial ossification (PO) of STSL were excluded from measurement (Fig-2).

Distance between deepest point of SSN and supraglenoid tubercle were taken in millimeters by scapulae with absence SSN, indentation, CO and PO were excluded from this measurements (Fig-3).

Distance between posterior rim of glenoid cavity and medial wall of spinoglenoid notch at the base of scapular spine was measured in millimeters (Fig-4).

RESULTS

The present study 83 scapulae were analyzed for various parameters as mentioned

Figure – 5 shows classification of shapes of SSN according to Iqbal et al to which we added partial and complete ossification of STSL.

Figure – 6 shows classification of SSN according to Natsis et al, for these measurements scapulae with indentation, PO, CO of SSN were excluded.

Table – 1 shows the distance between SSN and supraglenoid tubercle and distance between posterior rim of glenoid cavity and the base of scapular spine in mms.

Table 1: Showing the distances between SSN and supraglenoid tubercle and distance between the posterior rimof glenoid cavity and the base of scapular spine in mms.

Shape	Frequency	Mean length ± SD (AB)	Range	Mean length ± SD (CD)	range
U	36	31.45±3.03	25-37	14.46±2.16	11-18
J	25	31.17±2.16	25-35	14.63±1.95	10-18
V	3	30.2±2.16	28-32	15.6±0.82	15-16
Indentation	4	-	-	13.04±0.94	12-14
PO	5	-	-	12.55±1.33	10-14
CO	3	-	-	12.78±0.99	11-13
Absence	8	-	-	13.12±1.13	10-14

Fig. 1: showing various shapes of SSN : a – U shaped; b- J shaped; c – V shaped; d – Indentation; e – Absence of notch; f – partial ossification of STSL; g – complete ossification of STSL.

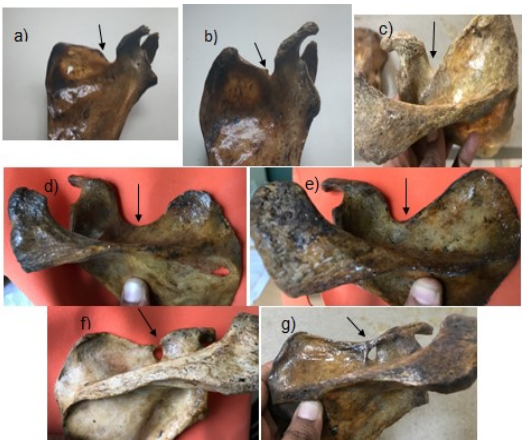
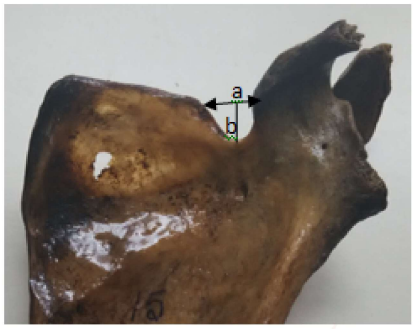


Fig. 2: Measurements of dimensions of SSN



a – superior transverse diameter of SSN; b – Vertical length of SSN.

Fig. 3: Distance between deepest point of SSN and supraglenoid tubercle.

Fig. 4: Distance between posterior rim of glenoid cavity and medial wall spinoglenoid notch at base of scapular spine.

Fig. 5: Classification of suprascapular notch according to shapes.

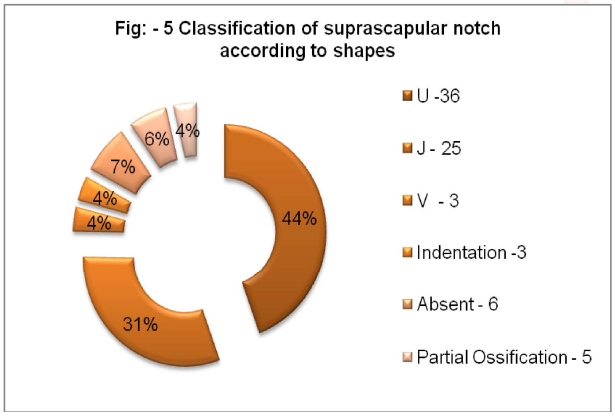
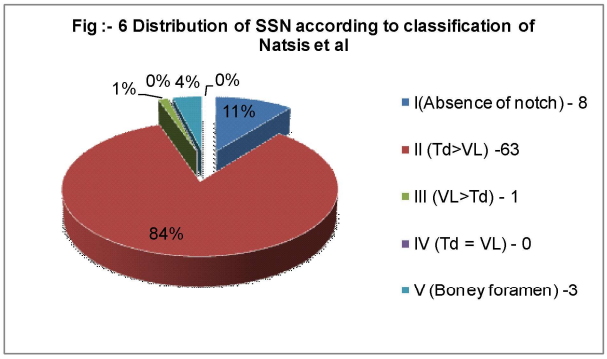


Fig. 6: Distribution of SSN according to classification of Natsis et al.



DISCUSSION

Scapula has complicated anatomy because of its own unique structure. Knowledge of detail anatomy of scapula is necessary for surgical treatment of shoulder joint disorders and arthroscopic procedures on shoulder joint disorders and arthroscopic procedures on shoulder joint [7].

Various studies reported about different shaped of SSN. Ticker etal in 1998, Bayramoglu et al in 2003, sinkeet etal in 2010 have classified SSN into only 2 types U and V. all had found 'U' shaped SSN as most common type [8-10].

Iqbal et al [5] in 2010, Gargi et al [11] in 2012, Vandana et al in 2013 have classified SSN into 5(five) types namely U, V, J, indentation and absence of notch. Iqbal et al have found 'J' shaped as most common frequent type (22%) and indentation as least common type (2.6%) [5]. Gargi found 'U' shaped as most frequent type (58%) and absence notch as least frequent type(2%) . [11]. Vandana et al in 2013 found 'U' shaped SSN as most common type(35%) and scapula with indentation(4.5%) and absence of SSN (4.5%) were least common [12].

In the present study 'U' shaped SSN was found to be commonest type944%), 'V'shaped (3.6%) and indentation of SSN (3.6%) were found to be least common.

Dunkelgrun et al have opined that the 'U' shaped notches have larger area than the 'V' shaped notch is more likely to be related with entrapment. [13]. The variability in the shape of SSN is influenced by ossification of coracoid process [11].

Variation in morphology of SSN includes partial and complete ossification of STSL which is one

of the predisposing factors for suprascapular nerve entrapment syndrome [8].

The incidence of complete ossification of STSL varied in different population. In French population it was found in 5-6% of scapulae, American population it was 4-5%, 7.3% among Greek population, 4% in Kenyan population, 7% in Polish population and 3% among chine's population [14,15,8,6,3,16]. Gargi et al found complete ossification of STSL in 3% of north west Indian population(11). Vandana et al found CO of STSL in 12.6% of south Indian (North Karnataka) population. [12]. In the present study carried out among south Indian (Karnataka) sample showed incidence of CO of STSL in 3.6%, indicating incidence difference in different population.

Incidence of partial ossification was 18% in Kenyan population , 18% in North American, 11% in Greek and 11% in West Indian and 3% in South Indian population. [10,8,6,11,12]. In the present study it was found to be 6%.

Classification of SSN depending on dimension:

Study conducted by Natis et al describe 5(five) types where type II(TD>VL) and type II(VL>TD) were commonest both having equal frequency of 41.8%, least common type was typeIV(notch and foramen) 0.75%. [6]. Ticker et al, Gargi et al, Wang et al and Vandana et al have found most common type was typeIII(TD>VL) with incidence of 33%, 72%, 58.16% and 69% and least common type was type IV(notch and foramen) with incidence of 1.27%, 0%, 0% and 0%. [8,11,16,12]. Polguj et al in his classification one more type of SSN with TD=VL was included and type IV(notch and foramen) excluded, the most common type he found was typeII (57,7%) and least common type he found was typeIV(2.3%) [3].

In the present study we have classified SSN into 6(six) types (Fig-6) where we found the most common type was type II(63%) and least common type was typeIV and typeVI(0%).

Distance between SSN and margin of glenoid cavity is critical during open surgical procedures requiring dissection of shoulder joint from posterior approach [10]. An effort to avoid injury to suprascapular nerve during procedures has lead to describe safe zone 'critical distance' within which these procedures can be done safely. Shishido et al in 2001 , Sinkeet et al in 2010 and Vandana et al in 2013 have reported the mean distance between SSN and supraglenoid tubercle as 23mm, 28.7mm and 27.3mm respectively [17, 10, 12]. In the present study the corresponding distance 31.03mm which is very much high compared to other studies. Shishido et al , Sinkeet et al and Vandana et al have reported distance between margin of glenoid cavity and medial wall of spinoglenoid notch at the base of scapular spine as 14mm, 15.8mm and 13.mm respectively [17, 10, 12]. Corresponding distance in our study is 14.21mm.

CONCLUSION

Since variation in morphologoy of suprascapular notch and ossification of superior transverse suprascapular ligament(STSL) can be a factor for suprascapular nerve entrapment syndrome and safe zone for different population varies. Hence knowing variations in shape and size of SSN, safe zone for different population is helpful. So this study may be useful for clinicians for better diagnosis and management. Still more population specific studies are required related to the morphology of suprascapular notch.

ABBREVIATIONS

SSN - Supra scapular notch

mms - millimeters

SISL - Superior transverse suprascapular ligament

AB - Distance between deepest point of suprascapular notch and supraglenoid tubercle

CD - Distance between posterior rim of glenoid cavity and the base of scapular spine

SD - Standard deviation

CO - Complete ossification

PO - Partial ossification

TD - Transverse diameter

VL - Vertical length.

Conflicts of Interests: None

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