MORPHOLOGICAL AND MORPHOMETRIC STUDY OF SUPRASCAPULAR NOTCH IN DRIED BONES, AND ITS MEDICOLEGAL ASPECTS

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ABSTRACT

Aim and objectives: This study aimed to see variations in shapes and sizes of the suprascapular notch as these characteristics may be the root cause of nerve compression in medicolegal cases and to explore its potential medicolegal implications for identification in mass disasters.

Background: The suprascapular notch is a critical anatomical feature in the shoulder region, housing the suprascapular nerve. Variations in its shapes and sizes have been associated with nerve compression syndromes, leading to significant medico-legal implications, especially in cases involving shoulder injuries and mass disasters. Understanding these variations is crucial for forensic experts and medical practitioners to accurately identify and assess nerve-related injuries, aiding in the determination of causes of death, injury severity, and potential legal implications.

Materials and Methods: In this study, a total of 102 dried human bones were selected. The scapulae were first examined for changes in morphology in shape. By using a digital vernier caliper, the vertical (VD) and the transverse dimension (TD) of the notch were measured.

Results: According to the classification by shape, there were 43 scapulae with a 'J' shape (39.1%), 35 scapulae with 'U' shape (31.81%), 10 with 'V' shaped (9.00%), 8 cases of indentation (7.27%), five cases of absence (4.54%), four cases of partial STSL ossification, and five cases of full ossification. Excluding the scapulae with incomplete ligament ossification and indentations, the findings were also classified according to Natsis. Among the scapulae, type II was present in 66 (67.34%), type III in 14 (14.28%), type IV in five (5.1%), and type V in none (0.0%).. Five (5.1%) of the scapulae were Type I. In addition, we discovered Td=Vd, in eight of the scapulae.

Conclusion: The study found common suprascapular notch types with varying nerve compression risks. It underscores the importance of SSN anatomy knowledge for accurate diagnosis and surgical planning, with implications for forensic anthropology and mass disaster victim identification.

Keywords: Supra scapular notch (SSN). Nerve decompression, Superior Transverse Scapular Ligament (STSL), Forensic anthropology, mass disaster.

INTRODUCTION

The suprascapular notch (SSN) can be found on the superior border of the scapula just medial to the coracoid process.

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Ossification of the superior transverse scapular ligament (STSL) in a few instances causes this notch to become a foramen, which acts as a bony passage for the suprascapular nerve. This notch is the primary location of the nerve compression, which may cause substantial rotator cuff dysfunction[1,] suprascapular nerve entrapment syndrome.

The symptoms of this disorder include weakness during external rotation and the beginning of shoulder abduction, as well as a dull, throbbing ache across the posterolateral shoulder and atrophy of the supraspinatus infraspinatus muscles. [2,3.] In the etiopathogenesis of suprascapular nerve entrapment syndrome, the morphology and size of the SSN is the most significant causative feature [4, 5]. The risk of developing this entrapment neuropathy may increase in people with narrow SSNs [6]. Previous studies have

confirmed, a V-shaped notch is more frequently linked with nerve entrapment. [7] Therefore, a detailed anatomical knowledge of the suprascapular region is essential, particularly with regard to the SSN's variations in, shape, size and ossifications.

Important in a number of surgical procedures related to arthroscopic suprascapular nerve decompression [8–10]. To prevent neurological problems during surgical operations such as arthroscopically assisted and open, arthroscopic procedures, a good anatomical understanding of the shoulder-girdle area is crucial. Based on its unique geometrical features, this osteological research, from our perspective, gives a thorough anatomical and morphological description of SSN and explains nearly all of its variants. The identification of human remains is a crucial aspect of forensic anthropology, particularly in mass disaster scenarios where traditional methods may be impractical or insufficient[11].

This study holds significant relevance in the context of various surgical interventions aimed at arthroscopic suprascapular nerve decompression. Comprehensive anatomical knowledge of the shoulder-girdle region is imperative to mitigate neurological complications during arthroscopically assisted and open surgical procedures. Through detailed osteological research, this study provides an in-depth anatomical and morphological characterization of the suprascapular notch (SSN) and elucidates its diverse variants. Such insights are particularly vital in forensic anthropology for accurate human remains identification, especially in mass disaster scenarios where conventional methods may be inadequate or unfeasible.

MATERIALS AND METHODS

The study employed a cross-sectional, observational design conducted within the Anatomy Department of Khyber Girls Medical College (KGMC) in Peshawar. The sample consisted of 102 dried adult human scapulae[12] obtained from the bone bank of the Anatomy department at KGMC, excluding any scapulae with damage or fragmentation. Various characteristics of the suprascapular notch (SSN) were examined and recorded, including different configurations, presence or absence of the SSN or suprascapular foramina, and measurements of the SSN's transverse and vertical dimensions. The classifications proposed by Iqbal et al [12] and Natsis et al [5] were utilized for categorizing SSN forms and measuring notch dimensions, respectively. Measurements were conducted using digital vernier calipers, ensuring accuracy and consistency. Scapulae with indentations or incomplete ligament ossification were excluded from the measurement process to maintain data integrity. The transverse diameter was defined as the distance between the edges of the notch, while the vertical diameter was measured from the midpoint of the notch's edges to its deepest point at the base

RESULTS

Data was analysed using computer software SPSS statistics 22. frequencies and percentages were used to express descriptive data in tables. In this study, partial or full ossification of STSL was seen coupled with three distinct types of notches. Scapulae were classified according to the form of the notch in [Table1 / Fig 1-7] using the Iqbal system.[12] Of these scapulae, 39(38.23%) had suprascapular notches that were "J"-shaped [Fig-1], 35(34.31%) were "U"-shaped [Fig-2], and 8(7.80%)"V"-shaped [al Fig-3]. Eight 8 (7.80%) examples had an indentation instead of a notch (Fig 4, four (3.80%) lacked a distinct notch (Fig. 5, and four 3.80%) bones had a "complete (Fig 6) and partial (Fig 7) ossification each.data

TABLE 1: Various shapes of suprascapular notch

SHAPE OF SSN	Number of Scapulae (%)
J- SHAPE	39 (38.23%)
U- SHAPE	35 (34.31%)
V -shape	8 (7.80%)
Indentation	8 (7.80%)
Absent	4 (3.80%)
Complete Ossification	4 (3.80%)
Partial Ossification	4 (3.80%)
Total	102 (100%)

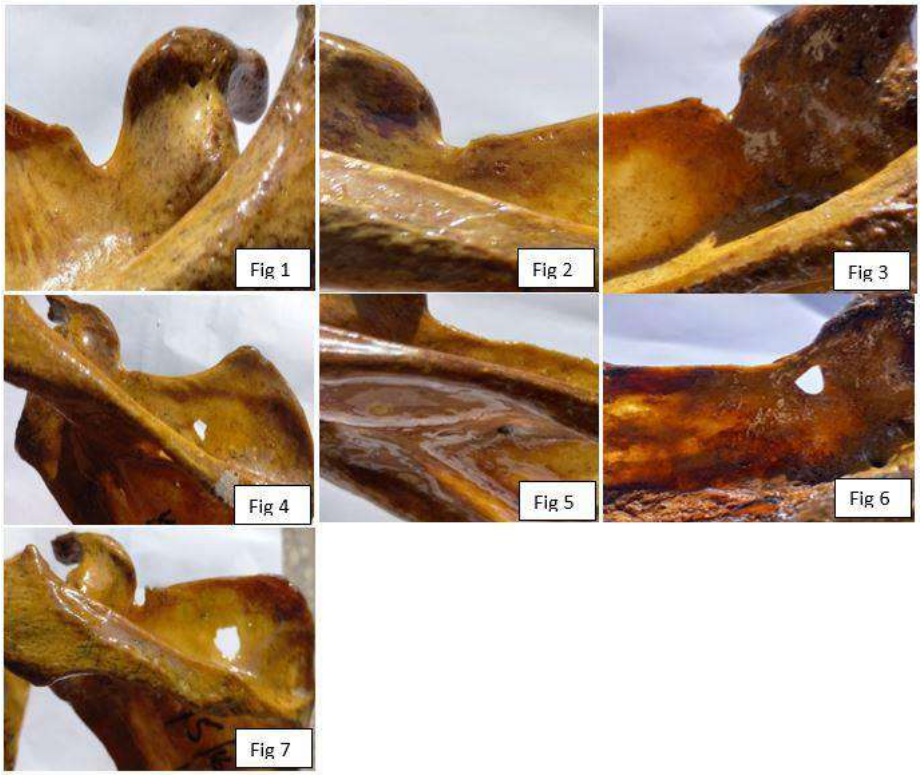
TABLE 2: Various types of suprascapular notch

	TYPE	Number of Scapulae (%)
i	Absence	4(4.26)
ii	(Td>Vl)	62(65.95%)
iii	(Vl>Td)	13(13.82%)
iv	Bony Foramen)	4(4.26%)
v	Notch plus Foramen)	1(1.06%)

TABLE 3: Results of other studied in comparison to present study

Type	Sharm et al. [26]	Shivaleela et al., [25]	Vandana et al., [24]	Mehdy et al. [23]	Wang et al. [22]	Natsiset al. [5]	Present Study (%)
(Absence) TYPE I	20	14.70	4.8	6.06	28	8.3	4(4.26%)
(Td>Vl) II	39	70.58	70.1	45.45	58.16	41.85	62(65.95%)
(Vl>Td) III	34	12.78	8	43.93	28.23	41.85	13(13.82%)
(Bony Foramen) IV	5	1.96	13.7	3.03	3	7.3	4(4.26%)
(Notch and Foramen) V	0.7	0	0	1.5	0	2	1(1.06%)

FIGURE 1: Showing different shapes of SSN.



Scapulae were divided into groups according to the dimensions of SSN, as suggested by Natsis et al. In our study, Four scapulae (4.26)were found to be devoid of a distinct notch (Type I), 62 scapulae (65.95%)to have SSN with transverse diameter(TD) , greater than the vertical diameter(VD) (Type II), 13 scapulae (13.82%) to have notches where the VD was greater than the TD (Type III), and four scapulae (4.26%) to have the transverse scapular ligament Our study has discovered an additional kind in eight scapulae (8.51%), in addition to those categorized under the Natsis classification, where TD=VD (Table 2). These findings underscore the importance of considering individual differences in suprascapular notch morphology when utilizing it for forensic identification purposes.

DISCUSSION

For a good diagnosis and course of therapy of shoulder girdle dysfunction, knowledge of the intricate anatomy of the SSN is required. Despite the fact that there are many books and articles that describe SSN, relatively Very few of them emphasize on its quantitative and qualitative anatomy. The goal of the current work is to categorize SSN using its form and size.

SSN has been categorized by several writers using certain criteria and a close inspection of its form. Kumar et al.[13], according to Azzat AR et al[14], and Sinkeet et al.[15] ,divided SSN into two categories based on morphological appearance: "U" and "V," and discovered that "U." and discovered that the most typical kind is a 'U' shaped notch. Iqbal et al. [12], divided SSN into three categories based on their gross examination shapes: "U," "V," and "J." Five forms of SSN were listed by Soni et al.[16] as "J," "U," "V," indentation, and absence of notch. The current analysis mostly revealed 'U' shaped notches of the Iqbal type. Table-3 lists the results of the current research in comparison to those of earlier studies based on shape.

SSN was categorized by Nastis et al., using measurements of the vertical and transverse diameters.[5] While Polguj et al., evaluated the three geometrical characteristics such as superior, middle transverse, diameters and maximum depth, he also added another type of SSN to his classification, where Td=Vl, as observed in our study.[17] The majority of the suprascapular notches in the current study were of “Natsis type II”, where the transverse dimension is greater than the VD. Suprascapular nerve entrapment syndrome is less likely to occur in both the Natsis type II and the primarily discovered "U" shaped SSNs in our study because there is more room for the suprascapular nerve.

In contrast to previous studies, ours found that 4.26% of patients had scapulae with a bony foramen, higher than that of “Julian SM et al”.[6](4%), “Mayuri MVR et al.” [15] (3%), Kaledzera et al., [17](1.93%), and “Polguj M et al”. [19](3.7%), and It was however less than that reported by Azzat AR et al., [14](12.5%), “Daripelli S et al. 9.5%.[20] , Kundu et al (5.9%), [21] and “Venkata et al”., [22] (8.33%). The suprascapular nerve gets compressed by the STSL ossification, this raises the possibility of suprascapular nerve entrapment and irritates it during different shoulder movements. (Table 3). By incorporating these variations into identification protocols, forensic experts can enhance the accuracy and reliability of skeletal identification, especially when other identifying features are unavailable or incomplete.

Comparing the distribution of suprascapular notch (SSN) types across various studies with the present study reveals both similarities and differences. Sharm et al. [26] and Wang et al. [22] (Table 3).observed Type II (Td>Vl) SSN as the most common, aligning with the present study. However, Sharm et al. had a higher percentage of Type I (Absence) SSN compared to the present study, whereas Wang et al. reported a higher percentage of Type I (Absence) SSN. Similarly, Shivaleela et al. [25] and Vandana et al. [24] found Type II (Td>Vl) SSN to be predominant, but Shivaleela et al. had a higher percentage of Type IV (Bony Foramen) SSN compared to the present study. Additionally, Mehdy et al. [23] and Natsis et al. [5] observed a significant proportion of Type III (Vl>Td) SSN, although Mehdy et al. had higher percentages of Type III (Vl>Td) and Type IV (Bony Foramen) SSN compared to the present study. These variations highlight the influence of sample characteristics, methodologies, and population demographics on SSN distribution.

CONCLUSION

Our study has revealed several forms of SSNs where the likelihood of nerve compression is lower. This study also demonstrated five instances with totally osseous STSL, where the likelihood of impingement increased. Clinicians must have detailed anatomical knowledge of SSN in order to properly diagnose patients and design surgical procedures because these anatomical variances are frequent in the community. By incorporating this anatomical feature into forensic anthropology protocols, forensic experts can improve the accuracy and efficiency of human remains identification, thereby facilitating the resolution of medicolegal cases and providing closure to families of missing persons.

Authors contributions:

1. Anwar Ul Haq
   Material and methods and results.
2. Shahabuddin
   Introduction, results.
3. Naheed Siddiqui
   Introduction, Material and methods.
4. Rizwan Ul Haq
   Discussion, Conclusion.
5. Faiza Nadeem

Discussion, conclusion.
6. Taus Khan
Introduction.

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