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ORIGINAL ARTICLE

Anatomical Variations of the Suprascapular Notch and Its Importance in Nerve Entrapment

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ABSTRACT

Background and Aim: Entrapped neuropathy syndrome could be effectively managed with detailed anatomical knowledge of suprascapular notch. Suprascapular nerve injuries are now widely acknowledged as a cause of shoulder pain and dysfunction. The present study aimed to determine the anatomical variation of the suprascapular notch and its importance in nerve entrapment.

Methodology: A total of 128 human scapulae of either gender were taken from the department of Anatomy, Saidu Group of Teaching Hospitals, Swat and Women Medical and Dental College Hospital Abbottabad during the period from January to June, 2021. Four parameters of Suprascapular notch (SSN) i) Superior transverse depth (STD), ii) Maximum depth (MD), iii) middle transverse diameter (MTD), and total circumferential diameter (TCD) were defined based on incisura inferior border shape and vertical diameters. Suprascapular notch presence or absence was grossly examined for all the scapulae. Vernier caliper was used for the measurement of the four suprascapular notch parameters. SPSS version 23 was used for data analysis.

Results: Out of 128, 61 (47.7%) were right-sided and 67 (52.3%) were left-sided human scapulae. The prevalence of U-shaped, V-shaped, and J-shaped notch were 62 (48.4%), 27 (21.1%), and 13 (10.2%) respectively. The incidence of the large double foramen, complete, and incomplete suprascapular notch were 2 (1.6%), 7 (5.5%), and 8 (6.3%) respectively. W-notched was present in 3 (2.3%) scapulae whereas 6 (4.7%) scapulae had no notch. The vertical and transverse diameters for right and left-sided type-II scapulae were 4.9±2.1 mm and 8.9±3.1 mm and 4.8±1.7 mm and 9.1±2.3 mm respectively.

Conclusion: The prevalence of U-shaped and V-shaped notch was 48.4% and 21.1% respectively. Suprascapular notch morphology could be determined with anatomical knowledge and play a critical role for neurosurgeons, clinicians, orthopedic surgeons, and radiologists for proper diagnosis and management of shoulder region surgical procedure and protocol.

Keywords: Suprascapular notch, Anatomical knowledge, Nerve entrapment

INTRODUCTION

The scapula is a flat triangular bone located on the chest wall's posterolateral side between the second and seventh ribs. The suprascapular notch (SSN) is located at the coracoid process's root and the lateral end of the superior border. The superior transverse scapular ligament converts this notch into a foramen, which serves as a passage for the suprascapular nerve [1]. Entrapped neuropathy syndrome could be effectively managed with detailed anatomical knowledge of suprascapular notch. Suprascapular nerve injuries are now widely acknowledged as a reason of dysfunction and pain in shoulder region [2]. The scapula superior border lateral part depressed through suprascapular notch from medial to coracoid process [3]. Superior trunk large branch that runs deeply from trapezius and omohyoid to supraspinous fossa, inferior to a transverse scapular ligament (STSL) [4]. SN is liable in crossing osteofibrous canal at SSN during compression. SN entrapment is possibly caused by SSN anatomical variations especially involving an individual's forceful and repetitive overhead activities [5].

The suprascapular artery of SSN can cause SN compression [6]. Motor and sensory innervation are provided to supraspinous muscles and rotator cut off muscles along with shoulder joint ligaments by suprascapular nerve [7]. The common site is suprascapular notch whereas nerve entrapment and injury are caused by compressed suprascapular nerve [8]. The compressed suprascapular nerve is significantly observed in spinoglenoid notch which cause entrapment syndrome. Should joint posterolateral aspect causing vague pain is characterized by this syndrome [9]. During arthroscopic procedures, suprascapular notch act as a significant landmark [10]. Supraspinatus and Infraspinatus muscles atrophy and shoulder region pain are characterized as SN entrapment. The purpose of this research is to determine the anatomical variations of the suprascapular notch in order to gain a better understanding of the possible risk factors for suprascapular neuropathy.

METHODOLOGY

A total of 128 human scapulae of either gender were taken from the department of Anatomy, Saidu Group of Teaching Hospitals, Swat and Women Medical and Dental College Hospital, Abbottabad during the period from January to June, 2021. Four parameters of Suprascapular notch (SSN) i) Superior transverse depth (STD), ii) Maximum depth (MD), iii) middle transverse diameter (MTD), and total circumferential diameter (TCD) were defined based on incisura inferior border shape and vertical

diameters. Suprascapular notch presence or absence was grossly examined for all the scapulae. Vernier caliper was used for the measurement of the four suprascapular notch parameters. The horizontally measured distance between suprascapular notches present at scapula superior border is referred as superior transverse diameter whereas horizontal distance from midpoint of maximum depth to the suprascapular notch opposite walls is known as mid transverse diameter. The distance from suprascapular notch deepest point to superior corner is called maximum depth. Total circumferential diameter (TCD) of the notch – A thread is placed along the medial end, deepest point, and lateral end and length of the notch and measured on a scale. SPSS version 23 was used for data analysis. All the gathered data was tabulated.

RESULTS

Out of 128, 61 (47.7%) were right-sided and 67 (52.3%) were left-sided human scapulae. The prevalence of U-shaped, V-shaped, and J-shaped notch were 62 (48.4%), 27 (21.1%), and 13 (10.2%) respectively. The incidence of the large double foramen, complete, and incomplete suprascapular notch were 2 (1.6%), 7 (5.5%), and 8 (6.3%) respectively. W-notched was present in 3 (2.3%) scapulae whereas 6 (4.7%) scapulae had no notch. The vertical and transverse diameters for right and left-sided type-II scapulae were 4.9±2.1 mm and 8.9±3.1 mm and 4.8±1.7 mm and 9.1±2.3 mm respectively. Prevalence of different shaped notch are depicted in Figure-1. Table-I represent measurement of various U-shaped suprascapular notch at scapula superior corners whereas scapula different suprascapular notch different measurement is shown in Table-II.

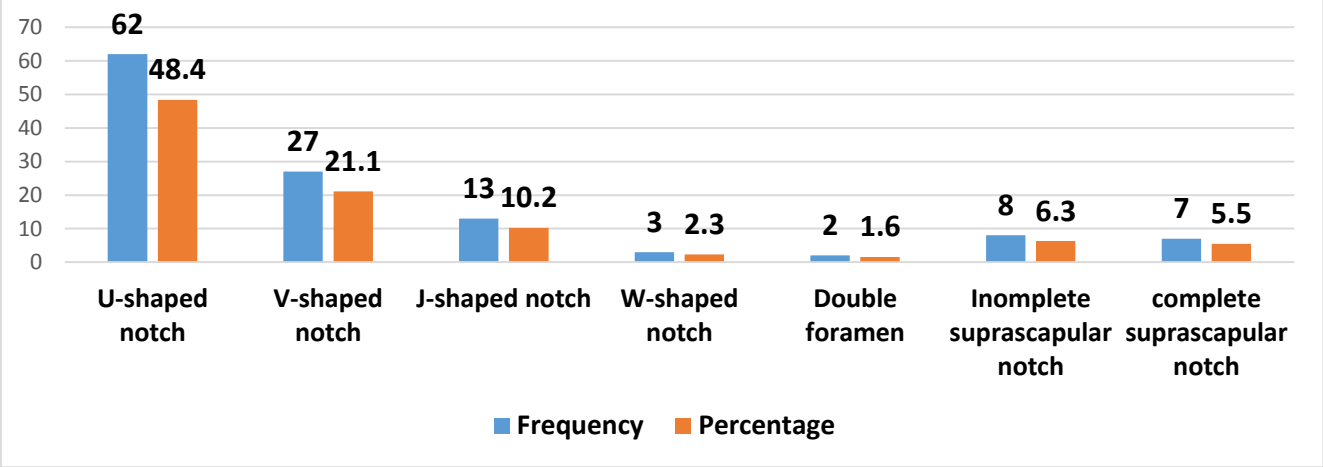

Figure 1: Prevalence of different shaped notch

Table 1: Measurement of various U-shaped suprascapular notch at scapula superior corners

Variables measured	U-shaped notch	U-shaped narrow notch	U-shaped wide notch	U-shaped wider notch	U-shaped widest notch
STD	11.69±0.8	8.31±0.9	13.9±1.4	29.93±1.1	41.91±0.9
MTD	7.81±0.7	7.36±1.2	18.93±1.2	19.74±1.6	31.9±1.7
MD	7.28±1.0	8.39±0.9	15.98±1.5	11.93±1.1	19.72±1.6
TCD	19.78±1.3	20.94±0.9	40.92±1.4	45.89±1.6	63.78±2.3

Table 2: Scapula different suprascapular notch different measurement

Variables Measured	V-shaped notch	J-shaped notch	W-shaped notch	Incomplete notch	Complete notch	Double Foramen
STD	12.10±0.9	10.18±1.2	5.85±2.3	10.1±1.2	7.81±0.6	14.2±1.3
MTD	5.87±0.8	8.19±0.8	4.2±1.1	4.9±0.8	8.7±0.9	10.75±1.1
MD	12.87±0.8	8.01±1.3	2.9±1.2	6.78±0.9	10.42±0.8	12.5±0.7
TCD	17.23±0.8	11.32±1.2	2.49±0.8	18.93±1.8	18.2±0.8	27.49±1.9

DISCUSSION

Suprascapular notch morphology could be determined with anatomical knowledge and play a critical role for neurosurgeons, clinicians, orthopedic surgeons, and radiologists for proper diagnosis and management of shoulder region surgical procedure and protocol. Suprascapular notch shape and size anatomical knowledge is an important suprascapular nerve entrapment risk factor. The formation of transverse scapular ligament and suprascapular notch serves as a bridge on notch border forming suprascapular foramen [11]. The brachial plexus important branch passing below the suprascapular ligament is known as the suprascapular nerve whereas the suprascapular vessels usually pass over the transverse scapular ligament [12]. Suprascapular notch different shape anatomy and suprascapular ligament's ossification had been testified by numerous studies in diverse population-centered on dissimilar variables like notch transverse diameter, notch vertical length, and notch shape [13, 14].

The prevalence of U-shaped suprascapular notch was higher followed by V-shaped notch in the current study. The suprascapular notch morphometry comparatively resembled other published studies [15, 16]. The prevalence of U-shaped notch was 48.4% which resembled other study findings [17]. Out of all the investigated scapula, about 10.2% of patients had J-shaped suprascapular notch which was higher than Saikia et al, 6.52% [18]. Compared to another scapular notch, lesser width of V-shaped notches was seen in entrapment syndrome patients.

The reduced morphmetry and variations in morphology could be the reasons for suprascapular nerve entrapment syndrome which leads to W-shaped notch formation. It might be developed by abnormal scapula or suprascapular ligament division or change in suprascapular blood vessels [19]. The inconspicuous additional notch (W) presence may result in suprascapular nerve entrapment, compressing the suprascapular blood vessels. Elzinga et al. [20] categorized six rudimentary suprascapular notch types in 211 cadaveric adult scapulae: Type 1 is the notch absence; type 2 is a V-shaped notch; type 3 is a U-shaped notch; type 4 is a small V-shaped notch; type 5 is a U-shaped notch with partial ossification of the suprascapular ligament; and type 6 is complete ossification of the suprascapular ligament [21].

Understanding the suprascapular notch entrapment syndrome requires an understanding of anatomical variation in the suprascapular notch and its morphology. The suprascapular nerve is a mixed nerve that arises from the brachial plexus's c5 and c6 roots at Erb's point. The suprascapular nerve travels deep to the suprascapular foramen and the spinoglenoid notch before splitting into motor and sensory branches. The motor branch supplies the supra and infraspinatus muscles, while the sensory branch supplies the subacromial bursa, acromioclavicular joint, and the glenohumeral joint [22, 23].

The most common variants of the scapula and critical factors for suprascapular entrapment neuropathy are the complete absence of the notch and ossification of the suprascapular ligament [24]. Suprascapular nerve entrapment was thought to be more likely in people with a narrow V-shaped notch [25]. During a physical examination, weakness and pain are caused by atrophy of the supraspinatus and infraspinatus muscles. For the anatomical demonstration of suprascapular nerve entrapment, electromyography, nerve conduction velocity study, and magnetic resonance imaging (MRI) are preferred gold standard diagnostic tools [26].

CONCLUSION

The prevalence of U-shaped and V-shaped notch was 48.4% and 21.1% respectively. Suprascapular notch morphology could be determined with anatomical knowledge and play a critical role for neurosurgeons, clinicians, orthopedic surgeons, and radiologists for proper diagnosis and management of shoulder region surgical procedure and protocol.

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