Bilateral Posterior Fracture Dislocations of the Glenohumeral Joint: A suggested Treatment Algorithm and Functional Outcome from a Case Series

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Abstract

Bilateral posterior fracture-dislocation of the gleno-humeral joints are rare injuries which can pose challenges for successful management. The injuries are often overlooked at initial presentation due to low index of suspicion by often inexperienced medical staff. High proportions of these injuries are missed on initial radiographic assessment, leading to late presentation of locked posterior fracture dislocation of the shoulders requiring salvage procedures in an attempt to restore shoulder function.

Four patients presented to a large regional hospital with bilateral posterior fracture dislocations of the gleno-humeral joint over a twelve-month period. We present a brief case synopsis for each patient and present functional outcome results for the surviving patients at a minimum of twelve months follow-up. A management algorithm is suggested for those patients that may require surgery.

Keywords: Bilateral Posterior Fracture Dislocations; Glenohumeral Joint; Algorithm

Introduction

Bilateral posterior fracture dislocations of the glenohumeral joint are a rare combination of injuries that can present significant challenges to manage in order to obtain an optimum outcome. A previous study of unilateral posterior shoulder fracture dislocations reported an incidence of 0.6 per 100,000 patients per year [1]. The true incidence of bilateral injuries is unknown and likely to be substantially lower.

There is often a delay in diagnosis [2,3] due to the injury not being recognised on plain radiography, the films often being reviewed by inexperienced medical staff who do not have a high index of suspicion for the injury. Adequate plain radiography must include a good quality antero-posterior view centred on the shoulder joint as well as an axillary or modified axillary view. These two views should provide the information required to establish the diagnosis [4-6], or at least raise suspicion of pathology and prompt further investigation. Often a good quality axillary view may not be possible due to pain resulting from the injury preventing adequate positioning of the limb. If this is the case, a computed tomogram of the shoulders must be undertaken to confirm or refute the diagnosis [7].

Although the published evidence suggests that these injuries are usually the result of seizures, electrocution injuries or severe trauma [7-11]; this injury pattern can also result from relatively low energy trauma as illustrated in this series of cases.

Our aim was to study the functional outcome in a consecutive series of patients who were treated for bilateral posterior fracture dislocations of the gleno-humeral joint following a set management algorithm.

Methods

Over a 12 month period from March 2008 to March 2009, a regional orthopaedic unit treated eight consecutive cases of posterior fracture dislocations of the glenohumeral joint in four patients. Treatment was based on a set management algorithm (Table 1). Data was collected prospectively and included patient demographic data, injury mode and treatment details. Functional outcome data was recorded at a minimum of twelve months in surviving patients using Constant scores. Radiological assessment included plain radiographs and computerised tomography (CT) scans at the initial presentation and plain radiographs at follow up visits.

Results

The eight shoulders involved four patients, three female and one male. The mean age of the patients was 60 years (range 21 - 85). Three patients attended hospital within 24 hours of the injury occurring and one patient attended after several weeks. In two of the three early presentations, the diagnosis of the shoulder injuries were initially overlooked with the patients being admitted under the care of other medical services before referral to the orthopaedic service. The delay in diagnosis in these situations was no more than 48 hours in both cases.

One patient died eleven months after surgery of an unrelated cause. The remaining three patients have been followed up prospectively for a mean of 24 months (range: 12 - 32) with radiographs and functional scores completed at follow-up outpatient clinics. Results are presented in table 2.

A brief case synopsis of the four patients and their management is given below.
Case series

Case 1: (NK060363)

An 81-year-old female patient presented to the Emergency Department following a simple fall from standing height. She landed on outstretched arms and was unable to elevate herself from the floor due to bilateral upper arm and shoulder pain. The patient denied any history of seizures and there was no evidence to suggest that a loss of consciousness contributed to the fall. She had previously been living independently with social input from her family.

During the course of her admission the patient was found to have a mild degree of cognitive impairment mainly relating to short term memory difficulty.

The patient underwent plain radiographic assessment of both shoulders (Figures 1-4) which showed both proximal humeri had been fractured, a four-part fracture dislocation on the right and two part fracture dislocation on the left. CT scans of both shoulders were subsequently undertaken to provide further information for planning surgery.

Table 2: Functional outcome scores at final follow-up for surviving patients.

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age</th>
<th>Sex</th>
<th>Time to final follow-up (months)</th>
<th>Constant Score (Right Shoulder)</th>
<th>Constant Score (Left Shoulder)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NK</td>
<td>81</td>
<td>F</td>
<td>32</td>
<td>44</td>
<td>43</td>
</tr>
<tr>
<td>WJ</td>
<td>53</td>
<td>F</td>
<td>29</td>
<td>55</td>
<td>55</td>
</tr>
<tr>
<td>WC</td>
<td>21</td>
<td>M</td>
<td>12</td>
<td>88</td>
<td>82</td>
</tr>
</tbody>
</table>

Figure 1: (NK R Pre-op AP).

Figure 2: (NK R Pre-op LAT).
Based on the CT findings and the management algorithm, the initial surgical plan had been to undertake a shoulder hemiarthroplasty on the right and attempt open reduction and internal fixation for the left shoulder in a single operative session. However, after the right shoulder hemiarthroplasty had been completed it was felt prudent by the anesthetic staff to allow the patient to recover for 24 to 36 hours before undertaking the second procedure.

The patient returned to the trauma theatre after 24 hours for the planned fixation of the left shoulder. However, at the time of surgery it became apparent that there were no soft tissue attachments to the humeral head fragment, increasing the risk of avascular necrosis significantly. In addition, there were concerns regarding compliance in the postoperative period given the short-term memory problems alluded to earlier. The fixation procedure was thus abandoned in favour of a second shoulder hemiarthroplasty. Postoperative radiographs are shown in figures 5-8.

Figure 3: (NK L Pre-op).

Figure 4: (NK L Pre-op LAT).

Figure 5: (NK R Postop).
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Figure 6: (NK R Postop LAT).

Figure 7: (NK L Postop).

Figure 8: NK L Postop LAT.

Case 2: (WJ688909)

The second case involves a 53-year-old female who initially presented following a collapse. A relative who witnessed the patient’s collapse described seizure type activity although no history of epilepsy was forthcoming. The patient was also noted to be morbidly obese by the Emergency Department staff. She also admitted to being a long-term smoker consuming in excess of 30 cigarettes daily for over twenty years. The patient did complain of continuous bilateral upper arm pain which was exacerbated by attempted movement. Given the patient’s history was strongly suggestive of a seizure causing the patient’s collapse, no further investigation of her upper arm pain was instigated and she was admitted under the care of the Neurosciences physicians.

After a period of 3 days plain radiographs of her shoulders were undertaken establishing the diagnosis of her shoulder injuries (Figures 9-12). She also underwent an EEG examination that showed no epileptiform activity. At this stage, the patient was transferred to the care of the Orthopaedic team and a definitive surgical plan was made. In view of the patient’s medical comorbidities, staged shoulder hemiarthroplasties were planned, separated by a period of a few days to allow some recovery from the anaesthetic and surgical insults. Six days after her initial admission to hospital the patient underwent a right shoulder hemiarthroplasty with the left shoulder hemiarthroplasty procedure being performed two days after that. The patient made an unremarkable recovery after each procedure. Postoperative radiographs are shown in figures 13-16.

![Figure 9: (WJ Right Pre-op AP).](image1)

![Figure 10: (WJ Right Pre-op Lat).](image2)
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**Figure 14:** (WJ Right Postop Lat).

**Figure 15:** (WJ Left Postop AP).

**Figure 16:** (WJ Left Postop LAT).
Case 3: (WC021087)

The third case involves a 21-year-old male who presented via his general practitioner after 3 to 4 months of difficulty with his shoulders. Numerous factors contributed to the delay in diagnosis, including increasing social isolation due to a psychiatric illness. This was compounded by the onset of seizure like episodes. The patient described several events where he “awoke” feeling disoriented with pain in both shoulders. No episodes were witnessed. Following one of the described episodes the patient attended the Emergency Department because of his bilateral shoulder pain. The patient had plain radiographs undertaken (Figures 17-20) which were reported as normal. However, the radiograph of the right shoulder did suggest a posterior subluxation may have been present. Approximately one month prior to the patient’s referral, the patient described sudden onset of significant pain and restriction in the range of shoulder motion bilaterally. Upon consulting his general practitioner, further plain x-rays and a CT scan of both shoulders revealed the locked posterior dislocations with humeral head reverse Hill-Sachs lesions.

![Figure 17: (WC Right Pre-op AP).](image1)

![Figure 18: (WC Right Pre-op Lat).](image2)

![Figure 19: (WC Left Pre-op AP).](image3)

On clinical evaluation, he had global restriction of movement bilaterally with locked internal rotation, and abstraction and flexion of 40 degrees and 60 degrees respectively.

Based on the treatment algorithm and taking into account the patient’s age and expected level of future function, he was admitted for surgery to both shoulders. He underwent staged fixation of both shoulders under a single anaesthetic after consultation with psychiatric and neurological colleagues. The left shoulder was found to have a large anterior humeral head defect of approximately 5 x 3 x 1.5 cm in size, requiring a structural segment allograft of fresh frozen donor femoral head to be fashioned and secured using cannulated screws. The defect in the humeral head on the right side was less marked. After subscapularis was released, the anterior humeral head fracture accounted for approximately 20 percent of the articular surface, mainly involving the articular margin. The greater and lesser tuberosities were found to be a separate fracture fragment. Morcelised allograft bone was placed beneath this fragment with subsequent reduction of the tuberosities and fixation with a cannulated screw and washer. A subscapularis transfer was then performed to fill the anterior defect. Post-operative x-rays are shown in figures 21-24. Both shoulders were then braced in abstraction and external rotation braces for 6 weeks.
Case 4: (LE 471034)

The final case was that of an 85-year-old female who presented to the Emergency Department. She described a history of suddenly waking in the early hours of the morning with bilateral shoulder pain and inability to rise off her couch. Any attempted movement of her arms exacerbated her pain. The patient denied any history of fall or trauma. She was noted to be anaemic on admission to hospital, with a history of type II diabetes requiring insulin as well as a significant history of ischaemic cardiac disease. The patient normally resided alone with a full package of care from the social work team.

Both upper arms and shoulder areas were bruised and generally tender to palpation with no distal neurovascular deficit. Plain radiographs were taken which revealed displaced 2-part fracture of the proximal humerus on the left and a 4 part fracture on the right side (Figures 25-28). Dislocation was suspected bilaterally and a CT scan confirmed the diagnosis.

She was admitted to the orthopaedic unit but underwent further investigation to determine the aetiology of the episode of loss of consciousness. This included CT scan of the brain and an EEG study both of which were reported as normal studies.

The patient subsequently underwent sequential shoulder hemiarthroplasties to manage her bilateral posterior fracture dislocations. Both procedures were undertaken during a single general anaesthetic. Post-operative x-rays are show in figures 29-32.
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**Figure 25:** (LE Right Pre-op AP).

**Figure 26:** (LE Right Preop Lat).

**Figure 27:** (LE Left Preop AP).

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Functional Outcome

All four patients required a period of inpatient rehabilitation prior to discharge home. A standardised post-operative physiotherapy programme was undertaken. At the time of most recent follow-up, one of the patients has died from unrelated causes. The three remaining patients have a mean follow-up of 24 months (range 12 - 32).

The patients’ individual scores at final follow-up are detailed in table 1.

Plain radiographs taken at time of follow-up are shown in figures e-d.

Discussion

From the literature available, it is clear that bilateral posterior fracture dislocations of the proximal humerus are rare injuries, evidenced by the sporadic case reports involving small numbers of patients [12–19]. These often have varied methods of surgical treatment with differing outcomes. The relatively large number of cases presenting to this unit over a very short time interval have provided some insight into the complexity of the injury patterns as well as the breadth of ages, medical comorbidities and social issues which influence the surgical management decisions.

There is a high incidence of seizure related conditions associated with posterior fracture dislocations and it is important to have a high degree of suspicion in patients presenting with these injuries and an unclear history of trauma. Early review by a neurologist is rec-
ommend to investigate the aetiology of any seizure related disorder and to start appropriate treatment. Electrocution is another, less common, cause for bilateral posterior dislocations and requires prompt recognition and appropriate resuscitation and treatment [20].

In patients presenting with a locked posterior dislocation an attempt at closed reduction may be made and if successful in reducing the dislocation bracing in external rotation can be undertaken [19]. However, in patients with displaced fracture dislocations or where the closed reduction is unsuccessful or leads to an unstable joint surgical treatment is recommended.

A large variety of procedures have been described when addressing the posterior fracture dislocation situation. Closed reduction of these injuries can be blocked by soft tissues [21-23] as well as bony fragments. These injuries are associated with reverse Hill-Sachs impaction fractures on the anterior aspect of the articular area of the humeral head. Numerous techniques have been described when addressing the injuries, relating to the size of the defect on the humeral head. If the articular surface defect is greater than 30 to forty percent of the articular surface, structural segment allograft has been used to restore a more normal anatomic situation. For smaller defects, the McLaughlin procedure [23,25] or a modification [26] thereof is well established in treating the humeral head injury. Other morcelised bone grafting and fixation techniques [27-29] have been reported as well showing a varied approach in dealing with these injuries. In the frequent situation where the diagnosis of these injuries is delayed, open reduction can result in poor outcomes due to the occurrence of secondary post-traumatic osteoarthritis [30]. In these situations, the use of replacement shoulder arthroplasties is recommended.

The experience gained from this relatively large series of patients in a short time period has highlighted that there are two issues which require assessment in the planning process. In the first instance, there are general patient factors to consider. In this series of patients there was a wide spread of ages with a variety of medical comorbidities which influenced the decision process. Three of the four patients were suspected of suffering from seizure related disorders which directly caused the bilateral shoulder injuries. This required investigation prior to shoulder surgery in two cases and liaison with psychiatry and neurology services to assess the stability of seizure control in one patient.

Based on this experience there are broadly two patient groups. These are patients who are generally fit or those who have well controlled chronic medical conditions such as diabetes or ischaemic heart disease. This type of patient is able to undergo prolonged anaesthesia to allow sequential shoulder surgeries in a single theatre session. The second type of patient is one who is medically frail or has acute medical comorbidities which require further assessment and management. For example, a patient with suspected hypoglycaemia induced seizure as a first presentation of diabetes. This type of patient is best served by staged single side shoulder surgeries, the dominant side being operated on first. This allows a period of recovery from the physiological stress of surgery and anaesthesia in an already stressed patient.

The second issue influencing the surgical management in these difficult cases are the fracture related problems. Largely this pertains to whether the fracture is reconstructable or not and whether the risk of humeral head avascular necrosis is present.

**Conclusion**

To the best of our knowledge this study involves the largest number of consecutive patients undergoing surgical reconstruction for bilateral posterior fracture dislocations of the glenohumeral joint. The study illustrates that there are numerous factors which ultimately influence the surgical management of these patients. They are technically difficult to manage well in order to obtain good functional outcomes.

We suggest these injuries while rare should be approached by surgeons who are experienced in the numerous possible procedures, which may be required in these cases. We present a treatment algorithm to aid in surgical decision-making in these patients who require surgical reconstruction.

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Conflict of Interests

Mr LAK Khan, Prof RS Page and Mr NL Shortt declare there are no conflict of interests with regard to this work.

Bibliography


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