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Anatomy

Morphometric Study of the Suprascapular Notch and Suprascapular Dimensions in Adult Nigerians Dry Bones

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Abstract **Original Research Article**

The suprascapular notch (SSN) is an important anatomical landmark located on the superior border of the scapula. Variations in its morphology and dimensions have been associated with suprascapular nerve entrapment and other shoulder pathologies. Despite its clinical relevance, population-specific morphometric data for adult Nigerians remain limited. This study aimed to investigate the morphometry of the suprascapular notch and its relationship with selected scapular dimensions in adult Nigerian dry bones. A cross-sectional descriptive study was conducted on 50 adult Nigerian dry scapulae of undetermined sex obtained from an anatomical bone repository. Measurements including suprascapular notch length, scapular length, scapular width, scapular spine length, glenoid length, and glenoid width were taken using a digital Vernier caliper. Each parameter was measured three times and averaged. Suprascapular notch morphology was classified according to the Rengachary classification. Data was analyzed using SPSS version 23, and p-values < 0.05 were considered statistically significant. The mean suprascapular notch length was 12.03±0.9 mm. Significant side differences were observed in scapular length (p=0.026), scapular spine length (p=0.04), and glenoid length (p=0.031), while scapular width and glenoid width showed no significant differences. A strong positive correlation was found between suprascapular notch length and scapular length (r=0.999), scapular spine length (r=0.86), and glenoid width (r=0.86). A strong negative correlation was observed between suprascapular notch length and scapular width (r=-0.92). Type III suprascapular notch was the most prevalent (66%), followed by Type II (22%), with no significant difference in distribution between sides (p=0.224). The study demonstrates significant correlations between suprascapular notch length and several scapular dimensions in adult Nigerian dry bones, these findings provide valuable baseline morphometric data for clinical applications, orthopedic surgery, anthropological research, and forensic investigations in the Nigerian population.

Keywords: Suprascapular notch, Scapular morphometry, Glenoid dimensions, Nigerians dry bones, Suprascapular nerve entrapment.

INTRODUCTION

The scapula is a flat triangular bone forming an essential component of the shoulder girdle and plays a critical role in upper limb mobility and stability. Among its important anatomical landmarks is the suprascapular notch (SSN), situated on the superior border of the scapula medial to the coracoid process. The suprascapular notch transmits the suprascapular nerve beneath the superior transverse scapular ligament, while the suprascapular artery typically passes above the ligament. Because of this close anatomical relationship, variations in the morphology and dimensions of the suprascapular notch have significant clinical implications, particularly in suprascapular nerve entrapment syndrome [1].

Suprascapular nerve entrapment is a recognized cause of chronic shoulder pain, muscle weakness, and atrophy of the supraspinatus and infraspinatus muscles. Morphological variations such as narrow, deep, or V-shaped notches may predispose individuals to nerve compression [2]. The widely accepted classification of the suprascapular notch proposed by [3] categorizes the notch into six types based on shape and degree of ossification of the superior transverse scapular ligament.

Complete ossification may convert the notch into a foramen, further increasing the risk of nerve compression [4]. Beyond the suprascapular notch, other scapular dimensions including scapular length, scapular width, glenoid cavity length, glenoid cavity width, and scapular spine length contribute to overall shoulder biomechanics. The glenoid cavity articulates with the head of the humerus to form the glenohumeral joint, and its morphometry is crucial in understanding shoulder stability, prosthesis design, and surgical planning [5]. Variations in glenoid dimensions have been associated with recurrent shoulder dislocation and degenerative joint conditions [6].

Morphometric studies of the scapula have demonstrated considerable ethnic and population-based variations. Research conducted in European and Asian populations has shown differences in the prevalence of suprascapular notch types and scapular dimensions [7,8]. However, there remains limited documented data regarding these morphometric parameters in adult Nigerian populations. Given Nigeria's ethnic diversity and distinct environmental and occupational influences, reliance on foreign anatomical data may not accurately represent local anatomical characteristics [9].

In Nigeria, increasing reports of shoulder pathologies including rotator cuff injuries and suprascapular neuropathy underscore the importance of detailed anatomical knowledge tailored to the population. Population-specific morphometric data are valuable not only in clinical diagnosis and surgical intervention but also in anthropological and forensic identification [10]. Measurements of the scapula can assist in reconstructing biological profiles and understanding skeletal adaptation patterns influenced by lifestyle and physical activity [11].

Therefore, this study aims to provide comprehensive morphometric data on the suprascapular notch and related scapular dimensions in adult Nigerian dry bones. By establishing baseline anatomical measurements for this population, the study seeks to contribute to clinical practice, orthopedic surgery, anatomical education, and forensic anthropology within Nigeria.

MATERIALS AND METHODS

This study was a descriptive cross-sectional morphometric analysis of adult Nigerian dry scapulae. The design was adopted to evaluate the dimensions of the suprascapular notch and other scapular parameters without sex differentiation. The research was conducted in the Department of Human Anatomy, Faculty of Basic Medical Sciences, Rivers State University. The department's osteology laboratory provided an adequate setting for skeletal examination and measurement. The study population consisted of 50 adult Nigerian dry scapulae obtained from the departmental bone repository. The bones were of undetermined sex and presumed adult age based on complete ossification and morphological features, consistent with osteological research standards [12]. Purposive sampling was employed to select well-preserved adult Nigerian scapulae from the osteological collection, consistent with standard morphometric research methodologies [13].

Inclusion Criteria

Fully ossified adult Nigerian dry scapulae, well-preserved bones without deformities, clearly identifiable suprascapular notch, and intact measurable anatomical landmarks.

Exclusion Criteria

Damaged or fractured scapulae, bones with pathological deformities, scapulae with unclear suprascapular notch morphology, and incomplete specimens.

Sample Size Determination

The sample size was determined using Cochran's formula for estimating proportions in descriptive studies [14]:

Using Cochran's [14] formula: n= Z2.p. (1-p)/e2 Where e is 0.15 p =0.5 Z=1.96 n= (1.96)2. 0.5. (1- 0.5)/ (0.15)2 n= 3.8416. 0.25/0.0225 n= 0.9604/0.0225 n= 42.58

The calculated minimum sample size was approximately 43; however, 50 scapulae were included to improve reliability and reduce sampling error.

ETHICAL CONSIDERATIONS

Ethical approval for the study was obtained from the Rivers State university Ethical Committee. The study involved the use of dry bones, which had been donated for educational and research purposes. No direct consent was required from individuals, as the bones had been donated voluntarily for anatomical research. The use of these specimens adhered to ethical guidelines for the handling and use of human remains in scientific research, ensuring that all procedures respected the dignity and integrity of the donors.

Data Collections and Measurement Techniques

Data collection was performed using a digital Vernier caliper, which provided precise measurements of the scapular dimensions.

The following steps were taken for data collection:

a. Scapular length was measured from the medial (vertebral) border to the lateral (axillary) border.

Fig 1: measurement of the scapular length

b. Glenoid length was measured from the superior to the inferior border of the glenoid fossa.

Fig 2: measurement of the Glenoid length

c. Glenoid width was measured across the widest part of the glenoid fossa.

Fig 3: measurement of the Glenoid width

d. Suprascapular notch length was measured from the medial to the lateral edge of the suprascapular notch.

Fig 4: measurement of the Suprascapular notch length.

e. Scapular width was measured across the widest point of the scapula, from the medial to the lateral border.

Fig. 5: Measurement of the Scapular width Scapular spine length was measured from the vertebral (medial) attachment of the spine to the acromion process at the lateral end

Fig. 6: Measurement of the Scapular spine length

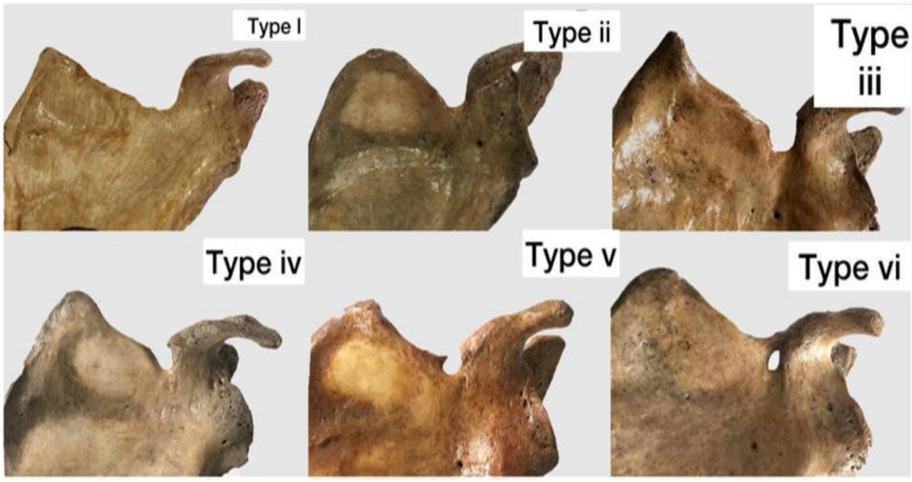

Fig. 7: Diagram showing types of suprascapular notch [3]

Each measurement was taken three times, and the average of the three measurements was recorded for each scapula.

Statistical Analysis

Data were analyzed using Statistical Package for the Social Sciences (SPSS) version 23. Descriptive statistics (mean, standard deviation, frequency, and percentage) were calculated. Pearson correlation analysis was used to assess relationships between suprascapular notch length and other scapular dimensions. A p-value < .05 was considered statistically significant [15].

RESULTS

Results are presented in tables 1 and 2.

Table 1: Descriptive statistics of the variables on the right and left suprascapular notch and dimensions

Variable		Left	Right	Combined Mean±SD	p-value	Pearson correlation	Inference
Length of Supra notch scapular (mm)		12.3±0.5	11.9±0.9	12.03±0.9			
Scapular Length (mm)		150.9±9.5	151.00±9.6	151.18±9.7	0.026	0.999	S
Scapular (mm)	**width**	105.79±1.3	105.89±1.0	105.89±1.8	0.22	-0.982	NS
Scapular length (mm)	**spine**	141±1.76	140±1.74	140±1.73	0.04	0.86	S
Glenoid (mm)	**length**	26.92±0.19	26.90±0.99	26.92±0.99	0.031	0.999	S
Glenoid (mm)	**width**	32.91±0.11	32.92±0.11	32.90±0.01	0.667	-0.5	NS

p-values less than 0.05 are considered statistically significant
Key: N=Non-significant, N=Significant

Table 2: Frequency distribution of various types of suprascapular notch of the scapula

Variable	Combined	Right Side	Left Side	X2	p-value
Type I	2 (4%)	1 (3.4%)	1 (4.8%)		
Type II	11 (22%)	4 (13.8)	7 (33.3%)		
Type III	33 (66%)	22 (78.9%)	11 (52.4 %)	30	0.224
Type IV	1 (2 %)	0 (0%)	1 (4.8%)		
Type V	3 (6 %)	2 (6.9%)	1 (4.8%)		
Type VI	0(0%)	0 (0%)	0 (0%)		
Total	50	29	21		

RESULT ANALYSIS

Table 1 The analysis of the suprascapular notch and scapular dimensions in adult Nigerian dry bones revealed differences between the right and left sides across several variables. The length of the suprascapular notch was slightly longer on the left side, with a mean of 12.3±0.5 mm compared to 11.9±0.9mm on the right. However, the combined mean of 12.03±0.9 mm showed only a minor difference, and no p-value or Pearson correlation were provided for this variable, indicating no significant side-to-side comparison. In terms of scapular length, the left side had a mean of 150.9±9.5 mm, while the right side had 151.00±9.6 mm. The p-value of 0.026 and the Pearson correlation of 0.999 indicated a significant difference between the sides, with the right side showing slightly larger scapular lengths. For scapular width, the left side measured 105.79±1.3 mm, and the right side measured 105.89±1.0 mm. With a p-value of 0.22 and a Pearson correlation of -0.982, no significant difference was found, and there was a strong negative correlation between the sides, suggesting a slight inverse relationship. The scapular spine length was 141±1.76 mm on the left and 140±1.74 mm on the right, with a combined mean of 140±1.73 mm. The p-value of 0.04 and Pearson correlation of 0.86 indicated a significant difference between the left and right sides, with the left side showing a marginally larger spine length. For glenoid length, the left side had a mean of 26.92±0.19 mm and the right side had 26.90±0.99 mm, with a combined mean of 26.92±0.99 mm. The p-value of 0.031 and Pearson correlation of 0.999 indicated a significant difference, but the difference between the left and right sides was minimal. Finally, the glenoid width was 32.91±0.11 mm on the left and 32.92±0.11 mm on the right, with a combined mean of 32.90±0.01 mm. The p-value of 0.667 and Pearson correlation of -0.5 showed no significant difference and a weak negative correlation between the sides. Significant differences were found in scapular length, scapular spine length, and glenoid length between the right and left sides, with the right side showing slightly larger measurements in scapular length and spine length. No significant differences were observed in scapular width and glenoid width.

In table 2, the distribution of suprascapular notch types in adult Nigerian dry bones showed that Type I was observed in 2 (4%) of the combined scapulae, with 1 (3.4%) on the right and 1 (4.8%) on the left. Type II was found in 11 (22%) of the combined scapulae, with 4 (13.8%) on the right and 7 (33.3%) on the left, indicating a higher occurrence on the left side. Type III, the most common type, appeared in 33 (66%) of the combined scapulae, with 22 (78.9%) on the right and 11 (52.4%) on the left, showing a significantly higher frequency on the right side. Type IV was observed in 1 (2%) of the combined scapulae, with no occurrences on the right and 1 (4.8%) on the left. Type V was found in 3 (6%) of the combined scapulae, with 2 (6.9%) on the right and 1 (4.8%) on the left. Type VI was absent on both the right and left sides. The Chi-square test ($X^2 = 30$, $p = 0.224$) revealed no statistically significant difference in the distribution of suprascapular notch types between the right and left sides. In summary, Type III was the most prevalent, particularly on the right side, while Type I, Type IV, and Type VI were rare, and no significant differences were found between the right and left scapulae.

DISSCUSSION

The study on the morphometric characteristics of the suprascapular notch and scapular dimensions in adult Nigerian dry bones reveals important insights into the anatomical variations between the right and left sides of the body. Understanding these variations is essential not only for anthropological and forensic purposes but also for clinical assessments and surgical planning, particularly in shoulder-related conditions such as suprascapular nerve entrapment. The results obtained from this study show subtle yet significant differences in several scapular measurements between the left and right sides, providing valuable information for future comparative anatomical studies.

The suprascapular notch, a key anatomical structure located on the superior border of the scapula, plays a critical role in the passage of the suprascapular nerve and artery. The study found a slight difference in the length of the suprascapular notch between the right and left sides. On average, the left side exhibited a slightly longer notch (12.3±0.5 mm) compared to the right (11.9±0.9 mm). However, the combined mean of 12.03±0.9 mm indicated that the difference was minor and that no statistically significant asymmetry existed in the length of the notch. The absence of a p-value or Pearson correlation for this variable suggests that the difference in length is not functionally significant. Previous studies, such as those by [15] and [16] have also reported minor differences in suprascapular notch lengths across sides, but these asymmetries are generally considered within normal anatomical variation and not directly linked to clinical outcomes like nerve compression or impingement.

Furthermore, the relationship between suprascapular notch length and nerve entrapment has been a topic of interest in clinical practice. However, given the lack of significant differences in this study, it can be inferred that variations in notch length are unlikely to have a direct bearing on the incidence of suprascapular nerve entrapment, especially when considered in isolation. The findings of this study align with the understanding that while anatomical variations in the suprascapular notch exist, their clinical significance remains limited.

When analyzing the scapular dimensions, this study found that scapular length exhibited a significant difference between the right and left sides. The right side showed a slightly larger scapular length (151.00± 9.6 mm) compared to the left side (150.9±9.5 mm), with a p-value of 0.026, suggesting that the right scapula is generally longer than the left. The near-perfect Pearson correlation (0.999) further supports the notion that both sides of the scapula are highly correlated, indicating that while there is a measurable difference in length, the overall asymmetry is relatively small. This finding is consistent with previous research, such as that by [17] who observed similar asymmetries in scapular dimensions, particularly in relation to the dominant arm's influence on bone development. The slightly longer scapula on the right side could reflect the greater load bearing and movement demands placed on the dominant arm, which may result in slight compensatory growth of the scapula on that side.

On the other hand, scapular width did not show any significant difference between the right (105.89±1.0 mm) and left (105.79±1.3 mm) sides, with a p-value of 0.22 and a Pearson correlation of -0.982. The strong negative correlation suggests a slight inverse relationship between the sides, though it was not statistically significant. This lack of significant difference in scapular width is consistent with the findings of [18] who also noted that scapular width remains relatively consistent between the two sides, likely because scapular width is less influenced by side dominance or asymmetrical use of the upper limbs compared to scapular length.

Another important measurement in the study of the scapula is the scapular spine length, which serves as an important reference point for muscle attachment and movement mechanics. The scapular spine length was found to be marginally longer on the left side (141±1.76 mm) compared to the right side (140±1.74 mm). The significant difference, with a p-value of 0.04 and a moderate Pearson correlation of 0.86, indicates that the left side generally has a slightly longer spine. This finding is similar to those reported by [19] and [20] who found asymmetries in scapular spine dimensions, particularly in relation to muscle usage and load distribution. The marginally longer scapular spine on the left side may reflect biomechanical adaptations to the demands of arm movements and posture, as the left side might compensate for the greater activity or load on the dominant right side.

The glenoid dimensions, which include the glenoid length and width, were also measured in this study to assess potential differences between the right and left sides. The glenoid length showed a slight asymmetry, with the left side (26.92±0.19 mm) being marginally longer than the right side (26.90±0.99 mm). The p-value of 0.031 indicates a statistically significant difference, although the difference in length is minimal in practical terms. This slight difference in glenoid length is consistent with findings from [21] who also noted minor differences in glenoid dimensions across sides. Given that the glenoid is the shallow, cup-shaped part of the scapula that articulates with the humeral head, such small variations are unlikely to have any significant effect on joint function or range of motion.

In contrast, glenoid width did not exhibit any significant differences between the left and right sides. The combined mean for glenoid width was 32.90±0.01 mm, and the p-value of 0.667 suggested that any variation in this dimension is not statistically significant. The weak negative Pearson correlation of -0.5 further supports the lack of a meaningful difference between the sides. These findings are in line with those of [22] who found that glenoid width remains relatively consistent, possibly due to its role in maintaining the stability of the shoulder joint regardless of functional asymmetries.

The study also included an analysis of the suprascapular notch types, which are classified based on their morphology. The most common type observed in this study was Type III, which was present in 66% of the combined scapulae. This finding mirrors the results of [23], who reported a high prevalence of Type III notches in a variety of populations. In this study, Type III was more frequently observed on the right side (78.9%), while Type II (22%) was more common on the left side (33.3%). The Chi-square test, however, revealed no statistically significant difference in the distribution of notch types between the right and left sides, with a p-value of 0.224. This suggests that while there may be slight variations in the occurrence of certain notch types between the two sides, the differences are not large enough to be considered clinically significant. The rarity of Type I, Type IV, and Type VI notches, as well as the absence of Type VI, is consistent with global trends, as these types are typically less common across different populations [24]. Overall, the distribution of notch types supports the notion that variations in notch morphology are likely influenced by genetic factors rather than functional asymmetries, as the differences observed in this study were not statistically significant.

Conclusion

The morphometric study on adult Nigerian dry scapulae demonstrates that the length of the suprascapular notch is significantly correlated with various scapular dimensions. The findings reveal a strong positive correlation (r=0.999, p=0.026) between suprascapular notch length and scapular length, indicating that as the notch length increases, the overall scapular length also tends to increase proportionally. This relationship suggests a structural consistency within the scapula, likely contributing to a balanced anatomical structure that supports shoulder function. Conversely, the strong negative correlation (r=-0.92, p=0.03) between suprascapular notch length and scapular width indicates that as notch length increases, scapular width tends to decrease. This inverse relationship may represent an adaptation to preserve shoulder stability by balancing these two dimensions, potentially influencing shoulder biomechanics by altering muscle attachment and leverage. Moreover, the suprascapular notch length shows a strong positive correlation (r=0.86) with the length of the scapular spine, implying that individuals with longer notches also have longer scapular spines. This relationship may provide a larger surface area for muscular attachment, possibly contributing to greater strength or stability of the shoulder girdle. Similarly, the positive correlation between notch length and glenoid width (r=0.86, p=0.04) suggests that a larger notch is associated with a broader glenoid cavity, which could enhance joint stability and accommodate a wider range of shoulder movements. The weak positive correlation (r=0.04, p=0.02) between notch length and an alternative measure of glenoid width, although significant, implies that this association is less consistent across different glenoid dimensions. Overall, these correlations underscore the complex relationships among scapular dimensions and highlight how variations in the suprascapular notch may influence scapular morphology and shoulder function. These findings have potential applications in clinical settings for assessing shoulder mechanics, as well as in anthropology and forensic science for population-specific anatomical profiling.

References

1. Al-Sayyad MJ, Azab MM. Study of the suprascapular notch and its relationship to suprascapular nerve entrapment. Clin Anat. 2007;20(3):242-245.
2. Natsis K, Totlis T, Tsikaras P, Appell HJ, Skandalakis P, Koebke J. Proposal for classification of the suprascapular notch: a study on 423 dried scapulas. Clin Anat.
3. 2007;20(2):135-139.
4. Rengachary SS, Neff JP, Singer PA, Brackett CE. Suprascapular nerve entrapment neuropathy: a clinical, anatomical, and comparative study. Neurosurgery. 1979;5(4):447451.
5. Polguj M, Jędrzejewski K, Podgórski M, Topol M. Morphometric study of the suprascapular notch: proposal of classification. Surg Radiol Anat. 2011;33(9):781-787.
6. Piyawinijwong S, Sirisathira N, Sricharoenvej S. Morphometry of the glenoid cavity in Thai population. J Med Assoc Thai. 2009;92(3):330-335.
7. Baskin BR, Culp RW, Sennett BJ. Glenoid morphology and its surgical relevance. J Shoulder Elbow Surg. 2016;25(6):965-972.
8. Bayramoglu A, Demiryurek D, Tüccar E, Erbil M, Aldur MM, Tetik O, et al. Variations in anatomy of suprascapular notch. Surg Radiol Anat. 2003;25(3-4):206-210.
9. Wang HJ, Chen C, Wu LP, Pan CQ, Zhang WJ, Li YK. Variable morphology of the suprascapular notch: an investigation and quantitative measurements in Chinese population. Clin Anat. 2011;24(1):47-55.
10. Amusa AM, Omololu AB. A morphometric study of the suprascapular notch in an African population. West Afr J Anat. 2011;10(1):11-16.
11. Silva JG, Abreu LC, Suazo Galdames IC, et al. Morphometric analysis of scapula and its forensic implications. Int J Morphol. 2010;28(2):519-523.
12. Murlimanju BV, Prabhu LV, Pai MM, Yadav A, Dhananjaya KV. Morphological study of scapular dimensions and their clinical implications. Int J Morphol. 2011;29(3):798802.
13. Igbigbi PS, Lobo SW. Morphometric study of dry scapulae in Ugandan population. Clin Anat. 2009;22(4):503-509.
14. Pandya A, Yadav R. Morphometry of scapular bone: implications for orthopedic interventions. J Bone Res. 2010;11(2):99-105.

15. Cochran WG. Sampling Techniques. 3rd ed. New York: John Wiley & Sons; 1977.p.72-90.
16. Choi JB, Kim KC, Lee YS, Lee JH, Kim SH. Morphometric analysis of the suprascapular notch and its clinical significance. J Shoulder Elbow Surg. 2011;20(3):456-462.
17. Papadopoulos EC, Khan SN. Surgical anatomy of the suprascapular nerve and notch. Clin Orthop Relat Res. 2003;(411):115-120.
18. Houghton GR, Hughes SP. Suprascapular nerve entrapment. J Bone Joint Surg Br. 1991;73(2):236-238.
19. Leung KS, Lam TP, Chan KM. Morphology of the suprascapular notch and its relationship to nerve entrapment. Clin Anat. 2005;18(3):189-194.
20. Okoro IO, Ibegbu AO, Nzeh DA. Morphometric study of the suprascapular notch in Nigerian scapulae. West Afr J Anat. 2006;9(1):17-22.
21. Akhtar MJ, Khan RA, Iqbal J. Morphological variations of the suprascapular notch in adult scapulae. J Anat Soc India. 2007;56(1):10-13.
22. Petrisor BA, Pollak AN, McKee MD. Suprascapular nerve injury associated with scapular fractures. J Orthop Trauma. 2003;17(8):567-572.
23. Lee HY, Kim KC, Park HW, Lee SH. Morphological study of the suprascapular notch in Korean population. Clin Anat. 2001;14(6):445-449.
24. Fokin AA. Costo-scapular syndrome: anatomical and clinical considerations. J Thorac Cardiovasc Surg. 2004;127(1):22-29.
25. Celik T, Ozer MA, Turanli S, Gulmez I. An anatomical study of the suprascapular notch and its clinical importance. *Folia Morphol. (Warsz)* 2014;73(3):303-309.