The acute first-time anterior shoulder dislocation (AFASD)
te Slaa, R.L.

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Chapter 8

Evaluation of radiographs in acute first-time anterior shoulder dislocation

Evaluation of radiographs in acute first-time anterior shoulder dislocations.

Ron L. te Slaa¹, Gerardus H.R. de Maat¹, Marcus Wijffels¹,
Anneke Sikkenk² en Rene K. Marti³

1
Reinier de Graaf Groep, Delft
Department of Orthopaedics and Traumatology.

2
Reinier de Graaf Groep, Delft
Department of Radiology.

3
Academie Medical Center (AMC), Amsterdam
Department of Orthopaedics and Traumatology.
Abstract

Objective:
The main objective of our study was to determine the incidence and clinical significance of abnormalities seen on radiographs taken in the emergency department in patients with acute first-time anterior shoulder dislocations (AFASD).

Design: Retrospective study.

Method:
Evaluation of the value of pre- and postreduction radiographs in 72 patients with an acute first-time anterior shoulder dislocation. The inclusion criteria for this study were: patients with an AFASD, pre- and postreduction radiographs and a medical record. A radiologist and orthopaedic surgeon who were blinded to the original interpretations separately reviewed the standard pre- and post-reduction radiographs.

Results:
Seven prereduction radiographs (10%) were suspect for having a glenoid rim fracture. Two of these were visible on the postreduction radiographs. In one case a fracture of the glenoid rim was seen on the postreduction radiograph that was not seen on the prereduction radiograph. Ten cases (14%) were suspect of having a greater tuberosity fracture on the prereduction radiograph. Seven (10%) could be confirmed on the postreduction radiograph. None of the fractures altered the management of the AFASD. Eighty-six percent of the postreduction radiographs were reviewed as normal.

Conclusions:
We conclude that there is an over utilization of radiography in patients with an AFASD in the emergency room setting. In our study we did not find any fracture that altered the initial treatment. The prereduction radiograph showed that in 10% of the patients a wrong diagnosis was made due to difficulty in interpretation of the radiographs.

Keywords: Anterior shoulder dislocation; pre- and postreduction radiographs; glenoid rim fractures.
Introduction
Anterior shoulder dislocation is the most common dislocation of the human joints. The reported incidence of acute first-time anterior shoulder dislocations ranges from 1 to 2 percent.\textsuperscript{10, 24} Many reduction methods have been advocated for this injury.\textsuperscript{16} After reduction of the shoulder in the emergency department the present standard procedure is a postreduction radiograph. The reason for this is to demonstrate that the dislocation has been reduced and that no fracture has occurred during the procedure. There is a growing interest in the usefulness of making (postreduction) radiographs in the treatment of patients with an anterior shoulder dislocation.\textsuperscript{7-9, 22} We conducted a retrospective study to determine the incidence of clinically significant fractures or abnormalities seen on pre- and postreduction shoulder radiographs in AFASD. Furthermore, the literature on this subject was reviewed.

Material and methods
Approximately 13,000 patients with a trauma attend our emergency department yearly. From January 1991 until July 1994 105 patients with 107 first-time AFASD visited the emergency department of our regional, teaching hospital. The inclusion criteria for this study were: patients with a AFASD, pre- and postreduction radiographs and a medical record. The minimum required radiographs for study inclusion consisted of an anterior-posterior view and a lateral or Y-scapular view of the affected shoulder pre- and post reduction. Each medical record was reviewed for age, sex, reduction method and fractures of the greater tuberosity, glenoid and coracoid process. An attending radiologist and orthopaedic surgeon, who were blinded to the original interpretations, separately reviewed the standard pre- and postreduction radiographs.

Of the 105 patients with a AFASD that were reviewed, 72 patients were included into this study according to our inclusion criteria. In 8 of the 72 included patients we could not find the type of reduction method used in the medical record. Thirty-three patients had to be excluded for this study. Thirty-three patients did not have the required radiographs or the radiographs could not be found.

The outcome was measured by: a) the incidence of fractures on the pre- and postreduction radiographs and b) the difference between the pre- and postreduction radiographs which might lead to a change in the treatment of the patient.
Results
The final patient population in this study consisted of 72 patients with a mean age of 43.5 years (range, 16 to 87 years). There were 44 men and 28 women in this study. Several reduction techniques were used.

The Kocher method was the most frequently used reduction technique in 44 cases (61%). The technique according to Hippocrates was used in 13 (18%) cases, the Stimson method in six (8%) and the Milch method in one case. In eight cases (11%) the method used for reduction could not be determined.

In three cases the first reduction attempt failed and a second attempt had to be carried out to achieve the reduction. No fractures were found on the pre- and post-reduction radiographs in these cases. In the medical record we could not determine whether the physician was clinically confident of the reduction.

Of the prereduction radiographs, 55 cases (76%) were reviewed as anterior shoulder dislocation without any fractures. Seven prereduction radiographs were interpreted with the suspicion of a glenoid rim fracture (10%) and 10 with a fracture of the greater tuberosity (14%). There were no fractures of the coracoid process or subcapital humerus seen on pre-reduction radiographs. (Table I)

Of the postreduction radiographs, 62 cases (86%) were reviewed as normal. A glenoid rim fracture was found in 3 cases (4%) and a fracture of the greater tuberosity in 7 cases (10%). Once again, no fractures were found of the coracoid process or subcapital humerus.

Two glenoid rim fractures that were suspected at the prereduction radiograph were visible at the postreduction radiograph. In one case a fracture of the glenoid rim was seen at the post-reduction radiograph that was not seen on the prereduction radiograph. In our opinion this fracture was not caused by the reduction method, but was missed on the prereduction radiographs due to the over projection of the humeral head. This small fracture had no therapeutic consequence.

None of the fractures on the post reduction radiograph altered the initial treatment. All patients were discharged from the emergency department and were prescribed a shoulder sling. All patients were referred to the orthopaedic outpatient clinic for follow-up. In 3 cases of our study there was a difference in judgment of the prereduction radiographs between the radiologist and the orthopaedic surgeon. Two cases were concerning a glenoid rim fracture and one case was concerning a greater tuberosity fracture. In all cases of disagreement, the judgment of the orthopaedic surgeon on the prereduction radiograph was the same as his judgement on the postreduction radiographs. All the postreduction radiographs were interpreted in the same way by both the radiologist and the orthopaedic surgeon. The above shows the difficulty in judging a glenoid rim fracture on the prereduction radiograph.
Table I. Findings on pre- and postreduction radiographs in patients with AFASD

<table>
<thead>
<tr>
<th>AFASD n=72</th>
<th>Prereduction radiographs</th>
<th>Postreduction radiographs</th>
</tr>
</thead>
<tbody>
<tr>
<td>No fractures #</td>
<td>55 76%</td>
<td>62 86%</td>
</tr>
<tr>
<td>Glenoid rim #</td>
<td>7 10%</td>
<td>3 4%</td>
</tr>
<tr>
<td>Greater tuberosity #</td>
<td>10 14%</td>
<td>7 10%</td>
</tr>
<tr>
<td>Coracoid process #</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Subcapital humerus #</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Discussion

Many studies in the past show an over utilization of radiographs in anterior shoulder dislocation. According to Roberts and Hedges, the reason for obtaining radiographs after reduction of an anterior shoulder dislocation is based on traditional teaching in orthopaedics and emergency medicine. Other reasons given for making postreduction radiographs is to confirm the reduction and to detect fractures of the glenoid and proximal humerus. Greater tuberosity fractures in association with AFASD are not rare. The tuberosity fragment usually reduces into an acceptable position after reduction of the shoulder. The diagnosis of glenoid rim fractures is not always easily made on the AP view radiographs. It should be suspected when there is an interruption on the dense subchondral line on the AP view. Glenoid fragments greater than 25-33% of the glenoid surface should be treated operatively. Based on literature, the risk of causing a fracture during a reduction technique is very low. Despite the fact that the Kocher method, known as one of the more traumatic methods, was the most frequently used in our study, we did not find any fractures caused by this reduction method. Another reason for making postreduction radiographs could also be for medico-legal purposes.

Harvey et al. questioned if postreduction (AP and Scapular Y view) radiographs are useful in uncomplicated anterior shoulder dislocation. They stated that regardless of the method used, successful reduction is nearly always clinically obvious to the physician and patient. There is often a palpable sensation as the humeral head slides back into the glenoid. The patients shoulder contour is restored and the patient moves his arm freely and subjectively confirms re-location. In their study of 69 cases of anterior shoulder dislocation (only 59% were AFASD) they found on the prereduction radiographs of three cases a glenoid rim fracture, in three cases a fracture of the proximal humerus and in five cases a Hill-Sachs deformity. Two Hill-Sachs lesions were not seen on the prereduction radiographs but did not change the treatment in the emergency department. In two cases there was a persistent shoulder dislocation at the postreduction radiograph. However, in both cases the physician was not sure of the success of the reduction. Ninety-four percent of the postreduction radio-
graphs confirmed the reduction and showed no new fractures. They concluded that postreduction radiographs were more useful than prereduction in showing Hill-Sachs lesions; however these radiographs did not alter the final treatment.

Hendey and Kinlaw reported in their retrospective study of 131 patients with 175 anterior shoulder dislocation that no fractures were caused by reduction of the dislocation.\(^8\) They mentioned that a potential reason for obtaining postreduction radiographs at some point is the prognostic value of finding Hill-Sachs or Bankart lesions. These lesions are sometimes associated with an increased rate of recurrent dislocation. They may be more easily detected on postreduction films.\(^4\)\(^5\)\(^12\)\(^13\)\(^19\) He found in 14 cases a new Hill-Sachs lesion on the postreduction radiographs. These findings did not change the treatment. Therefore he also questions the usefulness of postreduction radiographs. In Hendey’s prospective study on this subject he found that physicians are highly accurate in the clinical determination of shoulder dislocation.\(^9\) When clinicians were confident of successful reduction, they were correct in 83 of the 84 cases. A derived algorithm would have reduced radiographs by 51%.

Tannebaum et al. in their retrospective study of 128 patients with anterior shoulder dislocation found, as the three above mentioned studies, that postreduction radiographs did not show any new clinically significant fractures which altered the management of the patient in the emergency department.\(^23\)

Shuster et al., described 40 of 59 cases in which experienced emergency physicians were certain of an anterior shoulder dislocation by clinical examination alone.\(^22\) All 40 cases were found to have a dislocation of the shoulder and the prereduction radiograph did not affect management of the injury. They concluded that when the experienced emergency physician is certain of the diagnosis of anterior shoulder dislocation prereduction radiography delays treatment and does not alter management.\(^22\) We have to note that in our hospital, as in many others, there is a wide range of experience of the physicians who work in the emergency room.

From our study, we can conclude that the prereduction radiograph showed in 10% of the cases that a wrong diagnosis was made due to difficulty in interpretation of the radiographs. However, 76% showed no abnormalities on the prereduction radiograph. The postreduction radiograph was normal in 86% of the cases. Only 10 of the 72 patients (14%) showed a fracture. In our study we did not find any fractures that altered the initial treatment.

Our retrospective study differs from the other mentioned studies in the fact that all cases in our study are AFASD. Furthermore, we did not have a clinical evaluation of diagnosis in dislocation or fracture and we did not classify for any Hill-Sachs lesions.

There are some limitations in our study. Firstly, the retrospective design of the study. Secondly, standard postreduction radiographs were taken and no specialized views of the shoulder were made after reduction. We should realize that the normal AP and the scapular
Y view gives a lower incidence of glenoid rim fractures in contrast to specialised views such as the apical oblique view and the 45\textdegree{} cranio-caudal view.\textsuperscript{6,21} Finally, we could have introduced an observer bias, because the radiologist and orthopaedic surgeon were selected to review the radiographs. However, both were blinded from the earlier review results of the pre- and postreduction radiographs.

The advantages for patients of restricting radiographs are, reducing significant waiting time in the emergency and radiology department, as well as, less exposure to radiation and also diminishing the hospital costs.

Prereduction radiographs are difficult to interpret as shown in our study, especially when concerning glenoid rim fractures. This is predominately due to the poor quality of the initial radiographs and the “changed anatomy” in which the humeral head projects in front of the glenoid in patients with anterior shoulder dislocation.

The postreduction radiograph can confirm a reduction of the anterior shoulder dislocation. However, if the physician and patient are sure of a reduction and the postoperative shoulder function is restored, a postreduction radiograph adds no new information.\textsuperscript{9,22,23}

According to Hendey postreduction radiographs should only be obtained in the setting of a fracture dislocation and whenever the physician is unsure of joint position.\textsuperscript{8,9}

Theoretical disadvantages of using only a postreduction radiograph are: that one cannot determine whether a fracture is caused by the reduction method and the lesser experienced physicians are sometimes not sure if they are dealing with a subcapital humeral fracture instead of a dislocation of the shoulder.

In other words we can question ourselves as to how useful it is to make only a postreduction radiograph from a patient with an anterior shoulder dislocation. Based on recent literature it is even questionable if we should make radiographs at all in patients with an anterior shoulder dislocation and an uncomplicated reduction with a good function after the reduction.\textsuperscript{7-9,23}

We can conclude that despite the fact that there could be an associated fracture on the pre-reduction radiograph, this fracture did not change the treatment after reduction of the shoulder dislocation.

Furthermore, based on literature and our study, we feel that it is not necessary to make a postreduction radiograph after a normal reduction in a patient with an AFASD without fractures. It should be stressed that the physician should be sure of the reduction of the shoulder. However, further prospective and cost evaluation studies are required to validate our findings and to answer these remaining questions. Overutilisation of radiographs in patients with AFASD in the emergency department, still remains our general agreement.
References


