Morphometric Analysis of the Suprascapular Notch

G Soni, V Malik, L Shukla, S Chabbra, N Gaur

Citation

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Abstract

Suprascapular nerve entrapment may be due to the variable morphology of the suprascapular notch. The present study was done in 100 scapulae obtained from the bone room of the department of anatomy of the Maharaja Agrasen Medical College (MAMC), Agroha as well as the Pandit B.D Sharma Postgraduate Institute of Medical Sciences (PGIMS) Rohtak. The suprascapular notch has been classified by various workers in different populations but no such data to the best of our knowledge is available from India. The aim of the present study is to study the morphometry and morphology of suprascapular notch in the population of north-west region of India. In the present study the suprascapular notch is classified on the basis of two classifications, proposed by Natsis et al and Iqbal et al. Based on the classification proposed by Natsis et al two parameters- the vertical length of the notch and transverse diameter of the notch were measured, the notch was classified into five types and following observations were made in the present study: type I, without a discrete notch (5%); type II, a notch that was longest in its transverse diameter (72%); type III, a notch that was longest in its vertical diameter (20%); type IV, a bony foramen (3%); type V, a notch and a bony foramen (none). On the basis of the classification proposed by Iqbal et al, where the shape of the notch was observed on gross examination, the results of the present study showed 'U' shaped notch in 58%, 'V' shaped notch in 7%, 'J' shaped notch in 27%, absent notch in 2%, and indentation instead of a notch was seen in 3% of cases. The complete ossification of the superior transverse scapular ligament with the notch being converted to foramen in 3% and partial ossification was seen in 11% of cases.

INTRODUCTION

The suprascapular notch (SSN) is bridged by the superior transverse scapular ligament (STSL); the variations in the morphology of SSN are well known. Koepell and Thompson (1959) were the first to describe the suprascapular nerve entrapment syndrome [1]. They reported that abduction or horizontal adduction of the shoulder exerted traction on the suprascapular nerve, which led to its compression against the superior transverse scapular ligament. The anatomical variation of the SSN, which includes the variation in shape, complete or partial ossification of the STSL, is recognized as one of the causes of suprascapular nerve entrapment. SSN has been classified by various workers in different populations on the basis of parameters such as vertical length of the notch, transverse diameter of the notch and shape of the notch [2-6]. Rengachary et al observed six basic types of supracapular notch in 211 cadaveric adult scapulae: Type I (no notch): The entire superior border of the scapula showed a wide depression from the medial superior angle of the scapula to the base of the coracoid process (8%). Type II: This type showed a wide, blunted 'V'-shaped notch occupying nearly a third of the superior border of the scapula. The widest point in the notch was along the superior border of the scapula (31%). Type III: The notch was symmetrical and 'U'shaped with nearly parallel lateral margins. Type IV: The notch was very small and 'V'shaped. Frequently a shallow groove representing the bony impression by the suprascapular nerve was visible adjacent to the notch (3%). Type V: This type was very similar to Type III ('U' shaped), with partial ossification of the medial part of the ligament resulting in a notch with the minimal diameter along the superior border of the scapula. (6%).Type VI: The ligament was completely ossified; resulting in a bony foramen of variable size located just inferomedial to the base of the coracoid process (4%) [6].

In 1998, Ticker and colleagues conducted a cadaveric research study using a different classification system, separating the suprascapular notches into two types, namely 'U' and 'V' types [7]. The degree of ossification of the suprascapular ligament was evaluated separately. In contrast to Ticker et al who reported two types of notch [7], Iqbal et al reported three types of SSN based on its shape 'U', 'V',' J' on gross examination [3]. Further, Natsis et al proposed a new method of classification which was based on specific

geometric parameters and the correlation between SN entrapment and specific types of SSN could be determined [2]. By using the classifications given by Natsis et al and Iqbal et al the clinician can determine the type of SSN on a plain radiograph and correlate it with specific types of suprascapular nerve entrapments [2, 3].

However, the literature focusing on SSN and SN entrapment in Indian population is scarce. Therefore, the present study was done on the basis of classification proposed by Natsis et al, to obtain the morphological data regarding SSN in the population of north-west region of India. Natsis et al classified the SSN into the following five types; type I- without a discrete notch, type II- a notch that was longest in its transverse diameter, type III- a notch that was longest in its vertical diameter, type IV- a bony foramen and type V- a notch and a bony foramen [2]. In the present study, the SSN were also classified on the basis of classification given by Iqbal et al.

MATERIALS AND METHODS

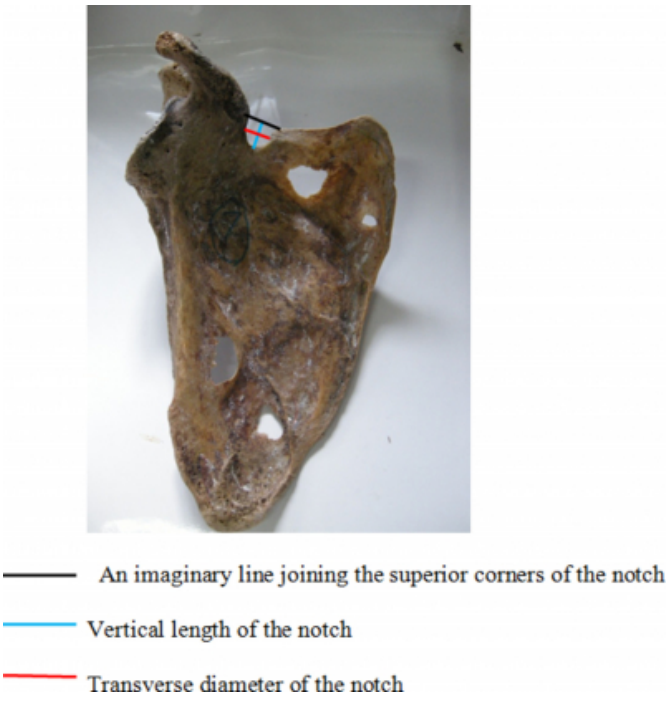
The present study was conducted on 100 scapulae obtained from the bone rooms of the department of Anatomy of the following institutions: MAMC, Agroha and PGIMS Rohtak. Each scapula was observed carefully by two investigators, the scapulae with indentation, absence (type I) or complete ossification of SSN (type IV) were separated. In the remaining scapulae the Vertical length (VL) and transverse diameter (TD) of the SSN were measured using Vernier calipers.

For VL, 2 points were taken; the first point was the midpoint of the imaginary line joining the superior corners of the notch, the second point was at the maximal depth of the notch. For TD the diameter perpendicular to the midpoint of VL was taken [figure 1]. Based on these parameters the notch were classified into five types as proposed by Natsis et al: type I- without a discrete notch, type II- a notch that was longest in its transverse diameter, type III- a notch that was longest in its vertical length, type IV- a bony foramen and type V- a notch and a bony foramen [2].

The shape of the notch was also recorded on gross examination. According to the shape the notch was classified into ‘U’, ‘V’ and ‘J’ shaped. The partial ossification of SSN was also taken into account [Fig.2].

Figure 1

Figure 1 showing the measurements of the notch



RESULTS

Figure 2

Table 1 showing the distribution of SSN into five types as classified by Natsis et al [2]

Classification	Percentage (%)
Type I (without a discrete notch)	5
Type II (TD>VL)	72
Type III (VL>TD)	20
Type IV(a bony foramen present)	3
Type V(a notch and a bony foramen)	None

Table I shows that the most common type of SSN observed in the present study is type II- a notch that was longest in its transverse diameter, the least common is type V where a notch and a bony foramen are present.
(TD; transverse diameter, VL; vertical length)

Figure 3

Table 2 showing the classification of suprascapular notch on the basis of its shape [Fig.1]

Shape of the notch	Percentage (%)
U	58
J	27
V	7
Indentation	3
Absent notch	2
Partial ossification of the superior transverse ligament	11
Complete ossification of the superior transverse ligament	3

Table II shows that the U shaped notch is most common, V shaped is least common. The SSN was absent in 2 scapulae, instead of a notch an indentation was seen in 3 scapulae, the complete ossification of the superior transverse ligament with the notch completely converted to a foramen was seen in 3 scapulae. The partial ossification of the STSL was seen in 7 'U' Shaped SSN, 2 'V' Shaped SSN and 2 'J' shaped SSN.

DISCUSSION

Rengachary et al classified the SSN into six types based on the inferior shape of the SSN as well as the degree of ossification of STSL [6]. This classification was difficult to use when transition between these types is being found. The classification given by Natsis et al seems to be simple and includes all the anatomical variations based on the vertical and transverse diameters of the SSN [2]. The classification by Iqbal et al also provides an easy method of distinction of SSN based on its shape (U, V, and J) without involving any measurements [3].

The results of the present study show that the most common type of SSN is type II- a notch that is longest in its transverse diameter (72%) and the least common is Type V where both notch and foramen present are present (none). This corresponds with the results of Wang et al (Chinese population) where also the most common type of SSN reported is Type II (58.6%) , where the notch is longest in transverse diameter and the least common is Type V where both notch and foramen are present (none) [4]. Natsis et al in their study reported an equal incidence of types II and III SSN [2].

Figure 4

Table 3 showing the comparison of the results of present study with previous studies

	Natsis et al[2] (%) [Greek]	Wang et al[3] (%) [Chinese]	Present study (%) [Indian]
Type I	8.3	28	5
Type II	41.85	58.16	72
Type III	41.85	28.23	20
Type IV	7.3	3	3
Type V	0.7	None	None

On comparing the shape on gross examination without involving any measurements, the results of the present study correspond with that of Sinkeet et al who also reported the U shaped notch as most common (29%) and the complete ossification of STSL as least common (4%) in Kenyan population [5]. Iqbal et al reported the J shaped notch the commonest (22%) in their study in the population of Pakistan [3].

Variation in the morphology of the STSL which include their partial or complete ossification have been identified to be one of the predisposing factor in cases of suprascapular nerve entrapment in various case reports [7-9]. The incidence of complete ossification of STSL varies widely in different populations. In Brazilian population its incidence is reported to be 30.76% [10] as compared to Vallios who reported the incidence to be 6.5% in Italian population [11] and Kajava who reported the incidence of complete ossification of STSL to be 1.5% in Finish Scapulae [12]. In the present study the incidence of complete ossification of STSL was observed in 3% of cases. This indicates that there are differences in different populations, therefore population specific studies are required to know the incidence of complete ossification of the STSL.

The differences in morphology of the SSN can be explained by the fact that the shape of the SSN is influenced by the ossification of coracoid process. Odita et al reported that epiphyseal centers of coracoids process appear earlier in Nigerian infants than Caucasians [13].

The size of the suprascapular notch is thought to play a part in the predisposition for suprascapular nerve entrapment, assuming that a small notch gives a larger chance of nerve impingement than a large notch [14]. In the present study the most common type of notch observed is type II (TD>VL), where the chances of suprascapular nerve entrapment would

be less. In types III, IV and V types the chances of suprascapular nerve entrapment would be more.

Although it has been hypothesized that suprascapular nerve entrapment is more likely to be associated with a narrow 'V'shaped notch, no direct correlation between notch type and suprascapular nerve entrapment has been shown clinically [15]. Therefore, rather than the shape and diameter of the notch, the morphology of the STSL has been identified to be associated with suprascapular nerve entrapment.

CONCLUSION

The results of the present study classify the SSN in the population of north-west region of India as the data regarding SSN from this part of the world is scanty. This data will be of help to the clinician in dealing with patients with suprascapular nerve entrapment.

Figure 5

Figure 2. Scapulae showing different shape of notches a) U shape; b) V shape; c) J shape; d) indentation; e) absence of notch and f) complete ossification of superior transverse scapular ligament

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Author Information

Gargi Soni
Department of Anatomy, Maharaja Agrasen Medical College

Vivek Singh Malik
Department of Anatomy, Pandit BD Sharma University of Health Sciences

Lovesh Shukla
Professor and HOD, Department of Anatomy, Maharaja Agrasen Medical College

Sudha Chabbra
Department of Anatomy, Pandit BD Sharma University of Health Sciences

Neha Gaur
Department of Anatomy, Maharaja Agrasen Medical College