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Exploring Suprascapular Notch Anatomy: Literature Synthesis, Imaging Analysis and Clinical Implications

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ABSTRACT

Background: The suprascapular notch, located at the superior border of the scapula, is a crucial anatomical structure facilitating the passage of the suprascapular nerve and vessels. Variations in its morphology have garnered attention due to potential clinical implications, particularly in conditions like suprascapular nerve entrapment. Despite ongoing exploration, a comprehensive understanding of these variations is still evolving.

Objectives: To comprehensively investigate suprascapular notch variations and their clinical implications through literature synthesis, imaging analysis, association assessment, and comparison with recent literature.

Materials and Methods: This study was conducted in Saidu Group of Teaching Hospitals, Swat from 1.1.2023 to 1.12.2023 using medical record to identify relevant studies exploring suprascapular notch variations. Inclusion criteria comprised studies providing detailed descriptions of notch morphology, while exclusion criteria excluded studies lacking specific descriptions of notch variations. Imaging data from 125 patients undergoing X-ray, MRI, or CT scans were analyzed. Notch morphology was independently reviewed by radiologists and anatomists. Variations were classified based on established criteria, and associations with demographic and clinical factors were assessed using chi-square tests.

Results: The study identified 25 relevant studies, providing insights into notch variations based on anatomical dissections, imaging studies, and clinical observations. Imaging analysis of 125 cases revealed a high prevalence of V-shaped notches (44.8%), followed by U-shaped notches (24.0%) and irregular notches (20.0%). Bony bridges were observed in 11.2% of cases. No significant associations were found between notch morphology and age, gender, or clinical symptoms, except for a correlation between bony bridges and a history of shoulder trauma.

Conclusion: This study contributes to the understanding of suprascapular notch variations by synthesizing existing literature and presenting original observations. The high prevalence of V-shaped notches and variable rates of other morphological variations underscore the complexity of notch morphology. Associations between notch variations and clinical factors provide insights into potential implications for patient care. Continued research in this area is essential to enhance diagnostic accuracy, treatment outcomes, and anatomical education.

Keywords:

Suprascapular notch, morphological variations, imaging analysis, clinical implications, literature review.

INTRODUCTION

The suprascapular notch, situated at the superior border of the scapula, serves as a critical anatomical landmark facilitating the passage of the suprascapular nerve and vessels. Variations in the morphology of this notch have garnered increasing attention due to their potential clinical implications, yet a comprehensive understanding of these variations remains an area of ongoing exploration.^{1, 2, 3}

This study endeavors to contribute to the body of knowledge surrounding suprascapular notch variations by synthesizing existing literature and presenting our own observations. Through a meticulous review of anatomical textbooks, peer-reviewed articles, and imaging studies, we aim to elucidate the diverse spectrum of morphological differences observed in this anatomical region.^{4, 5, 6}

Noteworthy variations encompass differences in notch shape, size, and the presence of bony bridges, each carrying potential significance for clinical practice. Understanding these variations is paramount for clinicians, surgeons, and anatomists, as they directly influence diagnostic approaches, treatment planning, and surgical outcomes in cases involving suprascapular nerve entrapment and related pathologies.^{7, 8, 9}

The implications of these variations extend beyond clinical practice to anatomical education, where a nuanced understanding of suprascapular notch morphology enhances the training of medical professionals. At Saidu Medical College, fostering excellence in anatomical knowledge and clinical skills is central to our mission, making this exploration particularly relevant within our academic community.^{10, 11, 12}

Through our study, we aim to contribute to the advancement of medical knowledge and improve patient care by shedding light on the intricacies of suprascapular notch morphology.

MATERIAL AND METHODS

A comprehensive literature review was conducted to identify relevant studies exploring variations in the suprascapular notch. Searches were performed in electronic databases including PubMed and Google Scholar.

Inclusion criteria:

Inclusion criteria comprised of studies providing detailed descriptions of suprascapular notch morphology, including variations in shape, size, and the presence of bony bridges.¹³

Exclusion criteria:

Exclusion criteria encompassed studies lacking specific descriptions of suprascapular notch variations or those focused solely on clinical outcomes without anatomical detail.¹⁴

Imaging Analysis:

Imaging data were collected from a cohort of 125 patients who underwent X-ray, MRI, or CT scans for various clinical indications at Saidu Group of Teaching Hospitals, Swat. These imaging

modalities were selected for their ability to visualize the suprascapular notch and surrounding structures with sufficient detail.

Cases were selected based on the availability of high-quality imaging demonstrating the suprascapular notch in the axial, coronal, and sagittal planes. Images were independently reviewed by experienced radiologists and anatomists to identify and classify variations in suprascapular notch morphology.

Classification of Variations:

Variations in suprascapular notch morphology were classified based on established criteria described in the literature. Notch shape was categorized as V-shaped, U-shaped, irregular, or other, while size variations were noted as small, medium, or large. The presence or absence of bony bridges was also documented.¹⁵

Statistical Analysis:

Descriptive statistics were utilized to summarize the frequency and distribution of suprascapular notch variations observed in the literature review and imaging analysis. Chi-square tests were employed to assess associations between variations and demographic or clinical factors.

This methodology facilitated a comprehensive examination of variations in the suprascapular notch across a cohort of 125 cases, combining both existing literature and original imaging analysis to provide a thorough understanding of this anatomical feature.¹⁶

RESULTS

Literature Review:

A total of 25 relevant studies were identified through the literature review process. These studies provided insights into variations in the suprascapular notch based on anatomical dissections, imaging studies, and clinical observations. Notch variations were categorized into different morphological types, including V-shaped, U-shaped, and irregular notches, with varying prevalence rates reported across studies.¹⁷

Table-1: Distribution of Suprascapular Notch Variations in the Study Cohort (n=125)

Suprascapular Notch Variation	Number of Cases (n=125)	Percentage
V-shaped	56	44.8
U-shaped	30	24
Irregular	25	20
Bony bridges	14	11.2

The table 1 illustrates the frequency and percentage of different suprascapular notch variations observed in the study cohort. V-shaped notches were the most prevalent, accounting for 44.8% of cases, followed by U-shaped notches at 24.0%, irregular notches at 20.0%, and bony bridges at 11.2%."

Table-2: Association Analysis between Suprascapular Notch Variations and Clinical Factors

Clinical Factors	Suprascapular Notch Variations	p-value
Age	V-shaped / U-shaped / Irregular / Bony bridges	>0.05
Gender	V-shaped / U-shaped / Irregular / Bony bridges	>0.05
Clinical Symptoms	V-shaped / U-shaped / Irregular / Bony bridges	>0.05
History of Shoulder Trauma	Bony bridges	<0.05

The table summarizes the results of the association analysis between suprascapular notch variations and clinical factors, including age, gender, clinical symptoms, and history of shoulder trauma. The p-values indicate the level of significance for each association, with a threshold of 0.05. Notably, no significant associations were found between suprascapular notch morphology and age, gender, or clinical symptoms. However, a significant correlation was observed between the presence of bony bridges and a history of shoulder trauma ($p < 0.05$), suggesting a potential link between traumatic shoulder injuries and alterations in suprascapular notch morphology.

Table-3: Findings in Our Study and current literature

Suprascapular Notch Variation	Observations
Consistent prevalence of V-shaped notches	High prevalence among individuals with suprascapular notch variations
Variable rates of other morphological variations	Variable rates of U-shaped notches and irregular notches in addition to V-shaped notches
Presence of bony bridges differs slightly from literature	Slight discrepancies in prevalence compared to existing literature
Potential regional or population-specific differences	Hint at regional or population-specific factors influencing morphology, warranting further investigation

This table summarizes the findings of our study regarding suprascapular notch variations, including the consistent prevalence of V-shaped notches, variable rates of other morphological variations, discrepancies in the presence of bony bridges compared to literature, and potential regional or population-specific differences.

Consistent prevalence of V-shaped notches: Our study corroborated previous findings indicating a high prevalence of V-shaped notches among individuals with suprascapular notch variations.

Variable rates of other morphological variations: While V-shaped notches were consistently prevalent; our study observed variable rates of other morphological variations such as U-shaped notches and irregular notches.

Presence of bony bridges differs slightly from literature: Interestingly, our analysis revealed slight discrepancies in the prevalence of bony bridges compared to existing literature. This suggests potential regional or population-specific differences in suprascapular notch morphology.

Potential regional or population-specific differences: Our study's findings hint at potential regional or population-specific factors influencing suprascapular notch morphology, warranting further investigation into the underlying mechanisms driving these variations.

These comparisons provide valuable insights into the consistency and variability of suprascapular notch morphology across different populations and underscore the importance of considering regional factors when interpreting anatomical variations.^{18, 19}

DISCUSSION

Our study's findings offer valuable insights into suprascapular notch variations, contributing to the current understanding of this anatomical feature. We compare our data with recent literature to contextualize our findings and discuss their implications:

Consistency with Recent Literature:

Our observation of a high prevalence of V-shaped notches aligns with recent studies that have reported similar findings. This consistency underscores the reproducibility of V-shaped notches as a common variation in suprascapular notch morphology.^{20, 21}

Variable Rates of Other Morphological Variations:

While our study confirms the prevalence of V-shaped notches, we also observed variable rates of other morphological variations, such as U-shaped notches and irregular notches. This variability has been noted in recent literature suggesting that these variations may be more diverse than previously thought.

Differences in Bony Bridge Prevalence:

Our study observed a slightly different prevalence of bony bridges compared to recent literature. While some studies have reported higher rates of bony bridges others have found lower prevalence rates. These discrepancies highlight the need for further research to elucidate the factors contributing to bony bridge formation and their clinical significance.²²

Clinical and Research Implications:

Our findings have several implications for clinical practice and future research. Clinicians should be aware of the variability in suprascapular notch morphology when evaluating patients with shoulder pathology, as these variations may influence diagnostic approaches and treatment outcomes. Furthermore, future research should focus on exploring the biomechanical factors underlying suprascapular notch variations and their relationship to clinical outcomes.

CONCLUSION

In conclusion, our study provides valuable insights into suprascapular notch variations and their implications for clinical practice and research. By comparing our findings with recent literature, we have enhanced our understanding of the diverse spectrum of morphological variations observed in this anatomical region. Our study underscores the importance of continued research in this area to improve diagnostic accuracy, treatment outcomes, and patient care.

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