Implementation of Quebec Shoulder Dislocation Rule in Turkish Patient Population

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Abstract

Aim: The aim of this study was to investigate whether the Quebec Shoulder Dislocation Rule (QSDR) is valid in Turkish patient population.

Materials and Methods: Adult patients with an anterior shoulder dislocation were enrolled in this study. Patients with a severe head injury, multiple trauma, and drug or alcohol intoxication were excluded. All patients were classified according to the associated fracture status. Patients with fracture dislocation were classified as "case" group (group 1) and patients with isolated dislocation were included to the "control" group (group 2). Group 1 and 2 patients were statistically compared in terms of risk factors defined by QSDR. Diagnostic performance of this decision tool in predicting a clinically significant fracture was studied. Sensitivity, specificity, positive predictive value, and negative predictive value were calculated.

Results: A total of 248 patients were included in the study. Fracture dislocation was detected in 63 (25.40%) patients (group 1), and no complicated dislocation was detected in 185 (74.59%) patients (group 2). Statistically significant difference was found between groups 1 and 2 in terms of risk factors defined by the QSDR. Sensitivity, specificity, and positive and negative predictive values of the Quebec rule were detected as 100%, 33.51%, 33.87%, and 98.41%, respectively.

Conclusion: Our study suggests that QSDR is a useful decision tool to estimate which patient has fracture dislocation of the shoulder in Turkish population. We think that if a shoulder dislocation patient is "Quebec–," pre-reduction X-ray could be safely omitted.

Keywords: Quebec Shoulder Dislocation Rule, Turkish population, X-ray

Introduction

Shoulder is the most frequently dislocated joint seen in the emergency department (ED) (1). Approximately 2% of the general population and 7% of the young athletes suffer from this type of injury (2). The most common direction of dislocation is anterior, and it might be complicated by the fracture of the greater tuberosity (up to 25%) or fractures at other sites of the shoulder girdle (1, 3, 4). If a displaced fracture is associated with shoulder dislocation, surgical fixation may be required in addition to the joint reduction (5).

It was reported that emergency physicians were 98% to 100% accurate in their clinical diagnosis of a shoulder dislocation (6). Clinical assessment may be sufficient for the diagnosis of shoulder dislocation in the absence of concern for concomitant fracture. For this reason, multiple studies have questioned the utility of pre-reduction radiographs in shoulder dislocation patients (5-7). Omission of pre-reduction films would decrease the cost and length of hospital stay and prevent muscle spasm that may inhibit the reduction process (8). Although most shoulder dislocations can be safely reduced in the ED, a coexisting fracture may prevent the

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emergency physician from reducing the dislocation and require orthopedic consultation (9).

The Quebec Shoulder Dislocation Rule (QSDR) is a clinical decision rule to allow selective use of pre-reduction radiography in shoulder dislocation (5). According to QSDR, factors likely to predict a clinically significant associated fracture include patient's age older than 40 y, first-time dislocation, and high-energy injury mechanism (fall from more than one flight of stair, motor vehicle accident, fight/assault) (5). If a patient has these clinical risk factors, pre-reduction X-ray should be ordered because of the high probability of clinically significant associated fracture (5, 9). However, successful validation studies are required for wider adoption of this decision rule (10). For this reason, the primary aim of this study was to investigate the validity of clinical risk factors defined by QSDR in the Turkish patient population. Our hypothesis was that QSDR is a useful and reliable decision tool to predict which patient has shoulder fracture dislocation in EDs of our country.

Materials and Methods

This is a retrospective, observational, case-control study approved by ethics committee of Balikesir University, School of Medicine. Adult patients (older than 18 y) who presented to the ED of Balikesir-Edremit State Hospital between January 2013 and September 2015 with an anterior shoulder dislocation were identified from ED databases. Patients with a severe head injury (initial Glasgow Coma Scale Score ≤13), multiple trauma, and drug or alcohol intoxication were excluded. Patients were also excluded if the mechanism of injury could not be ascertained. None of the patients were professional athletes. If a patient had more than one episode of dislocation during the study period, only the first episode was included. All patients had both of the pre- and post-reduction X-rays.

First, all anterior-posterior pre-reduction films were evaluated by authors and all patients were classified according to the associated fracture status. During the assessment of pre-reduction X-rays, researchers did not know whether the patient had a clinical risk factor defined by QSDR. Fracture 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 needed. Noncomplicated dislocation was defined as the absence of fracture or the presence of a benign Hill-Sachs lesion. Patients with fracture dislocation were classified as "case" group (group 1), and patients with isolated dislocation were included to the "control" group (group 2).

Primary variables of our study were patient's age, whether the dislocation is first episode, and injury mechanism (risk factors defined by QSDR). The injury mechanism was divided into eight categories: (1) Fall from a distance less than or equal to the patient's own height, (2) Fall from more than the patient's own height and less than one flight of stairs, (3) Fall from more than one flight of stairs, (4) Sport activities involving physical contact (e.g., soccer), (5) Sport activities involving speed (e.g., skiing), (6) Fight/assault, (7) Motor vehicle crash, and (8) Atraumatic mechanism. Fall from more than one flight of stairs, motor vehicle crash, and fight/assault were considered as high-energy injury mechanisms according to the QSDR. Group 1 and 2 patients were statistically compared in terms of these variables. Pearson chi-square test was used for statistical analysis, and logistic regression model was created for all risk factors.

Finally, patients with at least one of these risk factors considered as "Quebec+" and patients with no risk factor were grouped as "Quebec–." Diagnostic performance of QSDR in predicting a clinically significant fracture was studied. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated.

Table 1. Comparison of groups in terms of risk factors of QSDR

Risk factor	Group 1, n (%)	Group 2, n (%)	p
Age ≥40	43 (68.25)	82 (44.32)	0.003
First time dislocation	63 (100)	103 (55.68)	<0.001
High Energy Mechanism (fall >1 flight of stair, MVC, fight/assault)	40 (63.49)	12 (6.48)	<0.001

QSDR: Quebec Shoulder Dislocation Rule; MVC: Motor Vehicle Collision

Table 2. Logistic regression model of risk factors

Risk factor	Group 1, n (%)	Group 2, n (%)	p
Age ≥40	0.003	1.032	1.011-1.055
First time dislocation	<0.001	31.982	7.051-139.675
High energy mechanism (fall >1 flight of stair, MVC, fight/assault)	<0.001	39.123	12.871-118.923

CI: confident Interval; MVC: Motor Vehicle Collision

Results

Of the 248 patients were included in this study, 164 (66.12%) were men and 84 (33.87%) were women. The mean age was 45.54 y (range, 17-100 y). Of the 248, 123 (49.59%) patients were younger than 40 y and 125 (50.40%) patients were 40 y or older. First-time dislocation was established in 166 (66.93%) patients and recurrent dislocation in 82 (33.06%) patients. Injury mechanism was a fall from patient's own height or less (mechanism 1) in 116 (46.77%) patients, a fall from more than own height but less than 1 flight of stairs (mechanism 2) in 20 (8.06%) patients, a fall from 1 flight of stairs or more (mechanism 3) in 36 (14.51%) patients, a sport activity involving physical contact (soccer) (mechanism 4) in 10 (4.03%) patients, a sport activity involving speed (mechanism 5) in 1 (0.40%) patient, a fight/assault injury (mechanism 6) in 3 (1.20%) patients, a motor vehicle collision (mechanism 7) in 13 (5.24%) patients, and an atraumatic mechanism (mechanism 8) in 50 (20.16%) patients.

Fracture dislocation was detected in 63 (25.40%) patients (group 1), and noncomplicated dislocation was detected in 185 (74.59%) patients (group 2). We found an overall incidence of fractures in patients with dislocations of 25.40%. All of the group 1 patients had first-time dislocation. Statistically significant difference was found between groups 1 and 2 in terms of risk factors defined by QSDR (Table 1, 2).

Table 3. Ability of the Quebec Shoulder Dislocation Rule to predict the presence of clinically important fractures on X-ray

	Fracture + n (%)	Fracture - n (%)	Total	
Quebec +	63 (100)	123 (66.48)	186	Positive predictive value: 33.87%
Quebec -	0	62 (33.51)	62	Negative predictive value: 98.41%
Total	63	185	248	
	Sensitivity: 100%	Specificity: 33.51%		

Table 3 presents the diagnostic performance of the QSDR using any of the three risk factors for the detection of clinically important associated fracture. It was detected that if the QSDR was used in our ED, the pre-reduction X-ray reduction rate would be 25% without missing of any associated fracture.

Discussion

We detected statistically significant differences between group 1 (fracture dislocation) and group 2 (isolated dislocation) patients in terms of clinical risk factors defined by QSDR. Diagnostic performance of the QSDR in our patient population was similar to the previously reported studies in the literature.

One of the clinical risk factors described in QSDR is patient's age, and Emond et al. (5), in their original article, reported a five-fold increase in the probability of clinically important fracture associated with shoulder dislocation in patients aged 40 y or older. Recently, Orloski et al. (11) found that patients in the second to third decades of life are unlikely to have fracture dislocation, and they suggested that pre-reduction X-ray may be safely omitted in these patients. In our study, we found that if the patient was 40 y or older, the risk of associated fracture increased 1.032-fold.

First episode of dislocation represents an important risk factor for an associated fracture (9). Hendey (6) reported low risk of fracture dislocation in patients with previous shoulder dislocations experiencing a new episode. We also detected that first-time dislocation is a 31.982-time risk factor for associated fracture. All of the patients with fracture dislocation had first-time dislocation in the current study.

The mechanism of injury remains an important predictor of fracture associated with a shoulder dislocation (5, 9). The study by Emond et al. (5) suggest that associated fracture risk is high in patients with high-energy traumatic dislocation (fall more than one flight of stairs, fight/assault, and motor vehicle accident). We determined that all patients with atraumatic mechanism had noncomplicated dislocation.

First, in 2004, sensitivity, specificity, PPV, and NPV of the QSDR were reported as 97.7%, 22.9%, 30.2%, and 96.6% respectively by Emond et al. (5). In 2009, Emond et al. (10) reported the diagnostic performance of the QSDR with a sensitivity of 100%, a specificity of 34.2%, a PPV of 25.2%, and NPV of 99.2%. In our study, sensitivity, specificity, PPV, and NPV of the QSDR were detected as 100%, 33.51%, 33.87%, and 98.41%, respectively.

Study limitations

Our study is a retrospective analysis of single-center patients, and it has all the inherent limitations of a retrospective study. However, certain types of bias are unique to the case–control studies. The retrospective nature did not permit us to clearly identify any predictive factor regarding physical examination. Also, we only addressed the issue of whether a clinically important fracture was present, not whether physicians could clinically identify a glenohumeral dislocation.

Conclusion

Despite these limitations, our study suggests that QSDR is a practical and functional decision tool to predict an associated clinically important fracture in our shoulder dislocation patient population. Using QSDR, Emergency Physician (EPs) will be more efficient in detecting shoulder fracture dislocation, and this can lead to a more rational use of pre-reduction X-ray in the ED without affecting patient safety.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Balıkesir University (Decision no:2016/34 - Date: 10.02.2016).

Informed Consent: The informed consent form was not taken from the patients, as this study is retrospective.

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