

Diagnostic accuracy of Fresno-Quebec Rules and risk factors for an associated fracture in patients presenting to the emergency department with anterior shoulder dislocation: A retrospective study

✉ **Vahide Aslihan Durak, M.D.,¹** ✉ **Teoman Atıcı, M.D.²**

¹Department of Emergency Care, Uludağ University Faculty of Medicine, Bursa-Turkey

²Department of Orthopaedics and Traumatology, Uludağ University Faculty of Medicine, Bursa-Turkey

ABSTRACT

BACKGROUND: Anterior shoulder dislocation is the most common shoulder injury in patients presenting to the emergency department (ED). Up to 25% of these injuries are fracture-dislocations. In general, the standard approach is to obtain plain radiographs before and after reduction. Fresno-Quebec Rules (FQR) are described to identify the patients who require an x-ray before reduction to reduce radiation exposure and delays in treatment. We aimed to evaluate the efficacy of clinical predictors used in the Fresno-Quebec algorithm for detecting a shoulder fracture-dislocation.

METHODS: Records of patients who presented to the Emergency Department with presumed shoulder dislocation were retrieved and retrospectively analyzed according to "Fresno-Quebec Rule (FQR)". Sensitivity, specificity, and predictive values of FQR for detecting associated injuries were calculated.

RESULTS: Eighty-nine (65.9%) men and 46 (34.1%) women were included. The mean age of patients was 46 years (16–89). Ninety-nine (73.3%) of the cases had their shoulder dislocated for the first time, whereas 36 (26.7%) patients had a recurrent dislocation. Fifty percent of the patients (18 cases) with recurrent dislocation presented with an atraumatic episode. The remaining 18 patients with a history of recurrent dislocations had their shoulder dislocated as a result of trauma, and four (22%) of them had fracture-dislocation. Using the Fresno-Quebec rules yielded 100% specificity for the diagnosis of fracture-dislocation. The severity of the injury mechanism was not predictive in traumatic but recurrent dislocations. Only one of four patients with a fracture-dislocation in the traumatic recurrent dislocation group had high energy trauma.

CONCLUSION: FQR has 100% sensitivity in detecting fracture-dislocations in patients admitted to ED with anterior shoulder dislocation. It utilizes simple parameters that are easy to use and recall. Using these rules, 30% of unnecessary radiographs can be avoided, saving time and money and reducing radiation exposure in anterior dislocations.

Keywords: Dangerous mechanism of injury; Fresno-Quebec; humerus fracture reduction; shoulder dislocation.

INTRODUCTION

Anterior shoulder dislocation is the most common shoulder injury in patients presenting to the emergency department (ED). It is reported that up to 25% of these injuries are fracture-dislocations.^[1,2] While isolated dislocations can be

treated with a close reduction in the emergency ward, management of fracture-dislocations is more complicated and depends on the fracture configuration. Since it is the main factor in determining the treatment protocol, several studies have focused on the epidemiology of an associated shoulder fracture in cases with anterior shoulder dislocation.^[1,3]

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Address for correspondence: Teoman Atıcı, M.D.

Uludağ Üniversitesi Tıp Fakültesi, Ortopedi ve Travmatoloji Anabilim Dalı, Bursa, Turkey

Tel: +90 224 - 295 00 00 E-mail: teoman@uludag.edu.tr

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While 98–100% of anterior shoulder dislocations can be diagnosed with physical examination alone, accompanying fractures may be easily missed.^[4,5] In general, the standard approach is to obtain plain radiographs before and after reduction which increases radiation exposure, cost and hospital stay. Shuster et al.^[6] noted that taking x-rays before reduction resulted in 29.6 minutes delay in treatment. To prevent unnecessary radiographs, several authors tried to identify the factors which may predispose to a concomitant fracture in anterior shoulder dislocation.^[4–10]

In 2004, Emond et al. defined “Quebec Decision Rules”; an algorithm to assess the possibility of a fracture-dislocation and noted a 27.9% and 81.9% decrease in x-rays taken before and after reduction, respectively.^[4,7] This algorithm considers criteria of age >40, first episode of dislocation and high-energy trauma as risk factors for fracture-dislocation. However, the validity of these rules is questioned and their use in young adults is not recommended.^[8] Similar to Quebec rules, which include patient age, trauma mechanism and the dislocation being as initial or recurrent as important parameters, Hendey et al.^[5] suggested another algorithm where identification of an atraumatic or recurrent dislocation is the first and most crucial step to identify patients who required an x-ray before reduction. In a follow-up study, Hendey et al. (9) evaluated the validity of their approach and noted that using the aforementioned criteria significantly reduced the need for radiograph and delays in treatment.

Conflicting results from other studies on validity and reproducibility of these criteria have prevented the formation of a consensus on diagnostic management of these injuries.^[8] In 2018, the criteria from two separate study groups (Emond et al. and Hendey et al.) had been merged and definitions were revised to create a combined, new algorithm called “Fresno-Quebec Rules (FQR)”.^[10] According to this novel approach, patients who present to the ED with possible shoulder dislocation should be questioned on the atraumatic or recurrent nature of the injury. Patients older than 35 years old without an atraumatic recurrent dislocation should undergo radiological evaluation before attempting reduction. It is also noted that mechanism of the injury has significance when approaching a patient younger than 35 years old: high energy injuries, such as motor vehicle accidents, sports injuries, assault and violence and fall from a height (more than 10 feet), are classified as Dangerous Mechanism of Injury (DMI) and prompt radiographs taken before reduction.^[10]

In the literature, to our knowledge, there is no study evaluating the validity and reliability of this new FQR. In this study, we aimed to evaluate the efficacy of clinical predictors used in the Fresno-Quebec algorithm for detecting a shoulder fracture-dislocation.

MATERIALS AND METHODS

This retrospective, cross sectional case-control study was conducted in the emergency department of a tertiary-care center of an university hospital. Following approval from the institutional review board, patient records were retrieved and analyzed.

The digital patient database was retrospectively reviewed using International Classification Diseases (ICD)-10 coding to identify the entire patients with glenohumeral dislocation of the shoulder (ICD-10 code: M75, S43, S43.0, S43.4, S46, S49) admitted to the emergency department of the university hospital between January 2009–December 2019. Initially, a wide range of ICD codes which may be related to, but not specific for shoulder dislocation were scanned, to prevent omitting patients because of inaccurate coding during ED admission. 710 patients with possibility of glenohumeral dislocation were identified, and patient records were retrieved to determine cases with actual anterior shoulder dislocation. All radiologic imaging files and medical records of these patients were obtained from the Picture Archiving and Communication System (PACS) and clinical database. Medical records were used to extract demographic information (e.g., age, gender, side and dominant side), history, first or recurrent dislocation, clinical finding, mechanism of injury, additional injuries, and interventions performed at the emergency department. Data were collected by a single investigator who was blinded to the hypothesis of this analysis at the time of data collection and images were evaluated by the senior orthopaedic shoulder surgeon.

Patients older than 16 years old with an anterior shoulder dislocation were retrospectively analyzed. Patients with inaccurate, incomplete or missing radiologic data or medical records were excluded. We also excluded patients with a severe head injury, multiple trauma, drug or alcohol intoxication and posterior or inferior dislocation.

Standard anteroposterior shoulder and lateral scapular view radiographs of the shoulder were taken of all patients to confirm the clinical diagnosis of a dislocation, since it is the standard procedure in our institution’s emergency department. All reductions were performed with sedation and pain control by one orthopedic surgeon in the emergency room. Before reduction, a regular neurological and vascular examination of the upper extremity was performed. After sedation, maximum two reduction attempts were made in the emergency department, and if unsuccessful, the patient was transferred to the operating room for reduction under general anesthesia. Reduction was performed using Scapular manipulation or Kocher method.^[11] All patients had their x-ray taken after reduction.

Patients were classified as fracture-dislocation group (group I) and non-complicated dislocation group (group II). Frac-

ture-dislocation was defined as a fracture associated with an anterior glenohumeral dislocation in which special care was needed during reduction to prevent distraction of minimally displaced segments or in which surgical fixation was required. Non-complicated dislocation was defined as the absence of fracture or the presence of a benign Hill-Sachs lesion.^[7,10]

All patients included in this study were evaluated according to “Fresno-Quebec rule” using three predictive variables; a recurrent atraumatic episode, age >35 and dangerous injury mechanism.^[10] The main parameter when utilizing this approach is whether the dislocation is an atraumatic recurrent episode or not. In patients with traumatic or first dislocation, 35 years is the threshold age to consider radiological evaluation. Patients ≥35 years old with traumatic dislocation require radiological evaluation regardless of injury mechanism. For patients younger than 35, the need for an x-ray before reduction should be assessed based on mechanism of injury (Fig. 1).

Group I and II patients were compared according to these criteria and the efficacy of clinical predictors on detecting an associated fracture were evaluated. Pearson Chi-Square test was used for statistical analysis and logistic regression model was created for all parameters. A 2X2 table was created and standard statistical formulas were used to calculate sensitivity, specificity, and predictive values.

RESULTS

Four-hundred forty-eight of 710 patients (63%) with the possibility of glenohumeral dislocation had either an intact joint or an isolated fracture of the shoulder girdle. Of the

remaining 263 patients, ninety-four cases with inaccurate medical reports (no data on initial dislocation of recurrent cases, incomplete anamnesis regarding main parameters of study, missing patient records resulting from change of hospital software.), 11 cases with posterior/inferior dislocation and 23 cases with multi-trauma or intoxication were excluded. Complete records of 135 patients were available for final evaluation.

Eighty-nine (65.9%) men and 46 (34.1%) women were included. Mean age of patients was 46 years (16–89). Eighty-five (62.9%) of dislocations occurred on the right side, and dominant extremity was involved in 78 (57.8%) cases (p>0.05). No patient had bilateral dislocation. Eighty patients (59.2%) were ≥35 years old. Ninety-nine (73.3%) of the cases had their shoulder dislocated for the first time, whereas 36 (26.7%) patients had a recurrent dislocation. Fifty percent of the patients (18 cases) with recurrent dislocation presented with an atraumatic episode. The remaining 18 patients with a history of recurrent dislocations had their shoulder dislocated as a result of trauma, and four (22%) of them had fracture-dislocation. In none of these cases, the traumatic event could be classified as DMI. On the other hand, 20% (27 cases) of all dislocations were result of DMI (Table 1).

Thirty-four patients (25.2%) had fracture dislocation and were included in Group I. There were 18 (52.9%) women and 16 (47.1%) men in group I with a mean age of 56.3 years (21–89). Twenty-one (61.7%) cases had fracture of the tuberculum minus or majus. The remaining cases had fracture of the glenoid, osseous Bankart fracture, coracoid fracture, or fracture of the head and neck. Twenty-two (64.7%) patients

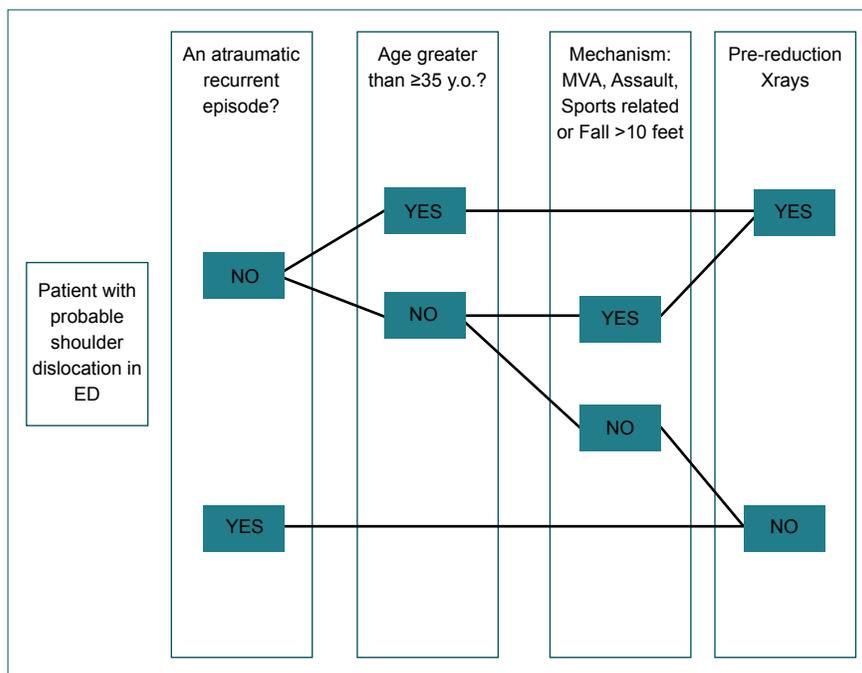


Figure 1. Fresno-Quebec Rules for shoulder dislocation assessment.

Table 1. Patient demographics and parameters used in Fresno-Quebec rules

Parameters	Total n (%)	Group I n (%)	Group II n (%)	p
Mean age (year)	46	56.3	42.5	0.001
Gender				
Female	46 (34.1)	18 (52.9)	28 (27.7)	0.007
Male	89 (65.9)	16 (47.1)	73 (72.3)	
Side				
Right	85 (62.9)	20 (58.8)	65 (64.4)	0.563
Left	50 (37.1)	14 (41.2)	36(35.6)	
Dominant side				
Yes	78 (57.8)	22 (64.7)	56 (55.4)	0.344
No	57 (42.2)	12 (35.3)	45 (44.6)	
Age				
<35	55 (40.8)	9 (26.6)	46 (45.5)	0.050
≥35	80 (59.2)	25 (73.5)	55 (54.5)	
Episode				
First	99 (73.3)	30 (88.2)	69 (68.3)	0.023
Recurrent	36 (26.7)	4 (11.8)	32 (31.7)	
Trauma				
DMI	27 (20)	11 (32.4)	16 (15.8)	0.037
Other	108 (80)	23 (67.6)	83 (84.2)	

DMI: Dangerous Mechanism of Injury.

had their dominant extremity involved. Twenty-five patients (73.5%) were above 35 years old. Thirty patients (88.2%) in Group I presented with first dislocation, whereas four cases (11.8%) had recurrent dislocation. The etiology of dislocation was DMI in 11 (32.4%) cases (Table 1). Seven of the patients with first episode of dislocation following a DMI were younger than 35 years old (Fig. 2).

One-hundred and one patients (74.8%) had isolated dislocation without any fracture and were included in Group II. There were 28 (27.7%) women and 73 (72.3%) men in Group II. The mean age was 42.5 years (21–89). Fifty-six (55.4%) patients had their dominant extremity involved. Fifty-five patients (54.5%) were above 35 years old. Sixty-nine patients (68.3%) in Group II presented with first dislocation whereas 32 cases (31.7%) had recurrent dislocation. Etiology of dislocation was DMI in 16 (15.8%) cases (Table 1). Five of the patients with first episode of dislocation following a DMI were younger than 35 years old (Fig. 2).

None of the 18 patients with atraumatic recurrent dislocation had concomitant fracture, whereas fracture occurred in 4 of 18 patients with traumatic dislocation who had a history of recurrent dislocation. Using the Fresno-Quebec rules yielded 100% specificity for diagnosis of fracture-dislocation. Severity of the injury mechanism was not predictive in traumatic but recurrent dislocations. Only one of four patients with a fracture-dislocation in traumatic recurrent dislocation group had DMI.

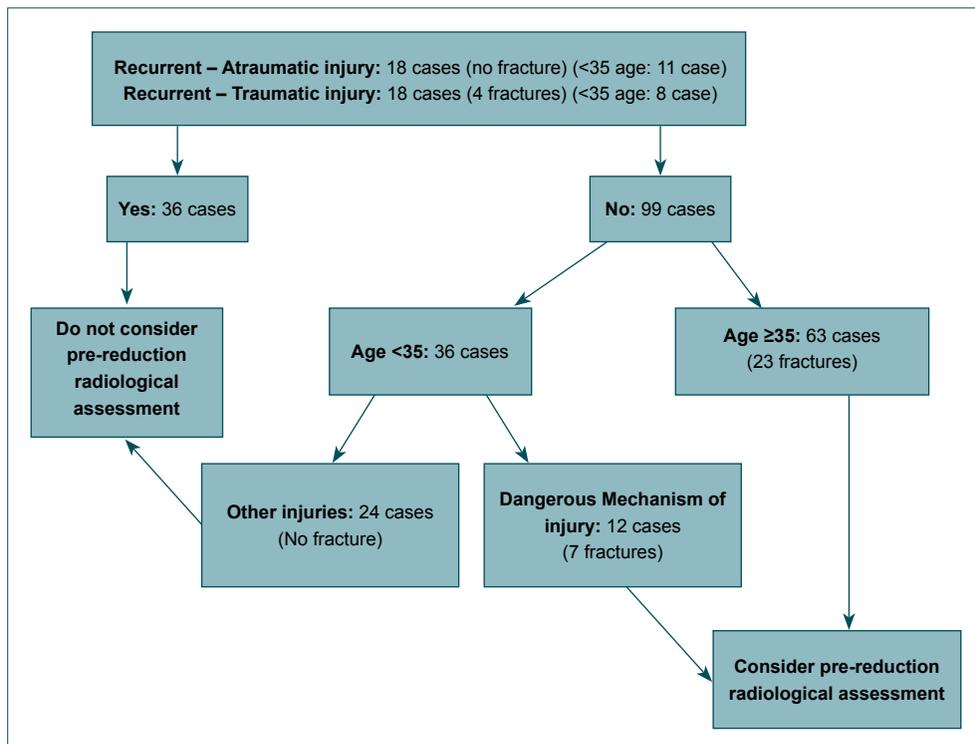


Figure 2. Patients data according to Fresno-Quebec Rules.

Table 2. Diagnostic accuracy of clinical predictors of the new Fresno-Quebec rule in detecting associated fracture

		Fracture		Total	Diagnostic accuracy
		Yes	No		
FQR clinical predictors*	Yes	34	77	111	Sens: 100% (0.89–1.00) Spec: 23.76% (0.15–0.33) PPV: 30.63% (0.28–0.32) NPV: 100%
	No	0	24	24	
Total		34	101	135	

*Presence of any of the 3 clinical parameters is considered as a positive FQR. FQR: Fresno-Quebec Rules; Sens: Sensitivity; Spec: Specificity; PPV: Positive predictive value; NPV: Negative predictive value.

Analysis of parameters used in FQ rules revealed significant difference between two groups in terms of patient age, gender, age (<35 or ≥35), severity of trauma and history of recurrent dislocation ($p<0.05$) (Table 1). Using any of the three clinical predictors of the new Fresno-Quebec rule yielded 100% (0.89–1.00) sensitivity, 23.76% (0.15–0.33) specificity, a positive predictive value of 30.63% (0.28–0.32) and a negative predictive value of 100% for detecting a fracture-dislocation (Table 2).

DISCUSSION

To our knowledge, this is the first study in the literature to verify the efficacy of the new Fresno-Quebec shoulder dislocation rules in detecting shoulder-dislocations and the need for a pre-reduction the x-ray. Retrospectively analyzing the patients with anterior shoulder dislocation revealed that Fresno-Quebec algorithm would have 100% sensitivity in predicting associated fractures. These values are similar to the study by the creators of this diagnostic set of rules, where they reported 100% sensitivity in detecting clinically important fracture-dislocations.^[10] This set of rules are quiet simple and efficient in guiding the treating physician to identify fracture-dislocations.

The anterior shoulder dislocation is the most common joint dislocation seen in emergency admissions. Although obtaining a radiograph before reduction has become the standard procedure, its necessity is controversial.^[4–6,9] Reducing the joint in the shortest time possible facilitates the reduction maneuver and improves the treatment outcome. In more than 90% of cases, the shoulder can be successfully reduced in the emergency department with simple reduction maneuver. The treating physician in the ED may have significant impact on time spent between admission and reduction. It is a general assumption that radiological examination and consultations are beneficial not just for diagnosis, but also to prevent legal liability. However, this approach may have a negative impact on patient treatment and health care system. Several algorithms have been proposed to help physicians to accurately diagnose and treat shoulder dislocations with minimum

delays and inessential examinations.^[4,5,9,10] Such a systematic approach will help to relieve the burden on an already overloaded emergency ward and healthcare system.

The essence of algorithms for shoulder dislocation diagnosis is to accurately detect an associated fracture. Several parameters, such as age, gender, injury severity and mechanism, first or recurrent dislocation episodes, are proposed to help identify which patients require a radiological evaluation before reduction attempt. There is no consensus on the safety and accuracy of these methods.^[8,12] One such algorithm is Quebec rules, described by Emond et al. in 2004 and later modified in 2009.^[4,7] The main parameters are threshold age of 40, ecchymosis around humerus, and first episode of dislocation and severity of trauma. Two different study groups evaluating accuracy and safety of Quebec rules reported 100% sensitivity in detecting fracture-dislocations (13,14). Similarly, Abuse^[12] reported that the need for radiographs would be reduced by 50% if these rules are utilized. On the contrary, Bolvardi et al.^[13] and Ong et al.^[8] noted that the sensitivity of Quebec rules for young patients is strikingly low and their use should be avoided. The conflicting results prompted Emond et al.^[10] to revise the algorithm once more in 2018. A new set of rules, named Fresno-Quebec Rules, was created by combining two previously described algorithms from two different independent research groups. Hendey et al.,^[5] the co-developers of the new algorithm, had identified the atraumatic recurrent dislocation as an important negative predictive parameter for the need of radiological evaluation before reduction in 2000. Later in 2006, they conducted a prospective study and confirmed their hypothesis.^[9]

First episode of dislocation requires a significant amount of force to disrupt the intact and healthy periarticular tissue, increasing the risk of a fracture-dislocation.^[9] Hendey et al.^[5] reported low risk of fracture dislocation in patients with previous shoulder dislocations experiencing a new episode resulting from atraumatic mechanism. Atraumatic recurrent dislocation is the single most important parameter in FQR

to rule out fracture-dislocation. When evaluated retrospectively, 36 of 135 patients in our study had recurrent dislocation, and 18 of these occurred without trauma. None of these 18 patients with atraumatic recurrent dislocation had an associated fracture. Our results conclude that radiological evaluation before reduction is not necessary in patients with atraumatic recurrent dislocation. The clinical impact of this finding may be limited, since atraumatic recurrent cases constitute a relatively minor portion of all shoulder dislocations (13% in our series) presenting to the ED.

Unexpectedly, severity of the injury mechanism was not predictive in traumatic but recurrent dislocations. Only one of four patients with a fracture-dislocation in traumatic recurrent dislocation group had DMI. The remaining three patients had relatively minor trauma, but still acquired a fracture. In our clinical practice, not infrequently we came upon patients with a history of recurrent shoulder dislocation whose last episode of dislocation is the result of a traumatic event. Furthermore, these patients are prone to high energy trauma as much as anyone in their age group, and may present with DI. In the aforementioned algorithms, it is not clear if these patients should be approached as recurrent atraumatic or primary traumatic dislocation. Patients with a history of recurrent dislocations should be nevertheless carefully examined, and the traumatic characteristic of the current dislocation should be well documented.

The age is the second parameter of FQR, and the threshold is defined as 35 years.^[10] Even though age is a generally accepted risk factor for fracture dislocation, the impact of lowering the threshold from 40 in Quebec rules to 35 in FQR should be evaluated. In their study where they defined FQR, Emond et al.^[10] reported the mean age for uncomplicated dislocation as 36 years and for clinically important fracture dislocation as 55 years ($p < 0.0001$). They did not clarify why they took 35 years as the threshold. In Ong et al.'s^[8] study where they evaluated the convenience of Quebec rules on 196 patients younger than 40 years old, they noted a median age of 25 (21–29) and these rules should not be used for patients age <40 years. There are other studies stating that these rules should be avoided in this age group.^[13] In their study on 7209 dislocation patients, Orloski et al.^[15] noted that mean age was 35 years and 23% of the cases were in the third decade of life. On the other hand, when comparing patients with ages older than 40 years to those between 18 to 40 years old, the odds ratio for fracture versus no fracture was 11.4 (8.2–15.9).

The mechanism of injury should be identified for the age to be classified as a defining parameter to decide whether radiological evaluation before reduction is necessary. Although a fracture-dislocation risk is presumably higher in young patients with DIs, different authors proposed alternative definitions for DI. In Quebec rules, Emond et al.^[4,7] considered motor vehicle accidents, assault, sports injuries or fall from more than the patient's height as high energy trauma, where-

as Hendeby et al.^[9] used a broader term of "blunt mechanism" and included fall, a direct blow or MVA. Using this definition, they reported an unacceptably low sensitivity with Quebec rules in young patients and questioned the correlation between age and trauma severity.^[8,13] It is highly likely that these conflicting results prompted the researchers to lower the age threshold when creating the FQR.

Our results are similar to those of Emond et al., who noted that FQRs could be utilized successfully. Thirty-six percent (36 cases) of cases with the first episode of dislocation were younger than 35 years old and all seven fracture-dislocations were the result of the DI mechanism. None of the 24 patients with low-energy trauma had an associated fracture. There were no associated fractures in patients with atraumatic recurrent dislocations or cases <35 years with low energy trauma. These findings indicate that low energy trauma in a patient <35 years is an efficient negative predictive parameter in detecting fracture-dislocations, similar to atraumatic recurrent dislocations. Using the FQRs, 42 of the 135 retrospectively analyzed our patients (18 atraumatic recurrent dislocations, 24 low energy <35 patients) would not require a pre-reduction radiograph, yielding a more than 30% save in medical costs. Results of this retrospective study indicate that FQ shoulder dislocation rules have high sensitivity and predictive value in detecting fracture-dislocations and the need for a pre-reduction radiograph.

This study has several limitations, most of them attributable to its retrospective design. The inaccuracy in the patients' medical records and missing data caused a substantial amount of patients to be excluded (94 patients from a total of 128 excluded cases). It may be expected that this high number of excluded patients impacted the results of our study. The data retrieval process was based on patients' ICD codes, which may be misleading. The institution where this study was conducted is a level I trauma center in a suburban location. Since uncomplicated shoulder dislocations can be managed relatively easily in an emergency facility, it is possible that complicated cases were referred to our institution, increasing the incidence of fracture-dislocations in our study. This may also explain the relatively low number of shoulder dislocations for a 10 year period, in addition to the high number of patients excluded due to missing records. Another limitation is that only cases admitted to the emergency department were analyzed, although in our clinical practice, we realized that a significant amount of patients with recurrent atraumatic dislocation prefer to present to the outpatient clinic.

Conclusion

In conclusion, FQR has 100% sensitivity in detecting fracture-dislocations in patients admitted to ED with anterior shoulder dislocation. It utilizes simple parameters that are easy to use and recall. Using these rules, 30% of unnecessary

radiographs can be avoided, saving time and money and reducing radiation exposure in anterior dislocations.

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ORJİNAL ÇALIŞMA - ÖZET

Acil servise öne omuz çıkığı nedeniyle başvuran hastalarda çıkık ile birlikte kırık görülme risklerinin ve Fresno-Quebec Kuralları'nın geçerliliğinin geriye dönük değerlendirilmesi

Dr. Vahide Aslıhan Durak,¹ Dr. Teoman Atıcı²

¹Uludağ Üniversitesi Tıp Fakültesi, Acil Tıp Anabilim Dalı, Bursa

²Uludağ Üniversitesi Tıp Fakültesi, Ortopedi ve Travmatoloji Anabilim Dalı, Bursa

AMAÇ: Acil servise başvuran hastalarda en sık görülen omuz yaralanması anterior omuz çıkığıdır. Bu yaralanmaların %25'e kadarında eşlik eden kırık görülebilmektedir. Genel yaklaşım, redüksiyon öncesi ve sonrasında röntgen çekilmesidir. Radyasyon maruziyetini ve tedavide gecikmeleri en aza indirmek için, hangi hastaların redüksiyon öncesi radyografiye ihtiyaç duyacağını belirlemek üzere Fresno-Quebec Kuralları (FQK) tanımlanmıştır. Bu çalışmada, Fresno-Quebec algoritmasında kullanılan klinik belirteçlerin eşlik eden kırığı ortaya koymadaki etkinliğini incelemeyi amaçladık.

GEREÇ VE YÖNTEM: Omuz çıkığı şüphesi ile acil servise değerlendirilmiş hastaların dosyaları FQK'na göre geriye dönük olarak gözden geçirildi. FQK'nın eşlik eden kırığı belirlemedeki duyarlılık, özgüllük, pozitif ve negatif öngörü değerleri incelendi.

BULGULAR: Seksen dokuz (%65.9) erkek ve 46 (%34.1) kadın hasta çalışmaya alındı. Hastaların ortalama yaşı 46 (16–89) idi. Doksan dokuz (%73.3) hasta ilk kez omuz çıkığı geçirirken, 36 (%26.7) hastada tekrarlayan çıkık mevcuttu. Tekrarlayan çıkığı olan hastaların yarısı (18 olgu) travmatik çıkıktı. Kalan 18 hastada da tekrarlayan çıkık öyküsü olmakla beraber son başvurularında travmatik neden ve dört tanesinde de kırıklı-çıkık mevcuttu. FQK'nın kırıklı-çıkıklı belirlemede %1000 duyarlılığı olduğu bulundu. Tekrarlayan fakat travma sonrası gelişmiş çıkıklarda yaralanma mekanizmasının şiddetinin belirleyici olmadığı görüldü. Tekrarlayan fakat travmaya bağlı çıkığı olan hastaların dört tanesinde eşlik eden kırık mevcutken, bu dört olgunun sadece bir tanesi yüksek enerjili yaralanma sonucu meydana gelmişti.

TARTIŞMA: FQK anterior omuz çıkığı sebebi ile acil servise başvuran hastalarda eşlik eden kırığı belirlemede %100 duyarlılığa sahiptir. Kullanması ve hatırlaması kolay parametrelere dayanmaktadır. Bu kuralları kullanarak, gereksiz radyografileri %30 oranında azaltmak, maliyeti ve radyasyon maruziyetini düşürmek mümkündür.

Anahtar sözcükler: Fresno-Quebec; humerus kırığı; omuz çıkığı; redüksiyon; yüksek enerjili travma.

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