

TÜRK POPÜLASYONUNDA OS AKROMIALE PREVALANSI VE MANYETİK REZONANS GÖRÜNTÜLEME İLE SUBAKROMİYAL MESAFE VE AKROMİYON TİPOLOJİSİNİN DEĞERLENDİRİLMESİ

Os Acromiale Prevalence and Evaluation of Subacromial Distance and Acromion Typology by Magnetic Resonance Imaging in a Turkish Population

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ÖZET

Amaç: Bir Türk popülasyonunda akromiyon tipi, os acromiale prevalansını ve akromiyon tipolojisinin subakromiyal mesafe ile ilişkisini belirlemek.

Gereç ve Yöntem: Dahil etme kriterlerini karşılayan toplam 528 hasta, os acromiale varlığı, akromiyon tipi ve subakromiyal mesafe açısından iki radyolog tarafından değerlendirildi. Akromiyon tipolojisi, os acromiale olmayan hastalarda değerlendirildi. Os akromiyon, subakromiyal mesafedeki değişiklikler istatistiksel olarak cinsiyet, etkilenen taraf (sağ / sol) varlığına bağlı olarak değerlendirildi. Ayrıca, subakromiyal mesafe ile akromiyon türleri arasındaki ilişki araştırıldı.

Bulgular: On iki hastada (% 2.27) os acromiale vardı. Yüz on altı hastada tip I akromiyon (% 22.5) varken, 352 hastada tip II akromiyon (% 68.2), 10 hastada tip III akromiyon (% 1.9) ve 38 hastada da tip IV akromiyon (% 7.4) vardı. Ortalama subakromiyal mesafe 6.6 mm (% 95; 6.5-6.77 mm) olarak bulundu. Akromiyon tipine göre, subakromiyal mesafe tip IV akromiyonda tip I ve II'ye göre anlamlı derecede yüksekti ($p = 0.02$). Subakromiyal mesafede cinsiyet ve taraf açısından anlamlı fark yoktu (sırasıyla $p = 0.309$ ve 0.454).

Sonuç: Türk popülasyonunda cinsiyete ve tarafa göre subakromiyal mesafede anlamlı bir fark yoktu. Değerlendirilen Türk popülasyonunda en sık ve en yaygın akromiyon türü sırasıyla tip II ve tip III idi. Subakromiyal mesafe tip 4 akromiyonda daha büyüktü.

Anahtar Kelimeler: *Os acromiale; Subacromiyal mesafe; Akromiyon tipolojisi*

ABSTRACT

Purpose: To determine the prevalence of acromion type, os acromiale, and the relation of acromion typology with subacromial distance in a Turkish population.

Materials and Methods: A total of 528 patients who met the inclusion criteria were evaluated in terms of presence of os acromiale, type of acromion, and subacromial distance by two radiologists. Acromion typology was evaluated in patients without os acromiale. Variations of subacromial distance depending on the presence of os acromion, sex, affected side (right / left) were statistically assessed. In addition, an association between subacromial distance and acromion types was sought.

Results: Twelve patients (2.27%) had os acromiale. One-hundred and sixteen patients had type I acromion (22.5%) whereas 352 had type II acromion (68.2%), 10 had type III acromion (1.9%), and 38 had type IV acromion (7.4%). The median subacromial distance was found to be 6.6 mm (95% CI for median; 6.5-6.77 mm). Regarding the acromion type, subacromial distance was significantly higher in type IV acromion than in types I and II ($p = 0.02$). There was no significant difference in subacromial distance according to sex and side ($p = 0.309$ and 0.454 respectively).

Conclusion: There was no significant difference in subacromial distance according to sex and side in the Turkish population. The most and least common types of acromion in the evaluated Turkish population were type II and type III, respectively. The subacromial distance was greater in type 4 acromion.

Key Words: *Os Acromiale; Subacromial distance; Acromion typology*

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INTRODUCTION

Acromion can be associated with many pathologies in the shoulder (impingement syndrome, tendinitis, and rotator cuff injuries) (1). Neer emphasized the importance of acromion morphology by establishing a link between acromion morphology and subacromial impingement (2). Since then, research on acromion morphology has gradually increased. Acromion morphology and subacromial distance play important roles in impingement syndrome and related rotator cuff tears. Especially the acromion type and presence of os acromiale are factors that affect surgical decisions (3-5). Acromion has four morphological types, of which the first three were described by Bigliani et al. (6) as straight (type I), concave (type II), and hooked (type III) (6). The last is a convex type described by Vanarhos (7). The identification of these anatomic differences in the community can assist clinicians and radiologists in diagnosis. To the best of our knowledge and to date, no anatomic study has been undertaken in Turkey based on radiological data to evaluate subacromial distance and acromion typology. In this study, we aimed to determine the os acromiale prevalence and the relation of acromion typology with subacromial distance in Turkish population.

MATERIALS AND METHODS

Permission was obtained from the Institutional Review Board of our institution to perform this study. Patients with shoulder MR examinations between January 2017 and January 2018 and between 18 and 85 years of age

were included in the study (n = 670). The exclusion criteria were having a history of shoulder surgery (n = 34), trauma or fractures (n = 23), painful shoulder requiring medical treatment (n = 85). Total of 528 patients were evaluated for presence of os acromiale and subacromial distance. Patients with os acromiale were excluded from the typology evaluation. Thus, remaining 516 patients were evaluated for relation of acromion typology with subacromial distance. The body mass index (BMI), age, side(right/left) and gender of the patients were recorded. All shoulder MRI examinations were performed on a 1.5 T scanner (Aera, Siemens Healthcare, Erlangen, Germany) using a shoulder coil. The volunteer was placed in a supine position on the MR examination table with the hand in a neutral position. Sagittal T1-weighted spin-echo sequence, coronal and sagittal proton density-weighted spin-echo sequence images were obtained (matrix, 256×256; field of view (FOV), 16 cm; slice thickness, 3 mm).

All shoulder MR images were assessed with a software (Syngo.Via console, software ver. 2.0; Siemens Medical Solutions, Erlangen, Germany) by two radiologists (G.P. and A.Y.) with six and nine years of experience in musculoskeletal imaging, respectively. Acromion types and subacromial distance were determined for all patients. In sagittal MRI sections for subacromial distance, the narrowest distance between acromion and glenohumeral bony structure was measured (Figure 1).

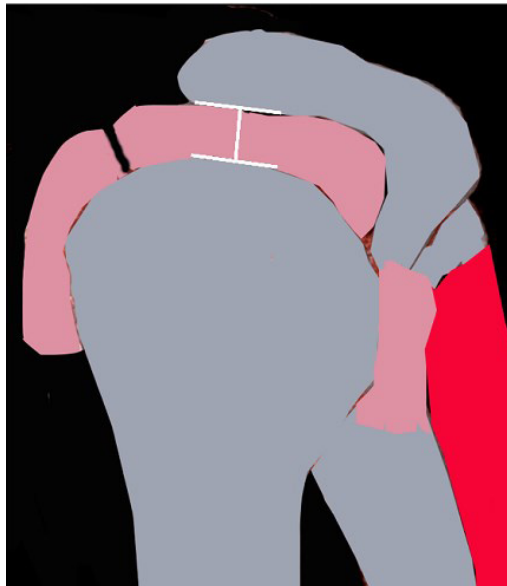


Figure 1: The subacromial distance between the acromion and the humeral head was measured in the narrowest area on sagittal sections.

The measurements were repeated randomly by the same radiologist 3 months later. Measurements of subacromial distances were obtained by taking the averages of the consecutive subacromial distance measurement performed by each radiologist. Acromion types were determined based on consensus.

All reported p values were calculated bidirectionally and a p value of <0.05 was considered statistically significant. All statistical analyses were performed using statistical software (Medcalc ver. 12, Mariagerke, Belgium). The normality of the data was assessed by the Kolmogorov-Smirnov test. The intra and inter-agreements between the radiologists in terms of subacromial distance measurements were determined by Kappa values. The Mann-Whitney U test was used to compare the subacromial distance according to the presence of os acromiale, sex, and affected side (right / left). The Kruskal-Wallis test was utilized to compare the subacromial distance according to acromion types. Body mass indexes and ages between the groups (First group: without and with os acromiale, second group: male and female, and third group: affected side (right / left)) were compared with the T-test.

RESULTS

Two-hundred and seventeen of 528 patients were male (%41). The mean age of 528 patients was 48.6 (± 15.05). Os acromiale was observed in 12 of the 528 patients (2.27%) (Figure 2). Five os acromiale were detected on the left shoulder. There were seven os acromiales

seen in females. Among the remaining 516 patients without os acromiale, 116 patients had type I acromion (22.5%), 352 had type II acromion (68.2%), 10 had type III acromion (1.9%), and 38 had type IV acromion (7.4%) (Figure 3). The interobserver kappa value for the subacromial distance measurement was 0.62, indicating a good agreement between the radiologists. The intraobserver kappa values for the subacromial distance measurement were 0.74 and 0.76 (respectively, observer 1 and observer 2) indicating good agreements for radiologists. The median subacromial distance was found to be 6.6 mm (95% CI for median; 6.5-6.77 mm). No significant difference was observed in subacromial distance between the patients with and without os acromiale ($P = 0.306$). There was also no significant difference in subacromial distance between the right and left shoulder ($P = 0.454$) or between male and female patients ($P = 0.309$). There was no significant difference between the patients with and without os acromiale for age and body mass indexes (respectively: $P=0.462$ and $P=0.348$). There was no significant difference between the male and female patients for age and body mass indexes (respectively: $P=0.386$ and $P=0.152$). There was no significant difference between affected side (right / left) for age and body mass indexes (respectively: $P=0.524$ and $P=0.352$). According to the acromion type, subacromial distance was significantly higher in type IV acromion compared to types I and II ($P = 0.02$).

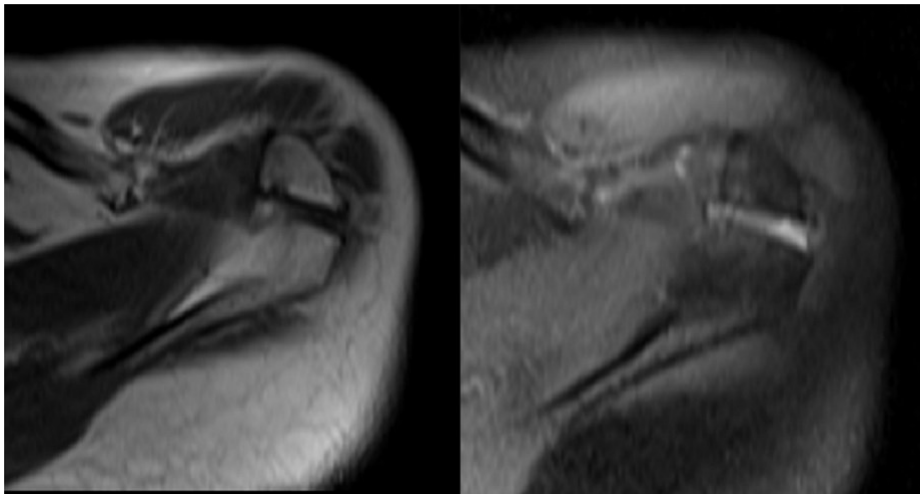


Figure 2: Os acromiale observed in T1-weighted (A) and proton-weighted (B) sequences.

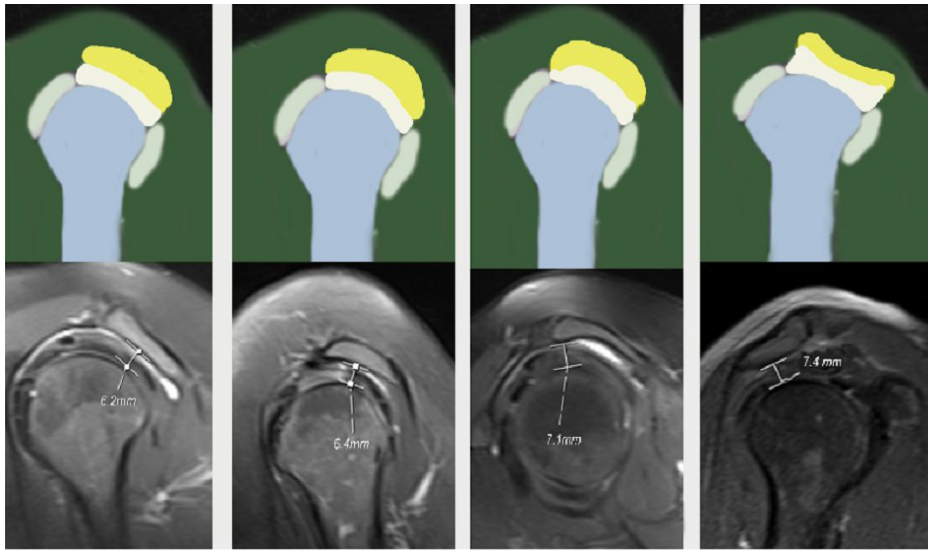


Figure 3: Acromion types are observed in coronal magnetic resonance sections. (A= Type I, B=Type II, C= Type III, and D= Type IV).

DISCUSSION

Pathologies of the coracoacromial region are associated with variations and morphology of this anatomical region (8). Studies have shown that among the four types of acromion (6, 7), the hooked type is associated with subacromial impingement and rotator cuff tears (6, 9, 10). Other authors have recognized the importance of this classification and used it to determine the frequency of each acromion type in different populations. In the literature review of Natsis et al., the prevalence of acromion types was found to be 5.4–67.7% for type I, 24.2–83% for type II, and 0–42.4% for type III (11). Some acromion types causes subacromial impingement and rotator cuff tears (12). In their literature review, Kumar J. et al. reported the prevalence of os acromiale to range from 0.7 to 13.2% (12). This data show that there is a significant difference between different populations in terms of prevalence of os acromiale and acromion types.

Most studies in the literature about os acromiale and acromion types have been conducted on cadavers or with volunteers, but the number of evaluated cases in these studies were relatively small (1, 3, 5, 8). Furthermore, most used X-ray images to obtain data but this method provides less sensitive findings (12). In the current study, we performed a cross-sectional

assessment of subacromial distance by evaluating the shoulder MR images of patients. Thus, we were able to determine the narrowest subacromial distance. There are large differences in terms of the prevalence of os acromiale reported in the literature, which is probably due to the methodological differences. However, in general, the findings show that this condition is more common among black race as a result of genetic factors (13).

Ninety Turkish cadaver scapulae were examined in a cadaver study performed by Coskun N et al. (14), and the prevalence was reported to be 1% for os acromiale, 10% for type I acromion (flat), 73% for type II acromion (curved), and 17% for type III acromion (hooked) (14). However, the results were limited due to using cadavers as the study sample, lack of evaluation of type IV acromion, undefined relationship between subacromial distance and os acromiale and acromion morphology. In contrast, the shoulder MR images used in the current study allowed for a cross-sectional assessment and the evaluation of subacromial distances on coronal and sagittal planes. In addition, this study is significant in terms of providing the most comprehensive assessment in Turkey with a large case series.

In conclusion, in the Turkish population evaluated, the most and least common acromion types were found to be types II and III, respectively. In addition, there was no significant difference in terms of subacromial distance according to the presence of os acromiale, sex, and affected side in the Turkish population.

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