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Glenoid Anterior Derinlik Açısı ve Glenoid Versiyonun Tekrarlayan Anterior Glenohumeral Dislokasyonlara Etkisi

The Effect of Glenoid Anterior Depth Angle and Glenoid Version on Recurrent Anterior Glenohumeral Dislocations

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ÖZ

Amaç: Anterior dislokasyonlar Glenohumeral Eklem Dislokasyonlarının (GED) %85'ini oluşturur ve erken cerrahi önerilir. Bu çalışmanın amacı, Glenoid Anterior Derinlik Açısı (GADA) ve Glenoid Versiyon Açısı'nın (GVA) tekrarlayan anterior glenohumeral çıkıklar (TAGD) üzerindeki etkilerini araştırmaktır. Aynı zamanda, TAGD'de glenoid anatomik formundan kaynaklanan riski belirlemeyi ve cerrahi planlamayı aydınlatmayı amaçladık.

Gereç ve Yöntemler: Çalışmamız kontrollü ve tek kör olarak tasarlanmıştır. Toplam 41 ön çıkık bir yılda en az üç kez tekrarlanmış ve manyetik rezonans görüntüleme (MRG) ile belgelenmiştir. 47 kontrol grubu hastadan elde edilen MRG'leri çalışmaya dahil edilmiştir. Eksenel MR görüntülerinden GVA ve GADA ölçüldü.

Bulgular: Cinsiyetin gruplar arasında dağılımı benzerdi. Hastaların yaş ortalaması 40,38 ± 15,96 yaş idi. GADA ve GVA değerleri sırasıyla 26.90 ± 5.62 (11-37.7) ve 11.74 ± 4.31 (1.8-20.4) olarak ölçüldü. GADA ölçümleri açısından gruplar arasında 0.927 uyumu istatistiksel olarak anlamlı idi (p = 0.001). Birinci ve ikinci gözlemcinin ilk GADA ölçümleri birbiriyle uyumluydu (0.881). Gruplar arasında ortalama GADA değerleri açısından anlamlı fark vardı (p = 0.00, kritik t 1.99). Gruplar arasında ortalama GVA değerleri açısından anlamlı fark vardı (p = 0.00, kritik t1.99).

Sonuç: AGED tanısı olan hastalarda Anterior Glenohumeral Eklem Dislokasyonu (AGED) nüks riski 11,22 ° 'den düşük GRA ve 25,21 °' den düşük GRA varlığında yüksektir.

Anahtar Kelimeler: Kontrol Grupları; Glenoid Açı; Glenohumeral Eklem Çıkıkları

ABSTRACT

Aim: Anterior dislocations comprise up 85% of Glenohumeral Joint Dislocations (GJD) and early surgery is recommended. The aim of this study was to investigate the effects of Glenoid Anterior Depth Angle (GADA) and Glenoid Version Angle (GVA) on recurrent anterior glenohumeral dislocations (RAGD). At the same time, we also aimed to determine the risk arising from the anatomical form of the glenoid in RAGD and enlight the surgical planning.

Materials and Methods: Our study was designed as controlled and double blind. A total 41 anterior dislocations had repeated at least three times in one year and documented with magnetic resonance imaging (MRI). The MR images obtained from 47 control group patients included the study. GVA and GADAwere measured from axial MR images.

Results: The distribution of sex between the groups was similar. Mean age of the patients was 40.38±15.96 years of age. The values of GADA and GVA were measured as 26.90± 5.62(11-37.7), and 11.74±4.31(1.8-20.4) respectively. The concordance 0.927 between the groups in terms of the measurements of GADA was statistically significant (p=0.001). The first measurements of GADA of first and second observer were in concordance with each other (0.881). There was a significant difference between the groups in terms of average values of GADA (p=0.00, critical t 1.99). There was also significant difference between the groups in terms of average values of GVA (p=0.00, critical t1.99).

Conclusion: The risk of recurrence of Anterior Glenohumeral Joint Dislocation (AGJD) is high in the presence of GVA lower than11.22° and GADA lower than 25.21° in patients with diagnosis of AGJD.

Keywords: Control Groups; Glenoid Version; Glenohumeral Joint Dislocations

INTRODUCTION

An 85% of GJDs are anterior dislocations. Anatomical bone surface area is less in the shoulder joint and soft tissues much more contribute to the stabilization of the joint. However, loss of bone tissue may be a cause of recurrent dislocation. Although the contribution of capsuloligamentous structures and dynamic muscle balance to shoulder stability has been well documented, the role of glenoid bone anatomy has not been fully investigated (1-4).

The aim of this study was to investigate the effect of glenoid anterior depth angle and glenoid version angle on recurrent anterior glenohumeral dislocations. Thus, in patients with pre-documented recurrent anterior shoulder dislocation, the glenoid version angle and the cut off value of GADA were determined.

We hypothesized that a decrease in glenoid retroversion angle and glenoid anterior depth angle increased the risk of recurrence of glenohumeral joint anterior dislocation.

MATERIALS AND METHODS

Between 2016 and 2017 years, patients who were diagnosed with shoulder dislocation in our emergency orthopedics clinic were retrospectively reviewed. This study was started with the permission of Kartal Education and Research Hospital Ethics Committee of 20017/514/113/4 and dated 22.08.2017. Our study was designed as controlled and double blind by radiologist who has no knowledge of control and patient groups. Fifty-three patients with anterior shoulder dislocation documented with MRI at least 3 times in a year were included in the study. Thirteen patients were excluded from the study due to presence of bone lesion in glenoid and head of the humerus, bankart lesions and glenohumeral joint chondral damage. Two patients with clinically multidirectional instability of the glenohumeral joint were excluded from the study. The control group consisted a total of 47 patients between 17-66 years of age. They were recruited from the hospital picture archiving and communication system (PACS) who were admitted to the orthopedics department with shoulder pain and had neither previous glenohumeral joint dislocation nor bone lesion at the glenoid and humerus heads.

From the hospital imaging system (PACS) a total of 47 patients with shoulder pain who were admitted to the orthopedics department between 17-66 years of age, who had no previous glenohumeral joint dislocation, had no bone lesion at the glenoid and humerus heads were included as control group of the study.

MR examinations were performed with Siemens 1.5 Tesla Avanto (siemens) scanner. All images were taken in supine position of the patient and the arm was taken on the side of the body and in the forearm supination. The humerus position was preserved during the shooting. In the MRI study, sagittal, axial and oblique coronal images were taken at 4 mm intervals.

Measurements were performed on the axial T2Asections where the scapular notch was clearly visible on the shoulder MRI on the PACS, by radiologist who has no knowledge of control and patient groups.

Since our scapular axis line does not always enter the imaging field in our routine MRI scans, scapular vault method for glenoid version described Matsumura et al (triangular in the axial plane where the medulla

terminates only the cortex) was used. Accordingly, our glenoid vault axis line is defined as the line passing through the midpoint of the glenoid vault (5). The glenoid line is defined as the anterior and the posterior rim of the glenoid. In our study, we defined the glenoid line as the line connecting the anterior and posterior labrum. We used glenoid line and glenoid vault axis lines to measure the glenoid version angle. Glenoid version angle: The angle between the glenoid line and the line drawn 90 degrees to the glenoid vault axis line (Figure 1).

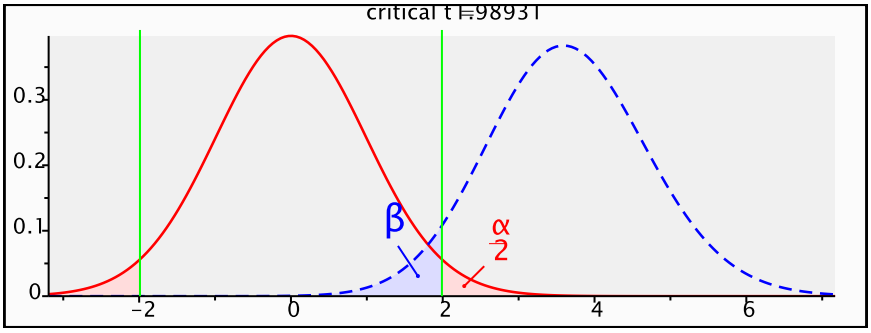

Figure 1. Cut off values in power analysis GADA [defined the glenoid line as the line connecting the anterior and posterior labrum (red line). The glenoid vault axis is defined as the line connecting the tip of the scapular vault and the center of glenoid. GVA: The angle between the glenoid line and the line drawn 90 degrees (dashed line) to the glenoid vault axis line.]

Glenoid depth angle: The angle between the line extending from the anterior glenoid labrum to the midpoint of the glenoid and the line drawn 90 degrees to the glenoid vault axis line (Figure 2). GVA was evaluated anteversions as negative and retroversions as positive.

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS; IBM SPSS Statistics Version 22, IBM, Armonk, NY, USA). The Mann Whitney U test was used in comparison of control and study groups in terms of averages of GADA and glenoid version angles and age distributions. Thirty shoulder MRI were randomly selected in order to establish the reliability of the measurements of GADA regarding to observer and inter observer.

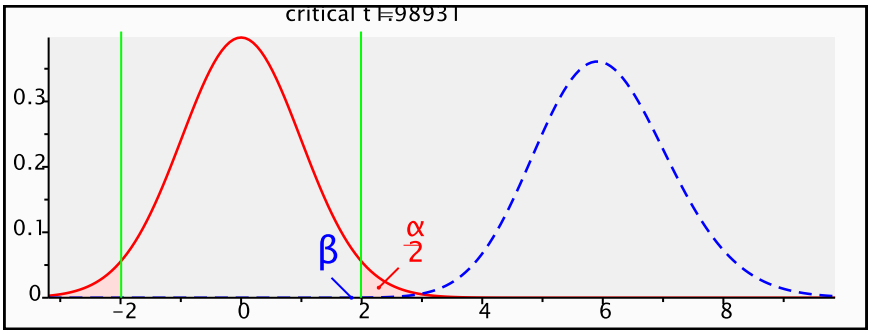

Figure 2. Cut off values in power analysis GVA (GADA defined the anterior glenoid labrum corner to the glenoid mid-point indicated by green and and the line drawn 90 degrees to the glenoid vault axis indicated by dashed line)

RESULTS

Control and experimental groups were similar in terms of sex distribution. (Chisquare=1.83, df=1, p=0.176). Female ratio was 36.6% in the study group and was 23.4% in the control group. Male ratio was 29.5% in general. The mean age of study group was 40.05±16.97 and was 40.68±15.22 in the control group.

The distributions of GADA and GVA were as 26.90±5.62(11-37.7) and 11.74±4.31(1.8-20.4) respectively in all groups. Reliability correlation coefficients for Glenoid Anterior Depth Angle between observers and the concordance of 0.927 between first and second glenoid anterior depth angle measurements of the first observer was statistically significant (ICC: 0.927; p = 0.001; p <0.01). The concordance of 0.881 between GADA measurements of the first and second observer was statistically significant (ICC:0,881; p=0,001; p<0,01).

Group Statistics

		N	Mean	Std. Deviation	Std. Error Mean
GADA	Experiment	41	23.6098	5.12522	.80043
	Control	47	29.7660	4.34062	.63314
GVA	Experiment	41	10.0415	3.78820	.59162
	Control	47	13.2277	4.21950	.61548

Tablo 1. The differences of GADA and GVA between the control and study groups

There was a significant difference between the control and study groups at the 99% confidence level in terms of mean values of GADA (μStudy=23.61, μControl=29.76, p=0.00). The effect size is 1.31, the test power is 0.99. Critical t 1.99, cutoff = 25.21. There was a significant difference between control and study grups at the 99% confidence level in terms of mean values of GVA (μStudy=10.04, μControl=13.23, p=0.00). The effect size is 0.79, the test power is 0.95. Critical t 1.99, cut off=11.22 Table 1, Graphy 1-2.

DISCUSSION

The Computed Tomography (CT) is the most popular method for the measurement of glenoid version in clinical cases (4-8). The measurement of the glenoid version is influenced by the large variety of the scapula's shape (7). The glenoid version, measured in two or three dimensions, is affected by the angle of the CT scissor bridge and the scapula position (8,9). The method described by Friedman et al. for measurement of Glenoid version is commonly used (6).

We modified the method described by Matsumura et al. for measurement of the GVA and applied on the images of MR (5). Using of the images of MRI instead of CT prevented the radiation administration to the patients. It has reduced the cost of test. This approach was chosen due to its high reliability of measurements between Intra-observer (within observer) and inter-observer (between observers) variability. Our GVAmeasurments on images of MRI were 13.2^0 retrovert in the control group. Our retroversion value is more than 8.9°obtained by using vault measurement methot on the shoulders by Matsumura et al. (5). We thought this was due to the fact that we obtained the glenoid line using labrum (5). Normal glenoid version is usually retroverted (10). The degree of this retroversion was decreased in patients with anterior shoulder dislocation.

Erik Hoffman et al. showed that the glenoid version was significantly lower in patients with anterior shoulder instability than in a matched control group (11). In our study, retroversion angle decreased in recurrent anterior gleno humeral dislocations in accordance with the literature. Early surgical treatment has been recommended for young patients. Primary arthroscopic stabilization has been shown cost effective compared with the observation (12). There is no consensus about the ones should be underwent early surgical treatment.

Our recommendation is that surgery should be reserved for the patients with anterior glenohumeral joint dislocation, patients with GVA in images of MRI lower than 11.22° and patients with GADA lower than 25.21°. In addition, activity status of the patients should be considered for decision making.

Nyffeler et al. investigated the effect of glenoid version on displacement of the humeral head in total shoulder arthroplasty (13). They showed that increasing in the glenoid anteversion had effects on translocation of the head of humerus and eccentric loading on the anterior of the glenoid.

This study has some limitations. First, the control group was established by investigating the PACS database for patients with shoulder pain who presented to the emergency department or general orthopedics clinic. This example may not represent a normal healthy population and sampling bias cannot be excluded. Secondly, our study was retrospective and MRI was 4 mm. More real and meaningful results may be obtained by prospectively researching with large patient group, thinner MRI sections and control group with no shoulder complaints.

In conclusion glenoid version and GADA measurements were significantly different between control and patient groups. It is difficult to define precisely whether our findings are clinically relevant or not, because other factors may also affect the risk of dislocation. We suppose the high risk of the recurrence of the anterior glenohumeral joint dislocation in the presence of a glenoid retroversion angle lower than 11.22°and GADA lower than 25.21°in patients with anterior glenohumeral joint dislocation.

In addition, the surgery should be decided considering the patient's activities. We believe that the measurement of GADA, which we described as a contribution to the literature, may be useful.When our recommendation is the first AGJD, surgery should be planned according to the probability of recurrence by looking at GADA and GVA.

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