Incidence of Associated Injury in Posterior Shoulder Dislocation: Systematic Review of the Literature

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**Objective:** Posterior shoulder dislocations are rare and often missed. Classically associated with seizures, very little is known about the incidence and type of associated injuries. Unfortunately, the majority of the literature consists of incidental reports or small case series. Our goal was to increase the strength of available data by performing a systematic review.

**Data Sources:** We searched EMBASE and PubMed for the terms “posterior shoulder dislocation.” Our inclusion criteria were articles in either English or French with the words “posterior” and “dislocation” in the abstract or title. All reports of chronic cases or instability as well as those without patient information were excluded. Data regarding demographics, etiology, investigations, associated injuries, treatments, and outcomes were extracted. All data were analyzed by using SPSS 18.0 (IBM, Chicago, IL).

**Results:** A total of 766 articles were found of which 108 were retained for analysis. A total of 475 patients (543 shoulders) were compiled. Seizures were reported in 34% of cases. A majority of dislocations (65%) had associated injuries. Fracture was most common followed by reverse Hill-Sachs and cuff tears. In the absence of fracture or reverse Hill-Sachs injury, the risk of cuff tear increased nearly fivefold (odds ratio, 4.6; P = 0.016).

**Conclusion:** Our results suggest the amount of associated injuries related to posterior shoulder dislocation is far greater than thought. We propose an investigation algorithm for acute posterior shoulder dislocations.

**Key Words:** posterior shoulder dislocation, Hill-Sachs, Bankart, rotator cuff, algorithm

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Despite abundant literature on posterior dislocation, small case series are still widely published despite low scientific content and limited new information. The purpose of this study is to conduct a systematic review of the current literature to summarize and extract incidence of associated injuries, like fractures, rotator cuff tears, and reverse Hill-Sachs lesions. Also, this review helps to describe the etiology, risk factors for associated injuries, and functional outcome.

MATERIALS AND METHODS

We searched both MEDLINE and EMBASE databases with the terms “posterior” and “shoulder dislocation” to find all relevant studies. Only articles with abstracts in either English or French and including human adult (17 years or older) subjects were considered. All articles referring to anterior dislocation were excluded. The remaining abstracts were evaluated for inclusion. All chronic dislocations series, defined as greater than 1 month, were excluded. Reports referring to traumatic posterior instability without actual traumatic dislocation were also excluded. The included articles were all obtained and evaluated by two different authors. Studies containing no patient demographic data or found to match previous exclusion criteria were not retained. Finally, all the remaining references were crosschecked to find any missing relevant articles.

Both authors analyzed all articles for data extraction. A predetermined set of data was established (Table 1) and each article was examined. Data entry was compared between both lists and any discrepancies (ie, patients with multiple associated fractures that had only been included in one category) were settled with a consensus review. All results were then compiled and analyzed using statistical software (SPSS Version 18.0, Chicago, IL).

Statistics

Descriptive data were obtained by weighted mean, in which each study influences the mean according to the relative number of patients included. When information was available in the article, individual patient information was entered instead of the group average (ie, incidence percentages and age). The means between groups were tested using Student t test and the incidence of injuries with the chi-square test. The level of significance was established at 0.05.

RESULTS

Study inclusion is outlined in Figure 1. From the initial list of 766 articles identified, only 106 were retained for data extraction after evaluation. All studies were of therapeutic Level IV and were published between 1964 and 2009. Of these studies, 81 were case reports (as defined by less than five patients) and 25 were case series (more than five patients). There were 477 patients (547 shoulders) with 90 women (19%). Average age of these patients was 41.1 years (range, 17–75 years). In 70 cases, the dislocations were bilateral. In 133 cases (24%), the initial diagnosis of posterior dislocation was missed. Seizure was a common cause present in 186 instances (39%). For diagnostic purposes, 441 patients had x-rays information reported, 158 underwent CT scanning, and 50 had an MRI.

<table>
<thead>
<tr>
<th>TABLE 1. Predetermined Data Collected in a Systematic Review</th>
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<tr>
<td>Age</td>
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<tr>
<td>Sex</td>
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<tr>
<td>Number of patients (shoulders)</td>
</tr>
<tr>
<td>Presence of seizures</td>
</tr>
<tr>
<td>Radiologic investigations</td>
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<tr>
<td>Number/type of fracture</td>
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<tr>
<td>Reverse Hill-Sachs presence</td>
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<td>Cuff pathology</td>
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<td>Surgical treatment/type</td>
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<td>Complications</td>
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<td>Functional outcome</td>
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FIGURE 1. Study flow chart.
In total, 65% of cases had associated injuries. A breakdown of these injuries can be seen in Table 2. Fractures were present in 185 cases (34%) with many being at multiple sites. The most common fracture was neck fracture (101) followed by lesser tuberosity (78) and greater tuberosity (43). Other fractures (humerus diaphysis, scapula, clavicle, or any other fracture) were present in 33 patients. Figure 2 illustrates a posterior Bankart fracture on CT scan. The reverse Hill-Sachs lesion was identified in 160 cases (29%). The prevalence in the 158 patients (181 shoulders) having undergone CT scan evaluation was 45. This rate, 25%, is similar to that which was found in the total study population and thus we consider the true incidence to be comparable.

Rotator cuff tear was present in only 13 shoulders (2%); however, the total number of patients undergoing rotator cuff imagery was limited. Only 50 shoulders underwent MRI and for 48 shoulders, cuff status was described during the operation. The total rate in these patients is then 13%, which is probably closer to the actual incidence. Open surgery was performed in 238 cases and arthroscopic surgery in nine cases. The most common procedure was open reduction and internal fixation, although in most reports, the specific fracture type requiring fixation was not indicated. Other common procedures included the McLaughlin surgery and its modifications and hemiarthroplasty.

Average follow-up was 40.0 months and was very variable among different studies (range, 1–180 months). The Constant score was available in 66 cases and the average score was 87 (range, 46–97). Further functional outcomes were too variable across the different studies to be compiled.

Statistical analysis about risk factors for associated injuries revealed that in the absence of fracture or reverse Hill-Sachs injury, the risk of cuff tear increased fivefold (odds ratio, 4.6; P = 0.016) Also, the group of patients with reverse Hill-Sachs lesion was older than the group without (50 year old average vs 34 years old, P = 0.008).

| TABLE 2. Results Including Demographics and Associated Injuries |
|-------------------|------------------|
| **Data**          | **No.**          |
| Patients          | 477              |
| Shoulders         | 547              |
| Bilateral         | 14.6%            |
| Women             | 90 (19%)         |
| Average age (years)| 41.1            |
| Fracture type     |                  |
| Neck              | 18.5%            |
| Lesser tuberosity | 14.3%            |
| Greater tuberosity| 7.8%             |
| Other             | 6.0%             |
| Reverse Hill-Sachs total | 29% |
| Reverse Hill-Sachs with computed tomography scan* | 25% |
| Rotator cuff tear | 2%               |
| Rotator cuff tear with magnetic resonance imaging/surgery† | 13% |

* n = 158.
† n = 98.

DISCUSSION

Traumatic posterior glenohumeral dislocation remains a rare but severe injury. This systematic review illustrates the high incidence of associated bone and soft tissue injuries. When compared with anterior dislocations, the incidence of fracture is increased. Two large series of anterior shoulder dislocations published in 2004 and 2005 found an incidence of fracture of 26% and 21% respectively, compared with the 34% in our analysis. We found an increased incidence of reverse Hill-Sachs lesions with increasing age, which is likely secondary to progressive osteopenia as showed by Emond et al for anterior dislocation and fracture incidence. Younger individuals have less chance for bone impaction injury. Also, the actual number of missed dislocations is quite higher; however, in this review, we have excluded all chronic presentations. Incidence of rotator cuff tears in our study seems to be lower for posterior dislocation than anterior dislocation. However, this conclusion is drawn knowing that only a small number of series had MRI or surgical evaluation. One reason for this could be that posterior dislocation creates less inferior displacement and less pulling force on the superior and posterior cuff. The increased chance of rotator cuff tear in the absence of fracture or Hill-Sachs may be explained by the decreased pull of the cuff muscles on the humeral head during spontaneous reduction. The force with which the humeral head impacts on the glenoid rim with a torn cuff is possibly less violent, causing less reverse Hill-Sachs and by extension less humeral neck fractures. However, the position of the arm at the moment of impact (ie, more adduction) could also explain this phenomenon and there is no biomechanical data to confirm either possibility. The acute or chronic nature of cuff tears included in our study could not be obtained.

Although our study focused solely on primary traumatic posterior dislocation, literature concerning posterior shoulder instability adds to our understanding of these pathologies. These articles were excluded from our study because their focus was on subacute and chronic instability; however,
several conclusions can be drawn. Bradley et al reported a prospective series of 100 shoulders with posterior instability of which 53% had been traumatic. All patients participated in competitive sports. In the patients with traumatic instability, 66% had reverse Bankart-type injuries. These patients were chronic cases and were treated after an initial physical therapy regimen and thus the study was excluded from our database. In 2005, Botti et al reported on 31 shoulders operated on for traumatic posterior shoulder instability. All patients were operated on more than 1 month after initial presentation and thus the article was excluded from our study. Reverse Bankart lesions, posterior rim fracture, or rim calcification was found in 97% of shoulders; however, a more detailed incidence was not mentioned. In 2005, Provencher et al reported on 33 patients with posterior instability with 91% having traumatic injuries. However, there were no documented dislocations. Radiologic abnormalities included 52% of posterior labral tears, one reverse Hill-Sachs lesion, and a partial supraspinatus tear. Patients were treated arthroscopically with restoration of stability in 88% of cases. Our study has several limitations primarily as a result of the weakness of available literature, which is typical of a rare pathology. No prospective study was found and no therapeutic trial is available. Despite this, a significant number of papers on posterior dislocation were found, demonstrating the interest and concern about this injury in the orthopaedic community. An ideal situation would have been to combine the original databases from each series, but the number of studies and timespan between each of them made this impossible.

**Recommended Investigation Algorithm for Acute Posterior Dislocation**

After analyzing these results, we propose an algorithm of investigation for acute posterior shoulder dislocations (Fig. 3). To avoid displacement of a humeral neck fracture, which is present in one in five patients, we recommend a mandatory CT scan before a trial of closed reduction for posterior dislocation. A humeral neck fracture is a strong argument for open reduction because of the high risk of avascular necrosis of the head, although specific rates were not reported in included studies. In the presence of other fractures, the usual criteria of displacement should guide the surgical treatment decision. In the absence of both a fracture and a Hill-Sachs lesion or if rotator cuff weakness is present, soft tissue imaging must be done in a timely fashion. Conservative treatment is advocated for shoulders with successful reduction and without instability, significant fracture, or rotator cuff tear. Any surgical intervention must be tailored to individual injuries and specific patient needs and limitations. No scientific data compared the different surgical options in these rare injury patterns. Moreover, there are no data to support a specific type of conservative treatment. In our practice, we use a brace in neutral rotation for 2 to 4 weeks followed by progressive active self-assisted range of motion in a standing position. Prevention of any anteroposterior stress of the shoulder like pushups or contact sports should be maintained for 2 to 3 months. Regardless of the regimen chosen, the goal is to promote posterior capsule healing and prevent posterior humeral head translation.

For future development about acute posterior shoulder dislocation, a multicentered prospective prognostic study would bring more information on treatment choice and functional outcome. An eventual subgroup of patients with worse outcome could then be identified and surgical treatment tailored according to results. Awareness by primary care physicians, radiologists, and even of orthopaedic surgeons has to be maintained by continuous teaching.

**REFERENCES**


