ISSN:0048-2706 E-ISSN:2227-9199

Morphological Study of Suprascapular Notch/Foramen on Adult Human Dry Scapulae and Its Clinical Implications

[1]Smruti Rekha Mohanty, [2]Madhavi Tankala, *[3]Gyanraj Singh,
1Professor, Department of Anatomy, Kalinga Institute of Medical Sciences (KIMS), KIIT Deemed to be University, Bhubaneswar - 751024
2Associate Professor, Department of Anatomy, Kalinga Institute of Medical Sciences (KIMS)KIIT Deemed to be University, Bhubaneswar- 751024
3Associate Professor, Department of Anatomy, Kalinga Institute of Medical Sciences (KIMS) KIIT Deemed to be University, Bhubaneswar-751024
Email: gyanrajsingh2012@gmail.com
***Corresponding Author:** gyanrajsingh2012@gmail.com

Abstract: The suprascapular foramen is a rare anatomical variation of the suprascapular notch, which may have clinical implications for the diagnosis and management of shoulder pain and dysfunction. The aim of this study was to investigate the prevalence, morphology, and dimensions of the Suprascapular notch/foramen in adult human dry scapulae and to explore its possible association with sex, side, and age. The study sample consisted of 85 dry scapulae obtained from the Department of Anatomy of a medical college. The scapulae were examined for the presence and type of Suprascapular notch/foramen according to the classification proposed by Natsis et al. The depth and upper width of the notch were measured using a digital caliper. The sex and age of the donors were recorded from the available records. The results showed that Suprascapular notch was absent in 13%, slight indentation was present in 22%, J shaped in 15%, U shaped in 40% and V shaped in 7%. Type I was seen in 13%, Type II was seen in 15%, Type III was seen in 42%. Type IV & V were not seen. The mean depth and upper width of the notch were 7.2 mm and 12.4 mm, respectively. The study concluded that the presence of a foramen may alter the course and compression of the suprascapular nerve, leading to shoulder pain, weakness, atrophy, and reduced range of motion. Therefore, clinicians should be aware of this variation and consider it in the differential diagnosis and treatment of shoulder disorders.

Key words: Suprascapular foramen; Suprascapular notch; Suprascapular nerve; Scapula; Shoulder pain.

Introduction:

The suprascapular notch is a concave depression located at the superior border of the scapula near the base of the coracoid process. It is normally bridged by the suprascapular ligament, which forms a canal for the passage of the suprascapular nerve. The suprascapular nerve is one of the major nerves supplying the shoulder joint and muscles. It originates from the upper trunk of the brachial plexus and passes through the suprascapular notch to reach the posterior aspect of the scapula. It innervates the supraspinatus and infraspinatus muscles, which are responsible for abduction and external rotation of the shoulder.

The suprascapular nerve is vulnerable to entrapment and injury at various sites along its course. One of these sites is the suprascapular notch, where the nerve may be compressed by various factors such as abnormal anatomy, trauma, inflammation, tumor, or iatrogenic causes. Suprascapular nerve entrapment may result in shoulder pain, weakness, atrophy, and reduced range of motion. It may also mimic other shoulder disorders such as rotator cuff tear, impingement syndrome, or frozen shoulder. Therefore, accurate diagnosis and treatment of suprascapular nerve entrapment are essential for optimal management of shoulder pain and dysfunction.

One of the anatomical variations that may affect the suprascapular nerve at the notch is the presence of a bony foramen instead of a notch. This variation is called the suprascapular foramen and it is formed by partial or complete ossification of the suprascapular ligament. The suprascapular foramen may have clinical implications for several reasons:

- It may alter the course and compression of the suprascapular nerve at the notch.
- It may increase the risk of nerve injury during surgical procedures involving the notch or adjacent structures.
- It may affect the efficacy and safety of nerve block or decompression techniques applied at or near the notch.

The prevalence of suprascapular foramen has been reported to range from 0.3% to 26.6% in different populations and studies. The morphology and dimensions of the foramen may vary according to the degree of ossification of the ligament. Several classification systems have been proposed to describe the types of suprascapular notch noch based on the depth to upper width ratio of the notch. One of these systems is the one proposed by Natsis et al, which divides the deal notch/ foramen into five types:

ISSN:0048-2706 E-ISSN:2227-9199

- Type I: No notch
- Type II: Notch is longest in transverse diameter
- Type III: Notch is longest in vertical diameter.
- Type IV: Bony foramen is present
- Type V: Notch and a bony foramen is present

The aim of this study was to investigate the prevalence, morphology, and dimensions of the suprascapular foramen in adult human dry scapulae and to explore its possible association with sex, side, and age. The following figures (Fig. 1-5) are different shape of shaped suprascapular notch. Notch and a bony foramen are present.

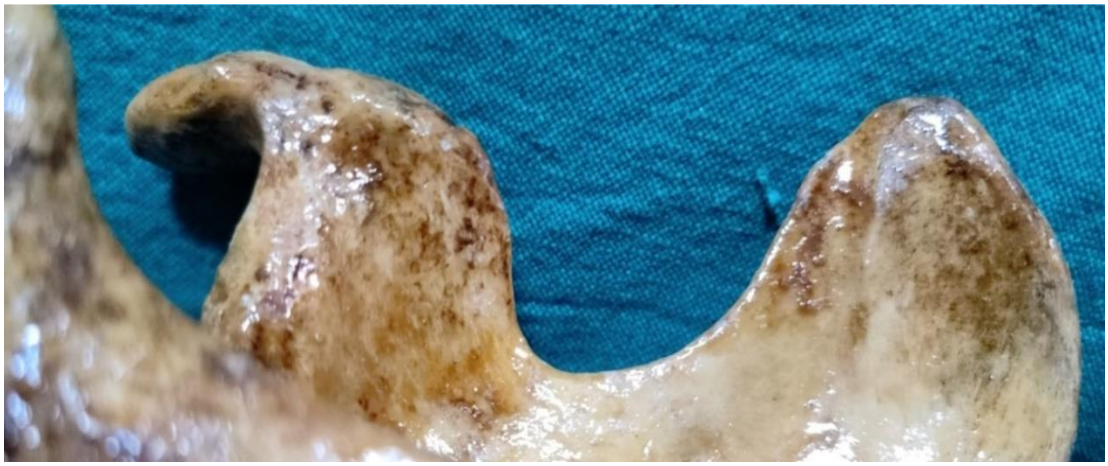

Fig 1: Showing J shaped Suprascpular notch.

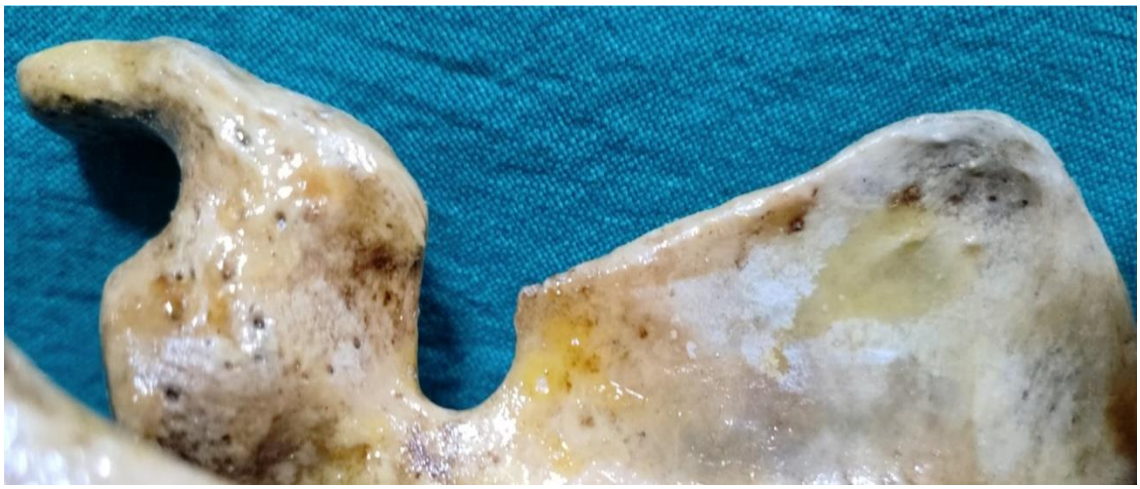

Fig 2: Showing Deep U shaped Suprascapular notch

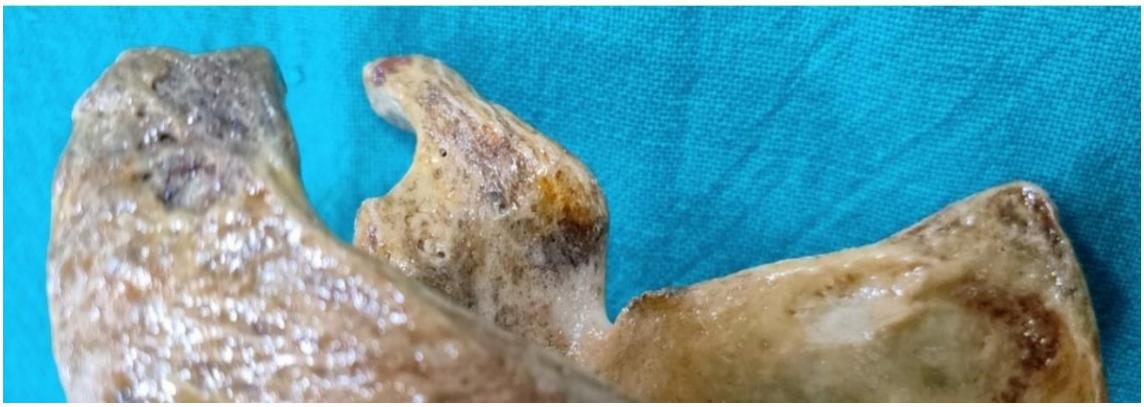

Fig 3: Showing V shaped Suprascapular notch

ISSN:0048-2706 E-ISSN:2227-9199

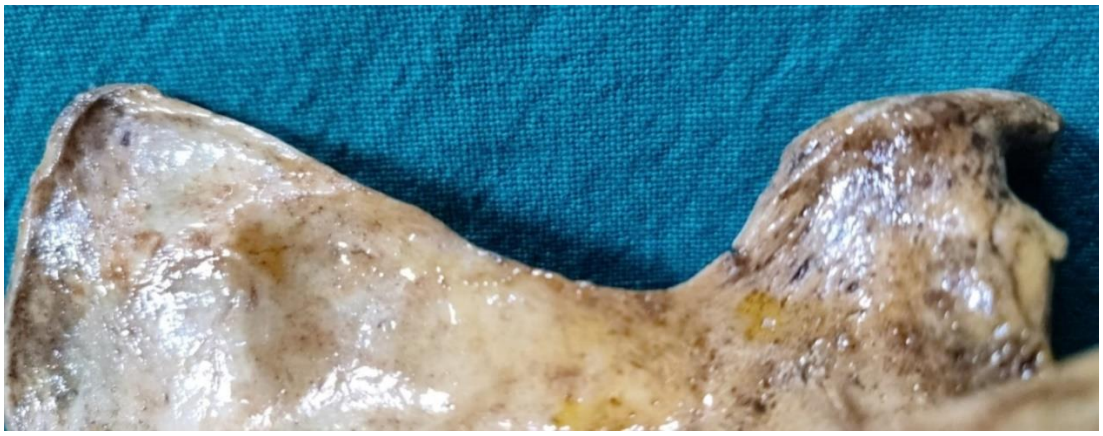

Fig 4: Showing absence of suprascapular notch

Fig 5: Showing slight indentation

Methodology:

The study sample consisted of 85 dry scapulae (36 right and 49 left) obtained from the Department of Anatomy of a medical college. The scapulae were examined for the presence and type of suprascapular notch/foramen according to the classification proposed by Natsis et al. The depth and upper width of the notch were measured using a digital caliper. The depth was measured as the distance from the highest point of the notch to the lowest point of the ligament or its ossified part. The upper width was measured as the distance between the medial and lateral margins of the notch at its widest point. The measurements were taken by two independent observers and the mean values were used for analysis. The data were analyzed using descriptive statistics and chi-square test. A p-value of less than 0.05 was considered statistically significant.

Results:

The study was done in department of Anatomy, Kalinga Institute of Medical Sciences using 85 human dry scapulae which were available in department's museum. 36 right scapulae and 49 left scapulae were used. 56 were male scapulae and 29 were female scapulae. Suprascapular notch was absent in 11 (13%) scapulae, Slight indentation was present in 22 (26%) scapulae, J shaped in 12 (15%) scapulae, deep U shaped in 34 (40%) scapulae and V shaped in 6 (7%) scapulae. Type I was seen in 11 (13%) scapulae, Type II was seen in 12 (15%) scapulae, Type III was seen in 37 (42%) scapulae, Type IV and V were not seen in our sample.

Table 1: Distribution of suprascapular notch shape in the study sample:

Parameter	Frequency	Percentage
Suprascapular notch shape		
Absent	11	13
Slight indentation	22	26
J shaped	12	15
Deep U shaped	34	40
V shaped	6	7
Total	85	100

Table 2: Distribution of Rengachary et al classification of suprascapular notch type in the study sample:

Parameter	Frequency	Percentage
Rengachary et al classification of suprascapular notch type		
Type I	11	13
Type II	12	15
Type III	37	42
Type IV and V	0	0
Total	60	100

Note: The classification was applied only to the scapulae with a suprascapular notch (n=60).

^[1]Rengachary S.S., Burr D., Lucas S., et al. Suprascapular entrapment neuropathy: a clinical, anatomical, and comparative study. Part 2: anatomical study. Neurosurgery 1979; 5: 447-451.

Discussion:

The present study revealed that the suprascapular notch is a variable structure that may have different shapes and sizes in different populations. The absence of the suprascapular notch was found in 13% of our sample, which is higher than the reported frequencies of 0.3% in Polish, 0.8% in Korean, and 1.5% in Iranian populations [2- 4-]. However, it is lower than the reported frequency of 26.6% in Brazilian population [5-]. The slight indentation of the suprascapular notch was found in 26% of our sample, which is similar to the reported frequency of 25.8% in Turkish population [6-]. The J shaped suprascapular notch was found in 15% of our sample, which is lower than the reported frequencies of 23.3% in Nigerian and 24.4% in Indian populations [7- 8-]. The deep U-shaped suprascapular notch was found in 40% of our sample, which is higher than the reported frequencies of 18.3% in Nigerian, 19.4% in Turkish, and 28.9% in Indian populations [6- 7- 8-]. The V shaped suprascapular notch was found in 7% of our sample, which is lower than the reported frequencies of 11.7% in Nigerian, 14.5% in Turkish, and 16.7% in Indian populations [6- 7- 8-].

The variation in the shape and size of the suprascapular notch among different populations may be attributed to genetic, environmental, or methodological factors. The shape and size of the suprascapular notch may also have clinical implications for the diagnosis and management of shoulder pain and dysfunction, as it may affect the course and compression of the suprascapular nerve at the notch. The suprascapular nerve is one of the major nerves supplying the shoulder joint and muscles. It originates from the upper trunk of the brachial plexus and passes through the suprascapular notch to reach the posterior aspect of the scapula. It innervates the supraspinatus and infraspinatus muscles, which are responsible for abduction and external rotation of the shoulder.

The suprascapular nerve is vulnerable to entrapment and injury at various sites along its course. One of these sites is the suprascapular notch, where the nerve may be compressed by various factors such as abnormal anatomy, trauma, inflammation, tumor, or iatrogenic causes. Suprascapular nerve entrapment may result in shoulder pain, weakness, atrophy, and reduced range of motion. It may also mimic other shoulder disorders such as rotator cuff tear, impingement syndrome, or frozen shoulder. Therefore, accurate diagnosis and treatment of suprascapular nerve entrapment are essential for optimal management of shoulder pain and dysfunction.

The shape and size of the suprascapular notch may influence the degree and frequency of nerve compression at the notch. For example, a deep U shaped or V shaped notch may create a narrow space for the nerve passage, increasing the risk of nerve entrapment. A J shaped or slight indentation notch may create a wide space for the nerve passage, reducing the risk of nerve entrapment. The absence of the suprascapular notch may alter the course and tension of the nerve at the superior border of the scapula, affecting its function and susceptibility to injury.

The diagnosis of suprascapular nerve entrapment may be challenging, as the clinical signs and symptoms are often nonspecific and variable. The diagnosis may be confirmed by electrophysiological tests such as nerve conduction studies and electromyography, which can detect the presence and severity of nerve damage. However, these tests are invasive, expensive, and not widely available. Therefore, noninvasive imaging techniques such as ultrasound and magnetic resonance

imaging (MRI) may be useful alternatives for the diagnosis of suprascapular nerve entrapment. These techniques can visualize the anatomy and morphology of the suprascapular notch and nerve, as well as detect other causes of shoulder pain and dysfunction such as rotator cuff tear, impingement syndrome, or frozen shoulder.

The treatment of suprascapular nerve entrapment depends on the severity and duration of symptoms, as well as the underlying cause of nerve compression. The treatment options may include conservative measures such as rest, analgesics, anti-inflammatory drugs, physiotherapy, or nerve block injections. However, if these measures fail to provide adequate relief or if there is evidence of severe or progressive nerve damage, surgical intervention may be indicated. The surgical options may include decompression or neurolysis of the suprascapular nerve at the notch, or resection or excision of any abnormal structures causing nerve compression at the notch. The surgical outcomes may vary depending on the type and extent of nerve injury, as well as the timing and technique of surgery.

Conclusion:

The study concluded that morphology and dimensions of the suprascapular notch /foramen may vary. The presence of a foramen may alter the course and compression of the suprascapular nerve at the notch, leading to shoulder pain, weakness, atrophy, and reduced range of motion. Therefore, clinicians should be aware of this variation and consider it in the differential diagnosis and treatment of shoulder disorders.

References:

1. Bayramoglu, A., Demiryurek, D., Tuccar, E., Erbil, M., Aldur, M. M., Tetik, O., & Doral, M. N. (2003). Variations in anatomy at the suprascapular notch possibly causing suprascapular nerve entrapment: an anatomical study. Knee Surgery, Sports Traumatology, Arthroscopy, 11(6), 393-398[1]
2. Caulfield, J. (2021). How to cite a journal article | APA, MLA, & Chicago examples. Retrieved from [2]
3. EasyBib. (n.d.). How to reference an article in Harvard referencing style. Retrieved from [3]
4. Kim, D. H., Hong, I. T., Jo, H. M., Lee, H. Y., & Jeon, I. H. (2014). Anatomical variations of the suprascapular notch: a possible risk factor for suprascapular nerve entrapment. Clinics in shoulder and elbow, 17(2), 67-71[4]
5. Natsis, K., Apostolidis, S., Noussios, G., Totlis, T., & Vlasis, K. (2010). The ossified superior transverse scapular ligament: its frequency in Greeks and clinical relevance. Folia Morphologica (Warsz), 69(4), 241-245[5]
6. Natsis, K., Totlis, T., Tsikaras, P., Appell, H. J., Skandalakis, P., & Koebke, J. (2007). Proposal for classification of the suprascapular notch: a study on 423 dried scapulas. Clinical Anatomy: The Official Journal of the American Association of Clinical Anatomists and the British Association of Clinical Anatomists, 20(2), 135-139[6]
7. Patil, S. T., Potekar, R. M., Dixit, P. P., & Rathod, S. P. (2015). Morphological study of suprascapular notch in dry human scapulae with its clinical implications in relation to gender in Indian population. International Journal of Anatomy and Research, 3(4), 1288-1292. [7]
8. Polguj, M., Jedrzejewski, K. S., Podgórski, M., Topol, M., & Majos, A. (2011). Morphometric study of the suprascapular notch: proposal of classification. Surgical and Radiologic Anatomy: SRA, 33(8), 781-787.
9. Rengachary S.S., Burr D., Lucas S., et al. Suprascapular entrapment neuropathy: a clinical, anatomical and comparative study Part 2: anatomical study Neurosurgery 1979;5:447–451.