



# Neglected Posterior Shoulder Dislocation with a Large Bone Defect in a young Active Patient Treated with Osteochondral Allograft

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## Abstract

**Background:** Posterior glenohumeral joint dislocation is a rare injury. Despite positive clinical signs is often underdiagnosed and undertreated. The presence of a large bone humeral defect could worsen the outcome.

**Case Report:** We report a case of 45 years-old man with a neglected posterior shoulder dislocation with a large segmental bone defect involving 40% of the articular surface of the humeral head. We decided to treat the patient with an open reduction of the shoulder dislocation and reconstruction of the articular surface with fresh-frozen humeral head allograft. Our patient showed improved shoulder mobility and ROM on all planes that positively affected the patient daily activities; no pain was registered at follow-ups.

**Conclusion:** Our case report demonstrates that neglected posterior shoulder dislocations with a large bone defect and viable humeral head can be treated using allograft, obtaining optimal clinical results and avoiding the need for early prosthetic replacement surgery.

**Keywords:** Neglected Posterior Shoulder Dislocation; Reverse Hill-Sachs Lesion; High-Demand Patient; Humeral Head Allograft; Anatomic Shoulder Restoration

**Abbreviations:** GHJ: Glenohumeral Joint; MRI: Magnetic Resonance Imaging; MVA: Motor Vehicle Accident; LHB: Long Head Of Biceps Brachii; XR: X-Rays

## Introduction

Posterior glenohumeral joint (GHJ) dislocation is a rare injury and accounts for only 2% to 5% of all dislocations of the shoulder [1]. GHJ posterior dislocation has a prevalence of 1.1 per 100,000 inhabitants per year, with the first peak in male patients aged between 20-49 years old, and the second one in the elderly over the age of seventy [2]. Posterior shoulder dislocation is often underdiagnosed and undertreated in up to 50% of cases admitted to the E.R. [3]. A dislocation is defined chronic when left untreated for more than 3 weeks. Diagnosis of posterior GHJ dislocations is often delayed, becoming chronic and leading to a locked joint and

decreased functional outcome [4]. Typically, posterior shoulder dislocation can be traumatic or atraumatic: the first might be due to direct high-energy trauma or it can also develop insidiously through a repetitive minor injury. A major trauma with a force applied to the arm with the shoulder in adduction, flexion and internal rotation is the most frequent cause (e.g. A direct blow to the anterior shoulder or by a fall on a forward-flexed upper limb)[5]. On the other hand, seizures and electrocution are the major causes of atraumatic dislocations, by contraction of the internal rotators and disruption of the joint static and dynamic posterior stabilizers [1]. Associated

injuries include humeral neck or tuberosity fractures, impaction fractures of the anterior humeral head (i.e. reverse Hill-Sachs lesion), posterior labrum capsular complex lesions (i.e. reverse Bankart lesion) and rotator cuff tears [2, 6]. Reverse Hill-Sachs lesions can be associated with posterior GHJ dislocation in up to 86% of cases, requiring open or arthroscopic surgical therapy [1, 7, 8].

Missed, late or incorrect diagnosis is a significant clinical problem, as it can predispose to serious complications, such as chronic instability, osteonecrosis, post-traumatic osteoarthritis, persistent joint stiffness and functional instability [4, 8]. Treatment management of chronic posterior shoulder dislocation associated with a large articular defect is strongly debated due to lack of studies with significant clinical records: operative treatment is usually preferred based on the type and the extension of injury, age, medical history and functional demand of the patient. The patient gave consent for case report.

### Case Report

A 45-year-old deaf man, involved in an MVA, sustained a direct blunt trauma to his dominant right shoulder. The patient was employed as a warehouse worker. At the time of the accident, he has been admitted to the ER of another hospital where he has been discharged with the diagnosis of "right shoulder contusion". The patient was admitted to our clinic three months after the trauma, complaining severe pain and functional limitation of the right shoulder. At physical examination the patient showed functional limitation of the shoulder motion on all planes, in particular: abduction 30°, flexion 30°, internal rotation at the iliac spine, external rotation 0°. At palpation the shoulder was painful. The patient was neurovascular intact.

X-Ray and CT scan were carried out, showing posterior GHJ dislocation with an osteochondral lesion about 40% of the humeral head surface, localized on its antero-medial edge (a reverse Hill-Sachs lesion; type I according to Randelli's classification of posterior shoulder dislocation) (Figure 1) [9]. Based on clinical (i.e. not reducible dislocation after conservative treatment) and radiological evaluation (i.e. complete dislocation of the shoulder with important bone loss of the humeral head), the patient was subsequently scheduled for surgery. Considering the young age of the patient, his high functional demand and the extension of the lesion, we decided to perform a humeral head allograft reconstruction. We requested it to the bone bank communicating the size of the humerus of the patient to obtain the best matching allograft. The procedure was performed under general anaesthesia with the patient placed in a beach-chair position. A deltopectoral approach was used with release of the pectoralis major tendon insertion to improve the exposure of the surgical field. After

finding and isolating the anterior humeral circumflex artery and vein, the subscapularis tendon was exposed and cut through its insertion. After detaching the subscapularis muscle from the lesser tuberosity, as the long head of biceps brachii (LHB) tendon tended to dislocate from the bicipital groove we decided to tenotomize it. We proceeded to perform lysis of the posterior adhesions and then the posteriorly dislocated locked humeral head was gently reduced with the aid of a Schanz pin inserted in the lateral aspect of the humeral shaft used as a joystick. Subsequently a large 40% reverse Hill-Sachs lesion was exposed. With an appropriate burr, an accurate regularization of the Hill-Sachs lesion was made, obtaining a viable bony surface. The fresh-frozen humeral allograft was then carefully prepared aside to obtain an anatomic restoration of the cephalic anatomy. The size-matched osteochondral allograft was press-fit into the humeral defect and fixed with 3 4.0mm lag screws reaching a stable construct - (Figure 3). The subscapularis tendon was reinserted by two anchors (JuggerKnot® SoftAnchor - 2.9 mm, Zimmer-Biomet, Jacksonville, FL, USA), (ALLthread™ Suture Anchor - 5mm Zimmer-Biomet, Jacksonville, FL, USA), on his anatomical site. The LHB was sutured on the pectoralis major tendon with non-absorbable suture. The arm was kept in a 30° of abduction and 30° of external rotation using a shoulder brace for 4 weeks post-operatively. Passive range of motion was started at 4 weeks following surgery and active range of movement was started 6 weeks post-operatively. A shoulder CT scan was performed at 1-year follow-up showing no signs of allograft bone resorption, screw loosening or avascular necrosis (Figure 4 A-B). Also 1 year after surgery the patient reported no painful symptoms showing excellent ROM on all planes (Figure 5 A-D); he was able to perform normal daily and work-related activities. A 95 points Constant-Murley Score was recorded at this time.

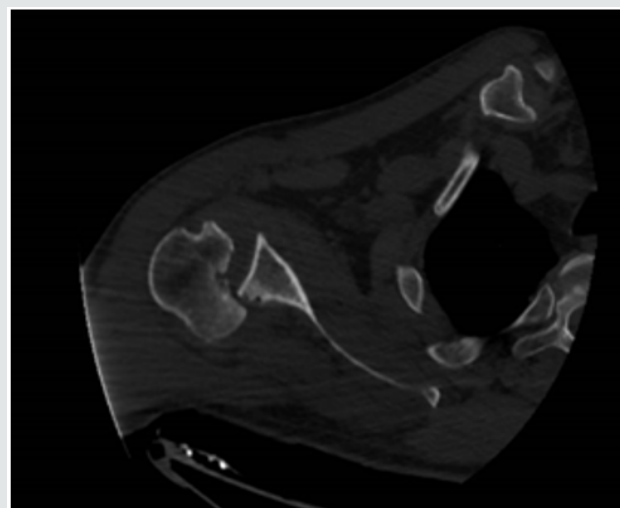


Figure 1: CT Scan Showing the Reverse Hill-Sachs Lesion.

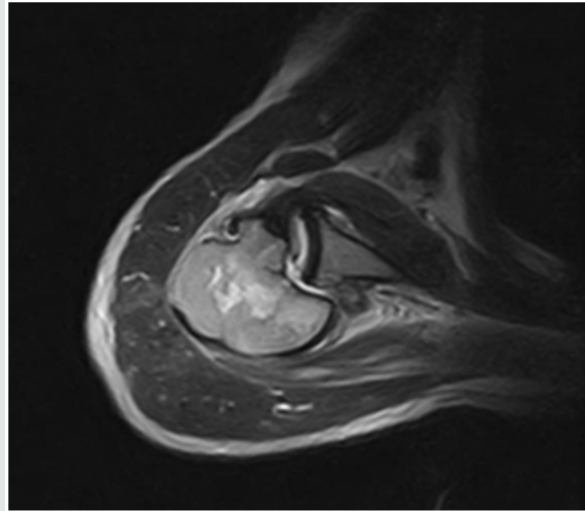


Figure 2: MRI Showing Reverse Hill-Sachs Lesion.

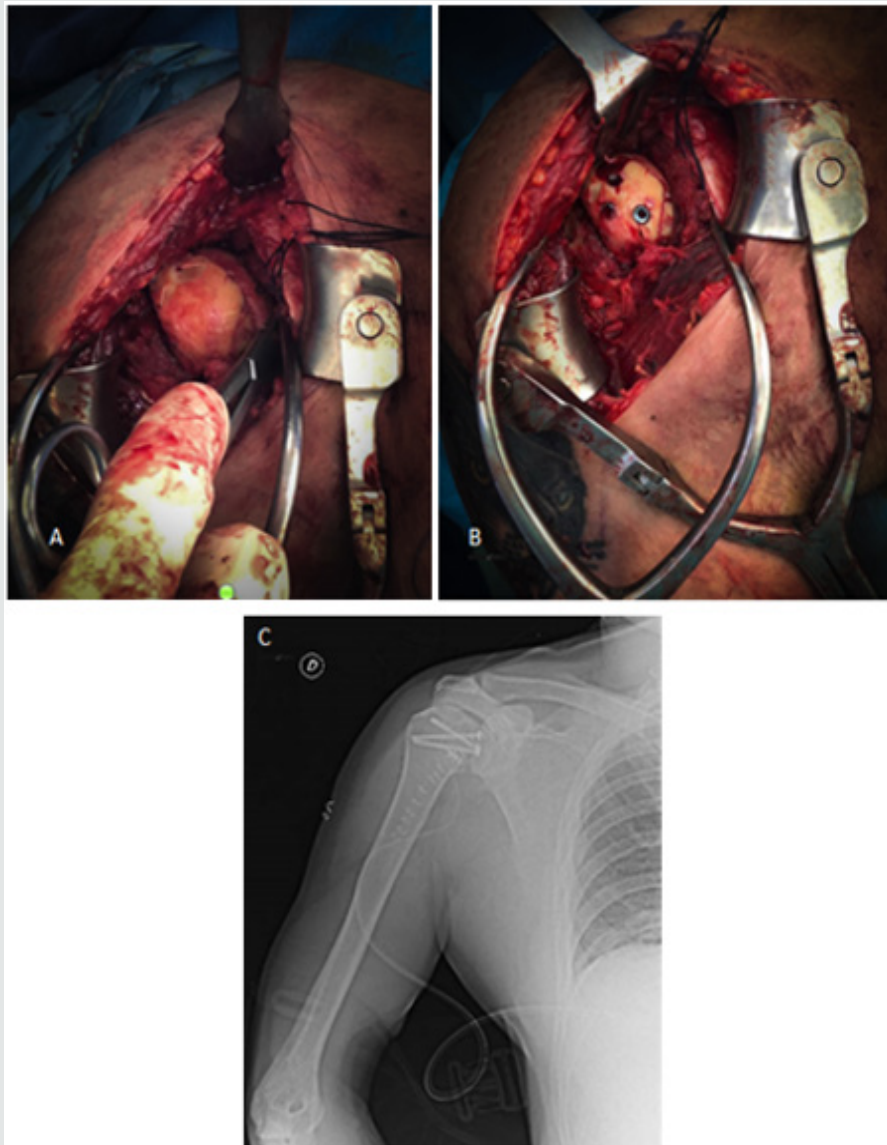


Figure 3: A-C: A and B Intraoperative press-fit of humeral head allograft; C Postoperative X-Ray.

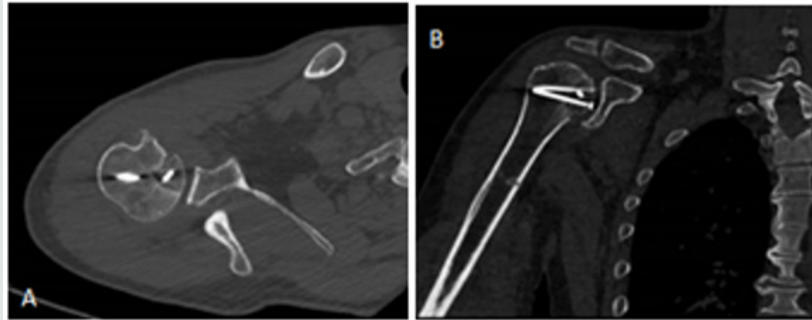


Figure 4 A-B: CT Scan 1-year follow-up.



Figure 5 A-D: showing postoperative ROM at 1-year-follow-up.

## Discussion

The aim of this paper is to present the clinical results using a fresh-frozen osteochondral humeral head allograft in a young active patient affected by a chronic GHJ dislocation with reverse Hill-Sachs lesions about 40%. Scientific literature shows scarce consensus about the treatment of this rare injury: there is an

ongoing debate about the different treatment options. Moreover there is not an agreement on the best allograft that has to be used. The reverse Hill-Sachs lesion size is the most influencing factor for choosing the type of treatment [3]. The reverse Hill-Sachs (also called McLaughlin lesion) is a wedge-shaped impaction fracture on the antero-medial aspect of the humeral head [7]. Any significant lesion should be treated operatively [8]. According to Guehring et

al., for defects involving less than 25% of the articular surface closed reduction is the first choice of treatment; patients with unstable joints and bone defects >25% could benefit of operative treatment, with arthroplasty being recommended if the bone defect is >40% [9,10]. For defects between 25% and 40% a plethora of treatment modalities can be adopted including the classical or the modified McLaughlin technique, bone grafts, etc. [11,12]. In our patient, we opted for a humeral head allograft to obtain an anatomic restoration. We preferred this procedure to non-anatomic procedures as subscapularis tendon transfer (i.e. classic McLaughlin) or the lesser tuberosity transfer (i.e. modified McLaughlin) because, according to authors, a non-anatomic restoration of the humeral head sphericity can lead to a decreased internal rotation of the shoulder and can complicate a foreseeable prosthetic reconstruction [3, 4, 5]. Our patient had borderline indications for hemiarthroplasty. Considering his relatively young age and global clinical assessment, we decided to perform an allograft procedure to respect the patient's high functional demand of the affected limb. Furthermore, we agree with authors which alert on the difficulty to manage the moderate-sized Hill Sachs lesions (i.e. sizing between 40-55%), even for experienced shoulder surgeons: young and middle-aged individuals with high functional demand can benefit of a delay in the hemiarthroplasty surgery by preserving the sphericity of the humeral head [6]. Concerning the graft type, most literature focus on cancellous allograft or autograft to treat acute posterior shoulder dislocation. These grafts are used as a void filler after lifting off the previous impacted articular surface to better stabilized the lesion gap and promote bone healing [1]. For defect between 25% and 40% some authors report reconstruction of the articular surface with fresh-frozen osteochondral allograft [1, 5, 13, 22, 23]. No specific guideline has been proposed for the choice of the allograft. Some authors used a fresh-frozen femoral head allograft. In particular, authors report good functional outcomes using a femoral head allograft for treating locked chronic posterior shoulder dislocation in patients having 25-50% articular surface bony defects [5,13]. The same good results are described in a case report by Patrizio et al. [22]. The most frequent possible complications recorded with this procedure are graft resorption, articular surface flattening and arthritis [5, 13]. Other authors. Proposed the use of a fresh-frozen talus allograft in case of limited accessibility of humeral head graft. They described a similar congruency between the radii of curvature observed with the taller dome and with the humeral head, allowing for application to broader category of patients [23].

The use of fresh-frozen humeral head allograft has been described by Martinez et al. in 5 patients affected by GHJ instability after posterior GH dislocation and in 1 patient with chronic GH dislocation. All patients had a 40% humeral defect. The study had a follow-up period of 10 years; 4 patients had satisfying outcomes while 2 suffered collapsing of the graft [1]. When comparing our case with the aforementioned paper, we obtained from the bone bank an accurate sized humerus matching the patient's one. By

doing so we were able to better fill the gap and restore the precise curvature of the humeral head of the patient, rather than with the use of femoral head, achieving an anatomical restoration. By filling the defect using a humeral head allograft we aimed at preserving both shoulder stability and function, while maintaining the integrity of anatomic soft tissue attachments and preserving the remaining articular surface. Our case report showed how operative treatment options must be patient-targeted according to each intrinsic factors (e.g. age, functional demand, comorbidities, etc.), to the type of injury (e.g. extension of bone defects) and its severity [14, 15]. Our patient had a high functional demand influencing his work-related activities and reported consistent pain for up to three months. Patients with posterior GHJ dislocation suffer a diagnosis delay and often report aspecific symptoms during healthcare evaluation [16, 17]. Our patient as well had aspecific symptoms; apart from significant pain and loss of motion, patients with chronic GHJ dislocation may show shoulder muscle atrophy and prominent acromion on the opposite side, while the dislodged humeral head can be palpated on the back of the shoulder [18]. XR findings can mislead clinicians as the AP view could show no sign of posterior GHJ dislocation: axillary-lateral or Y views (hard to obtain if consistent pain is present), CT scan and/or, as in our case, an MRI can unmask the dislocation [7, 19]. Diagnosis delay pivots the treatment: in a case series study it is highlighted how patients promptly treated for acute dislocation have a better outcome and are easier to treat [20]. During follow-up, our patient has undergone rehabilitation therapy; post-operative recovery consists of strengthening exercise neuromuscular re-education, while educating the patients to avoid flexion, adduction and internal rotation movements [19, 21]. We acknowledge the limitations of this paper due to limited follow-up.

## Conclusion

Posterior GHJ dislocation greatly benefits early diagnosis. If a reverse Hill-Sachs lesion is associated, there is the need of standardized treatment protocols for management of this condition. An important limit we faced when searching the literature is the paucity of studies with a large number of cases treating GHJ dislocation with a reverse Hill-Sachs lesion: we strongly recommend for future studies to unveil possible benefits and limitations, especially involving the benefits of bone grafts. We want to emphasize the importance of preserving the GHJ anatomy in the young, active patient by delaying prosthetic replacement only once necessary. We want to point out how, even if the graft procedure fails there is still the possibility to proceed with a salvage procedure (i.e. prosthetic replacement), that will be found easier to perform over a preserved humeral head anatomy.

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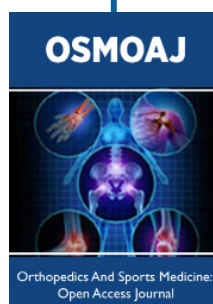
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