Posterior bone block: a reliable method to treat recurrent nonlocked posterior shoulder dislocation with engaging reverse Hill–Sachs lesion

Mohamad H. Fahmy

Department of Orthopedic Surgery, Zagazig University, Zagazig, Egypt

Correspondence to Mohamad H. Fahmy, MD, 18 Salam Street, Salam District, Zagazig, Egypt; Tel: + 20 122 105 3987/+20 552 338 995; e-mails: mhamed375@gmail.com; ahfafifi@yahoo.com

Received 14 October 2013
Accepted 14 November 2013

The Egyptian Orthopaedic Journal
2016, 51:252–262

Background

Posterior shoulder dislocation was first reported in 1839 by Sir Astley Cooper. Hill and Sachs, in 1940, stated that with any dislocation event the soft bone of the humeral head impacts against the harder, sharper edge of the glenoid, leading to an impression fracture of the posterosuperior head in recurrent anterior dislocation. A reverse Hill–Sachs lesion is an impression fracture in the anterosuperior head in recurrent posterior dislocation. In 1952, McLaughlin described his surgical technique to treat an anterior impression fracture of the humerus after recurrent posterior shoulder dislocation.

Hypothesis

Our hypothesis is to prove that posterior bone block augmentation of the posterior glenoid is a safe and reliable line of treatment in cases of recurrent posterior instability with engaging reverse Hill–Sachs lesion.

Patients and methods

Between March 2009 and March 2011 five cases were referred to us with chronic recurrent posterior shoulder dislocation with engaging reverse Hill–Sachs lesion. The mean age of the patients was 28 years (range: 20–36 years). There were two left and three right shoulders. All patients were male. All patients were manual workers. All sustained traumatic dislocations through nonathletic accidents. None of the patients had epileptic fits before. Preoperatively, the mean active forward elevation was 140° (range: 130°–150°) and external rotation with the arm at the side was 35° (range: 20°–50°). Preoperative constant score average was 40 points (range: 30–50 points). The mean time interval between injury and surgery was 12 months (range: 8–16 months). All cases had engaging reverse Hill–Sachs lesion. None of the cases had significant posterior glenoid bone loss. All patients were treated with open posterior bone block augmentation of the posterior glenoid harvested from the anterior iliac crest.

Results

Patients were evaluated at 3, 6, 12, and 24 months. Range of motion was recorded and follow-up radiographs were taken to evaluate graft incorporation. The mean follow-up time for the five patients was 30 months (range: 24–36 months). At 6 months postoperatively, the mean forward elevation was 165° (range: 160°–170°) and external rotation with the arm at the side was 55° (range: 40°–70°). Patients were evaluated postoperatively according to the constant score system (maximum: 100 points). We found a mean postoperative constant score of 87.5 points (range: 80–95 points), a fairly good result considering the nature of bone loss.

Conclusion

The posterior bone block can successfully restore the stability and function of the shoulder in patients with recurrent posterior dislocations with significant engaging reverse Hill–Sachs lesion in which arthroscopic soft-tissue reconstruction is not a reasonable option. This technique can be used for combined soft tissue and bony defects as well as for revisions after previous soft-tissue reconstructions.

Keywords:
bone block, posterior shoulder dislocation, reverse Hill–Sachs lesion

Egypt Orthop J 51:252–262

1110-1148

Introduction

Posterior shoulder instability has been difficult to diagnose and even more challenging to manage. However, because of the increased awareness of the condition, it is being diagnosed more frequently, particularly after sports injuries. A recurrent posterior instability is perhaps best considered a syndrome, of which the pathological processes are incompletely understood and in which several predisposing factors may coexist in the same patient.

Historical perspective

Posterior shoulder dislocation was first reported in 1839 by Sir Astley Cooper [1]. In 1855, 40 years before the discovery of radiography, Malgaigne reported on 37 cases of posterior dislocation of the shoulder [1]. In 1952, McLaughlin [2] described his surgical technique to treat an anterior impression fracture of the humerus after posterior shoulder dislocation. Neer described a modification of this technique by performing an osteotomy of the lesser tuberosity and transposing it into the anterior defect [3].

Pathology

Soft-tissue abnormalities

Soft-tissue abnormalities include posterior capsulolabral complex injuries [4]. The rotator interval was found to be damaged in 61% of cases [5]. Accompanying lesions include superior labral tear from anterior to posterior lesions, superior glenohumeral ligament injury, middle glenohumeral ligament injury, anteroinferior glenohumeral ligament injury, and an enlarged axillary pouch [6].

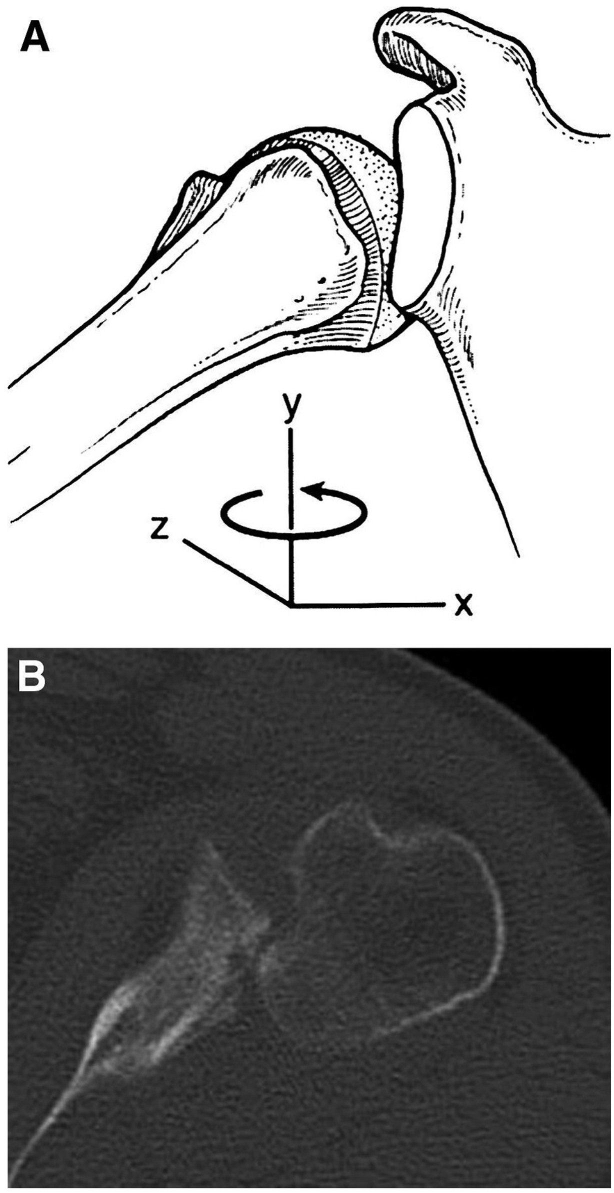
Bony abnormalities

Bony abnormalities include glenoid hypoplasia or dysplasia of the scapular neck, posterior glenoid rim deficiency [7], and glenoid retroversion. Brewer *et al.* [8] defined excessive retroversion of the glenoid as an angle of more than 7° in the sagittal plane. A reversed bony Bankart lesion is a fracture of the posteroinferior rim of the glenoid that may occur after posterior glenohumeral dislocation [9]. Cases of large bony Bankart lesions have been referred to as an inverted-pear glenoid because the affected glenoid in the en face oblique plane is wider superiorly than inferiorly [9]. Like a golf ball attempting to rest on a broken tee, the resistance to excessive posterior or anterior translation of the humeral head is obviously compromised when a significant amount of bone is destabilized or missing from the glenoid. Some controversy does exist on just how much bone loss is required to deem a lesion 'significant', but most sources fall between 20 and 30% [9].

Humerus

A Hill–Sachs lesion is an impression fracture of the posterosuperolateral humeral head, named after Hill and Sachs, who described it in 1940 [10]. This entity can occur with any dislocation event wherein the soft bone of the humeral head impacts against the harder, sharper edge of the glenoid (Fig. 1). Its incidence has been estimated at 47–80% in anterior shoulder dislocation cases and up to 100% in cases of recurrent instability [11]. A reverse Hill–Sachs lesion is an impression fracture of the humeral head that occurs on the anterior aspect of the bone, usually in cases of posterior shoulder dislocation [5]. As with glenoid bone loss, controversy exists as regards the range of 'significance' of size. Second is the concept of engagement, described by Burkhart and de Beer [9].

Figure 1



Etiology of Hill–Sachs lesions. (a) A Hill–Sachs lesion is created when a dislocation event causes the soft bone of the posterosupero-lateral humeral head to impinge against the hard edge of the anterior glenoid rim. A reverse Hill–Sachs lesion occurs through the same mechanism but with a posterior dislocation event. (b) An axial computed tomography image shows both a reverse Hill–Sachs lesion of the humeral head and significant posterior glenoid bone loss

In recurrent posterior instability, a lesion 'that presents the long axis of its defect parallel to the posterior glenoid with the shoulder in a functional position of adduction and internal rotation so that the reverse Hill–Sachs lesion engages the corner of the glenoid is considered engaging and reflects significance of bone loss (Fig. 1). Identification of an 'engaging' lesion is a dynamic process that requires physical examination and often diagnostic arthroscopy to fully evaluate the contribution of the humeral lesion to the instability of the shoulder [9].

Patients and methods

Between March 2009 and March 2011 five cases were referred to us with chronic recurrent posterior shoulder dislocation with engaging reverse Hill–Sachs lesion. This study approved by the Ethical committee of Zagazig University, Zagazig, Egypt. The mean age of the patients was 28 years (range: 20–36 years). There were two left and three right shoulders. All patients were male. All patients were manual workers. All sustained traumatic dislocations through nonathletic accidents. None of the patients had had epileptic fits before. Preoperatively, the mean active forward elevation was 140° (range: 130°–150°) and external rotation with the arm at the side was 35° (range: 20°–50°). Preoperative constant score average was 40 points (range: 30–50 points). The mean time interval between injury and surgery was 12 months (range: 8–16 months). All cases had engaging reverse Hill–Sachs lesion. None of the cases had significant posterior glenoid bone loss. Patients with a history of epilepsy, voluntary intentional dislocators, and evidence of osteoarthritis of the glenohumeral joint in radiographic evaluation were excluded from this study.

Table 1 Glenoid arc angles and corresponding bone loss expressed as percentage of surface area

Arc angle (deg.)	Bone loss (% area)
40	0.88
45	1.25
50	1.7
55	2.24
60	2.88
65	3.63
70	4.49
75	5.46
80	6.55
85	7.76
90	9.08
95	10.53
100	12.1
105	13.79
110	15.6
115	17.52
120	19.55
125	21.69
130	23.92
135	26.25
140	28.66
145	31.15
150	33.71
155	36.33
160	39
165	41.71
170	44.46
175	47.22
180	50

Preoperative clinical assessment

Full history was taken, including history of trauma or epileptic fits. On clinical examination, there was limitation of external rotation and forward elevation, positive posterior load and shift test, also positive O'Brien test, and posterior jerk test. A traumatic posterior shoulder dislocation can be associated with hyperlaxity or multidirectional instability. Often the dislocation is voluntary and readily reproduced by the patient with or without pain. Caution must be used when dealing with these patients, especially in the voluntary and intentional dislocators, in whom all treatment modalities have poor results. These patients can be difficult to distinguish from voluntary, but unintentional dislocators [12].

Preoperative radiographs

Every patient underwent a radiographic 'instability series' consisting of a true anteroposterior (Grashey)

Figure 2

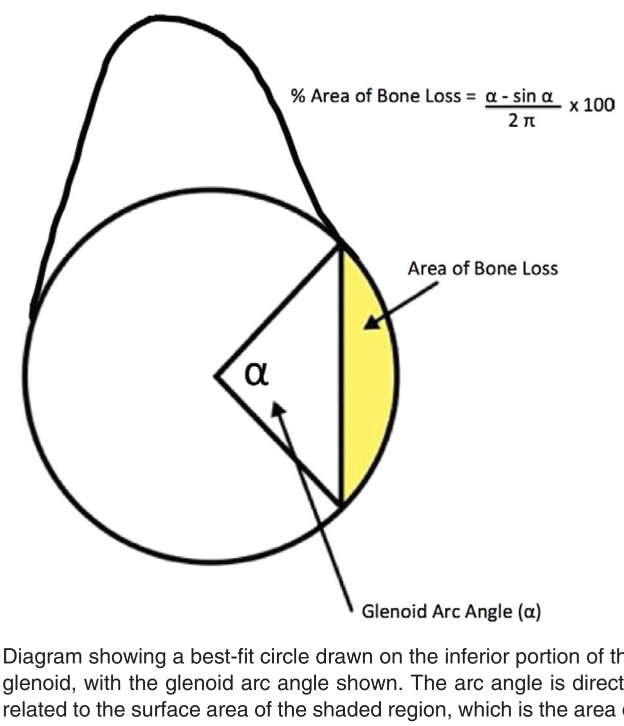
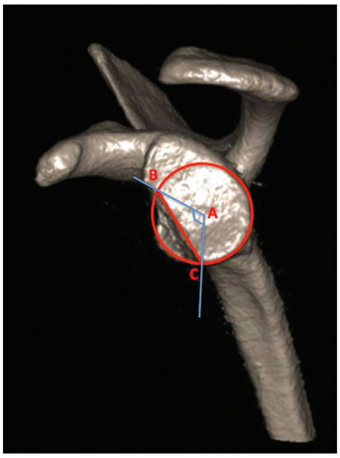


Diagram showing a best-fit circle drawn on the inferior portion of the glenoid, with the glenoid arc angle shown. The arc angle is directly related to the surface area of the shaded region, which is the area of glenoid bone loss view, internal and external rotation views, a scapular Y view, an axillary lateral view, and an apical oblique (Garth) view, and west Point and Stryker notch views. Sometimes, plain radiography alone is sufficient to identify a bony lesion and permit adequate planning of treatment. In many cases, however, plain radiographs will not lead to an accurate diagnosis. A recent study identified that almost 60% of operative bony lesions were missed by plain radiographs alone [13].

Figure 3



En-face view of a left glenoid from a three-dimensional reconstruction of a computed tomographic scan in a patient with anterior glenoid bone loss from recurrent anterior glenohumeral instability. The glenoid arc angle is drawn on the image to show the technique. The angle BAC is the glenoid arc angle

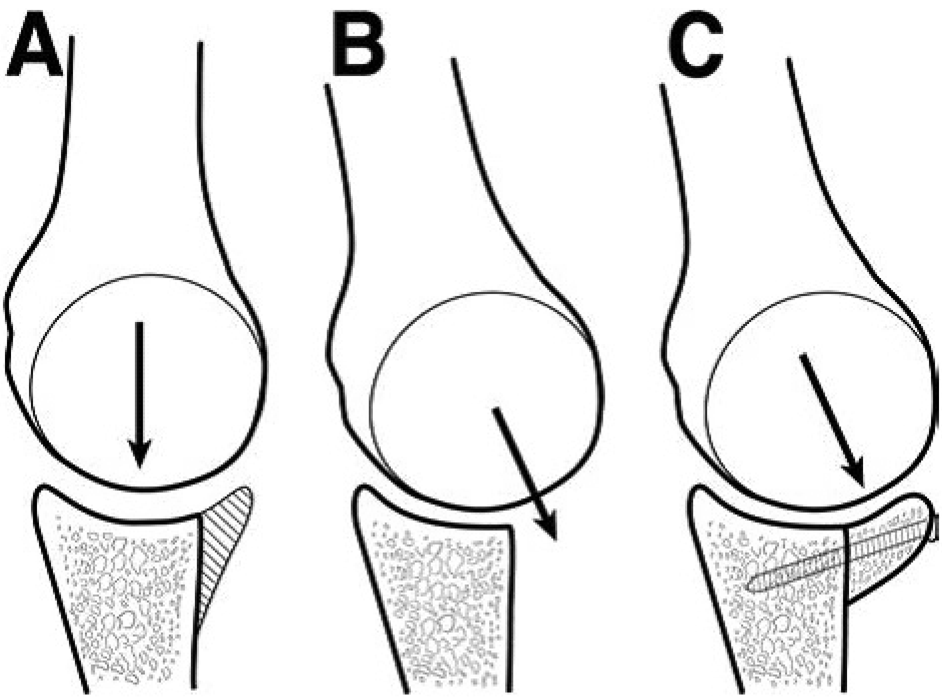
Cross-sectional imaging with either computed tomography (CT) or MRI (or both) is needed to identify and quantify bone loss [14].

Cross-sectional imaging should include coronal, axial, and oblique sagittal cuts to evaluate the glenoid and the humerus appropriately. Even if the plain radiographs are positive for a bony lesion, we elected to order advanced imaging to better characterize the size, location, and extent of the lesion and to rule out additional pathologies such as rotator cuff tears, labral tears, biceps tendon injury, ligamentous disruption, and other problems.

A simple method of determining the percentage size of a glenoid bony defect exists using a central arc angle. Each arc angle corresponds directly to a fraction of the circle that lies peripheral to the chord subtended by that angle (Fig. 2).

The arc angle measurement requires only an angle measurement tool and circle shape tool, which are available on most of the commonly used image viewing interfaces. Either the arc angle can be

Figure 4



(a) An axial force from the humerus centrally on the glenoid will not create a Bankart lesion or failure of a soft-tissue Bankart repair. (b) If an axial force is applied through a point beyond the edge of the deficient glenoid, failure of a soft-tissue Bankart repair is likely because the load must be borne by the soft tissues. (c) The Latarjet reconstruction extends the glenoid articular arc so that off-axis loads are resisted by bone inserted into the equation below to determine the percentage bone loss, where α is the glenoid arc angle, or a reference chart such as that provided in Table 1 can be used [15]:

$$\text{Percentage area of glenoid defect} = \left[\frac{\alpha - \sin\alpha}{2\pi}\right] \times 100.$$

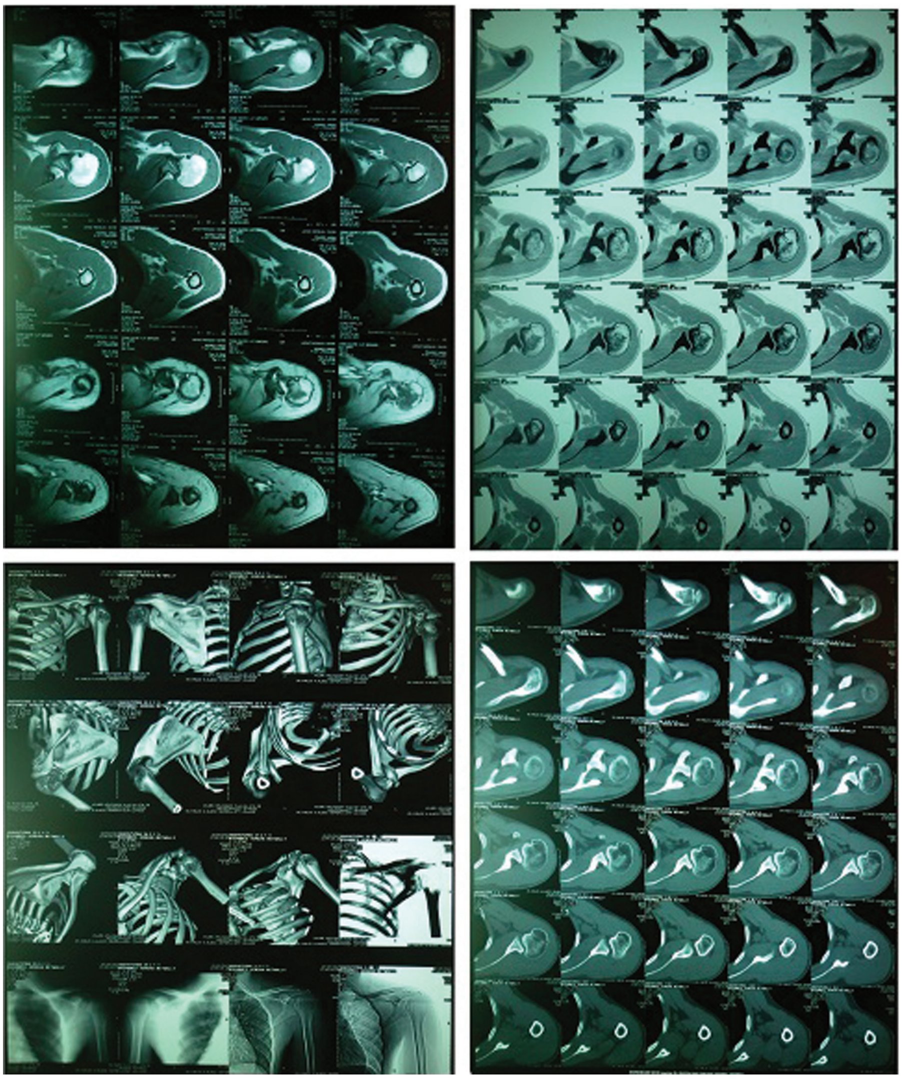
To determine the arc angle, either a sagittal-cut MRI study or an 'en face' view of the glenoid from a three-dimensional reconstruction of a CT scan can be used. A best-fit circle is drawn on the inferior portion of the glenoid. The 'circle' tool in most imaging softwares will automatically identify the center of the circle (point A). With the circle drawn on the image, the clinician can identify the superior and inferior points at which the glenoid defect intersects the perimeter of the circle (points B and C, respectively). The 'angle' tool is then used to measure the angle BAC (Fig. 3).

The obtained angle, measured in degrees, can easily be converted to more familiar terms of percentage bone loss. Either the angle can be inserted in the provided equation or a reference chart can be used such as that provided [15].

Surgical principles

Burkhart and de Beer published their work on glenohumeral instability with significant bone defects. They have defined significant glenohumeral bone defects as follows: inverted-pear glenoid, in which there is greater than 25% loss of the inferior glenoid diameter, or engaging humeral Hill–Sachs lesion. The two senior authors (S.S.B. and J.F.D.) have previously reported, in a series of 194 patients with arthroscopic suture anchor Bankart repair, a recurrent instability rate of 4% in patients without significant bone deficiency [16]. In contrast, the 21 patients in that report who displayed significant bone deficiency had 67% recurrent instability rate. Given the unacceptably high rate of recurrent dislocation and subluxation

Figure 5



Preoperative radiologic examination

Figure 6

Preoperative clinical examination: (a) limited forward elevation, (b) limited abduction, (c) limited external rotation, and (d) internal rotation

after arthroscopic repair in the presence of bone deficiency, the two senior authors abandoned arthroscopic repair in bone deficient patients and began performing their modified version of the Latarjet procedure in this category of patients [16].

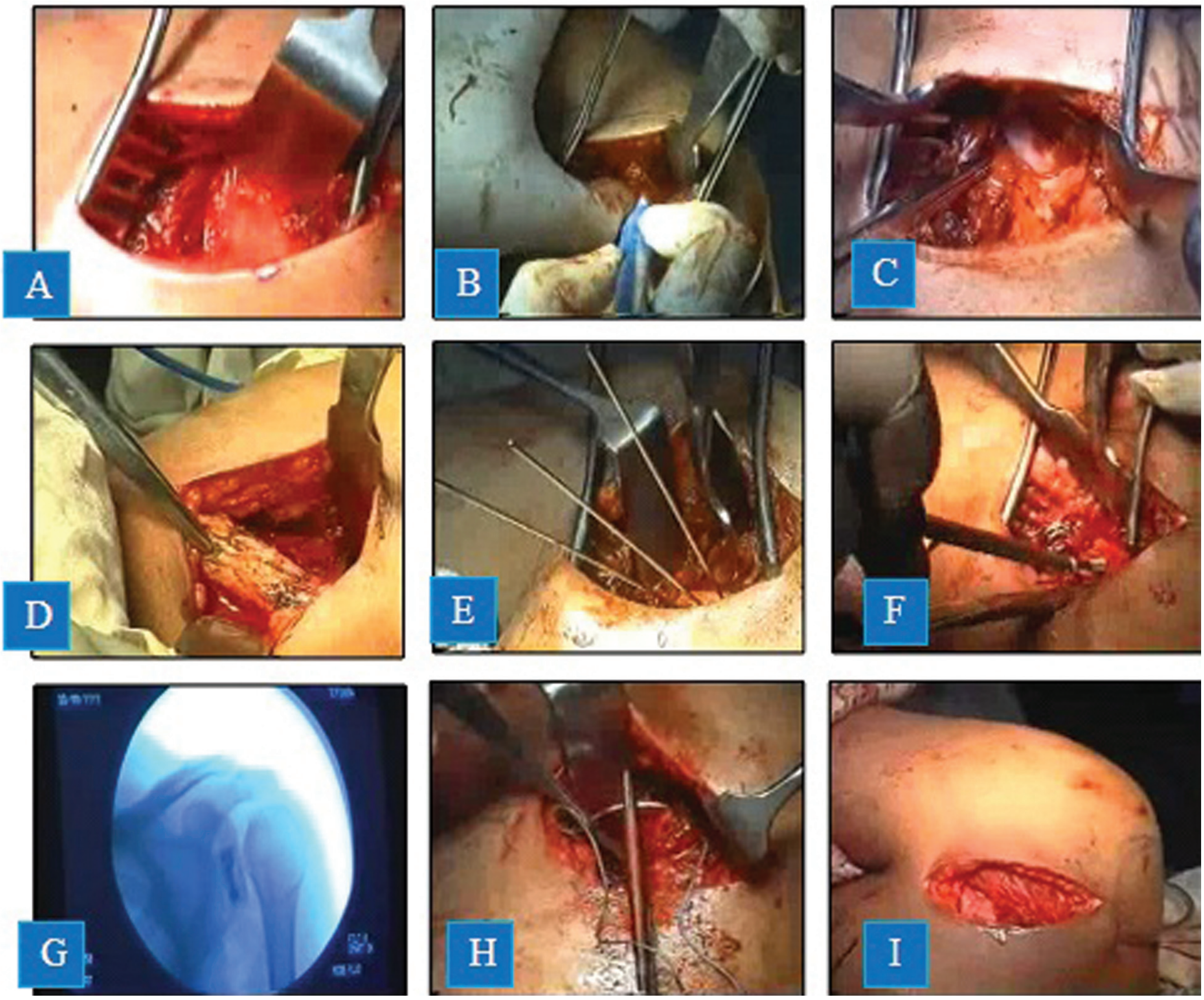
The Latarjet procedure [17] devised by Professor M. Latarjet in the 1950s uses a large coracoid bone graft to extend the glenoid articular arc, stabilizing the shoulder by means of a lengthened bone platform plus the sling effect of the conjoined tendon rather than by soft tissue alone in patients with significant glenoid bone stock deficiency or humeral bone stock deficiency (engaging Hill–Sachs lesion) (or both). Same principles apply to posterior shoulder instability (Fig. 4).

Surgical procedure

Patients underwent diagnostic arthroscopy for the purpose of quantifying bone loss and identifying concomitant pathology. Diagnostic arthroscopy was performed with the patient in the lateral decubitus position. Posterior, anterior, and anterosuperior portals were established. Glenoid bone deficiency was quantitatively evaluated while viewing through an anterosuperior portal while a calibrated probe was introduced through a posterior portal. The shape of the glenoid was assessed to see whether it approximated an inverted pear. On the humeral side, we considered a significant bone deficiency to be represented by an engaging reverse Hill–Sachs lesion – that is, a Hill–Sachs lesion that engaged the posterior glenoid rim in the position of adduction and internal rotation. If a significant bone deficiency was identified on either the glenoid or humeral side, we proceeded to open posterior bone block stabilization after addressing any associated pathology.

With the patient still in lateral decubitus, fresh drapes were applied. A 6–8 cm vertical incision was made directly over the posterior glenohumeral joint, 2 cm medial to the posterolateral edge of the acromion and extended into the axilla and can incorporate the posterior arthroscopy portal. We did not split the deltoid muscle; instead, the deltoid was retracted anteriorly. The interval between the infraspinatus and teres minor muscles was developed by means of blunt dissection. The posterior capsule was exposed by means of retraction of these muscles. The inferior glenoid neck was exposed with the teres minor and axillary nerve retracted inferiorly, and a spiked retractor was placed below the glenoid neck. The infraspinatus was retracted superiorly with a second spiked retractor. This provides an excellent exposure of the capsule. Inverted L-shaped posterior capsular incision was made beginning 1 cm medial to the rim of the glenoid with subperiosteal sharp dissection, to preserve enough capsular length for later reattachment. It is essential to have the teres minor muscle reflected sufficiently inferior so that the vertical cut in the capsule goes all the way down to the most inferior recess of the capsule. In all five cases the posterior capsule was greatly thinned out and stretched that even putting stay sutures was difficult. The joint was carefully irrigated and inspected. We found that the

Figure 7



Operative steps. (a) Posterior incision, (b) L-shaped capsular incision, (c) posterior glenoid preparation, (d, e) posterior bone block temporarily fixed with Kirschner wires, (f) posterior screw fixation, (g) C-arm verification, (h) capsular repair, and (i) muscles fall back into position

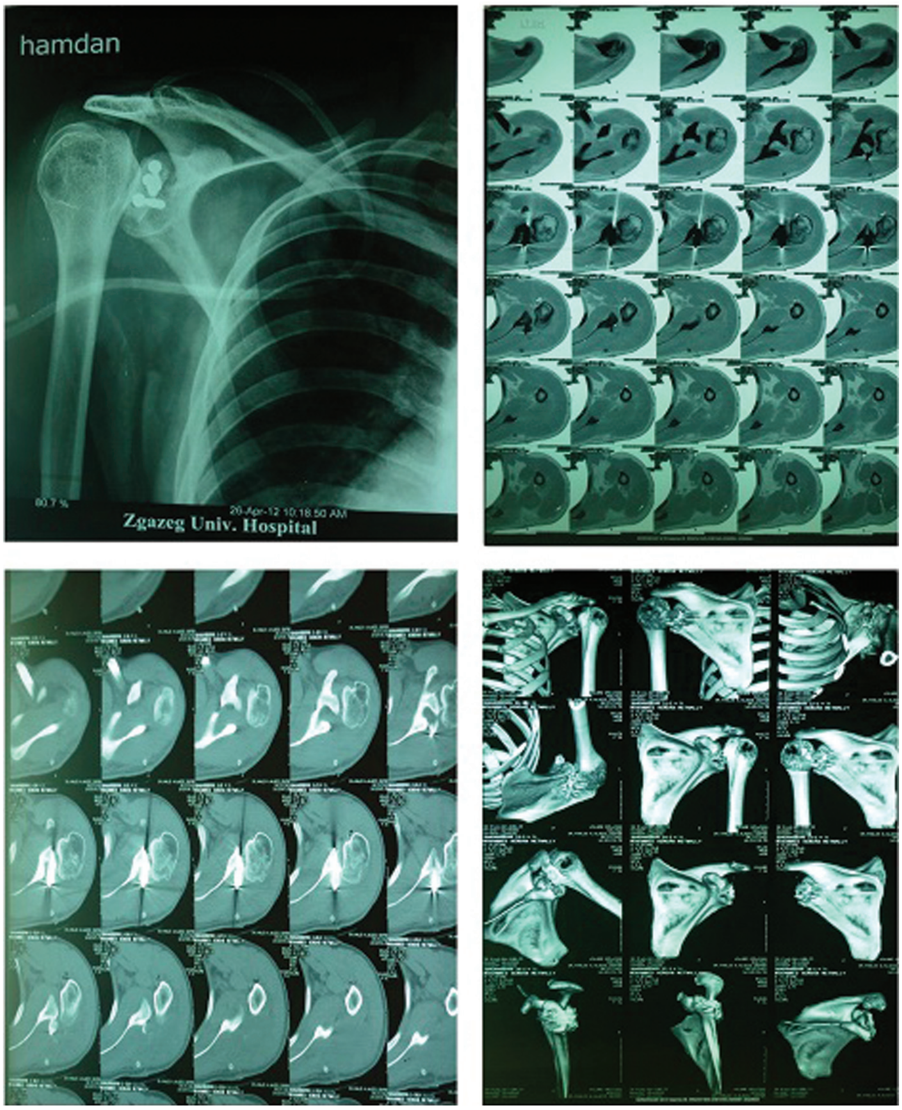
articular cartilage of the humeral head in all five cases was greatly softened. In two cases the humeral head showed some deformity.

The posterior glenoid neck is prepared as the recipient bed for the iliac bone graft with a high-speed bur, being careful to preserve as much native glenoid bone as possible. A tricortical iliac bone block was harvested from the anterior iliac crest measuring 2×1×1 cm. The best fit usually involves placing the medial surface of the graft with raw surface against the glenoid neck to provide good healing response. The concavity of the graft coincides with the concavity of the glenoid. Care is taken not to place the graft too proud or stepped down, and therefore it is placed so that it functions as an extension of the glenoid articular arc.

Under C-arm control, the graft is then stabilized by inserting two long 1.8 mm Kirschner wires. When inserting the wires, care must be taken not to advance the Kirschner wires completely through the glenoid as they may damage the brachial plexus anteriorly. It is therefore imperative to limit the penetration of the K-wires through to a maximum of 40 mm to aid in avoidance of the anterior neurovascular structures. Once satisfied with the position of the graft and both Kirschner wires have been placed, the glenoid is drilled and two canulated 4 mm partially threaded screws are inserted over guide wires. These usually measure 34–36 mm in length. The inferior screw should be inserted completely before drilling the superior screw to prevent the graft shifting position. At this stage, it is still possible to correct the tilt of the graft by rotating it around the inferior screw. The final position of the graft and screws was verified with C-arm.

Tree suture anchors (FASTak; Arthrex, Naples, Florida, USA) are placed in the native glenoid at 7, 8, and 9 O'clock positions (in a right shoulder) and at 5, 4, and 3 O'clock

Figure 8



Postoperative radiologic and MRI examination

position (in a left shoulder) for later capsul–labral repair. The capsule and labrum are repaired to the native glenoid by means of the previously placed sutures anchors, thereby making the graft an extra-articular structure and preventing its articulation directly with the humeral head. This precludes any abrasive effect of the graft against the articular cartilage of the humerus. In one case the posterior labrum was intact, and hence capsular shift and plication were only performed and suture anchors were not utilized.

The sutures of the anchors are utilized for posterior labral repair and posterior capsuloraphy. Horizontal mattress sutures of no. 2 fiber wire suture are inserted in the edge of the medial capsule. The arm should be held in neutral rotation and the medial capsule sutured laterally and superiorly under the lateral capsule. Next, the lateral capsule is reflected and sutured medially and superiorly over the medial capsule and again held in place with horizontal mattress sutures. This capsular shift procedure has effectively eliminated any of the posterior and inferior capsular redundancy.

In the fifth case the capsule was thin and friable and it appears that a capsular shift alone will be insufficient. The infraspinatus tendon was utilized to augment the capsular repair. The infraspinatus tendon is divided so that it can be double-breasted to shorten it and augment the capsular repair. The infraspinatus tendon is repaired next.

The stability of the joint is examined by taking the arm into adduction and internal rotation and seeing whether or not the head will dislocate. Finally, the muscles of the posterior shoulder will fill back into position after retractors are released. Standard closure over a drain is performed. The handshake orthosis is used to immobilize the shoulder in 20 of abduction and neutral rotation for 6 weeks.

Postoperative rehabilitation

At 6 weeks the brace is discarded. Range of motion and gentle internal and external stretching exercises are begun. Overhead motion is also encouraged. Strengthening exercises are delayed until 3 months postoperatively, at which time the bone graft usually shows early radiographic evidence of consolidation with the glenoid. Contact sports and heavy labor are generally allowed at 6 months postoperatively.

Results

Patients were evaluated at 3, 6, 12, and 24 months. Range of motion was recorded and follow-up radiographs were taken to evaluate graft incorporation. The mean follow-up time for the five patients was 30 months (range: 24–36 months). At 6 months postoperatively, the mean forward elevation was 165° (range: 160°–170°) and external rotation with the arm at the side was 55° (range: 40°–70°). Patients were evaluated postoperatively according to the constant score system (maximum: 100 points). We found a mean postoperative constant score of 87.5 (range: 80–95), a fairly good result considering the nature of bone loss. Follow-up radiologic and CT scans showed excellent graft incorporation with the native glenoid neck in all five cases. Complications recorded were one case of hematoma, which required drainage; one superficial infection resolved with antibiotics. We had no cases with graft lysis or screw loosening. None of the patients had recurrence. All patients were satisfied with the results of surgery. All patients returned to their previous jobs except one who had to modify his job to a lighter work (Figs. 5–9).

Discussion

Recurrent posterior shoulder instability remains a difficult problem to diagnose and treat. With recurrence of posterior shoulder instability the incidence of glenoid or humeral bone defects rise dramatically up to 100%. The scope of this study was to focus on the treatment options of recurrent posterior shoulder instability with reverse Hill–Sachs lesion. Our hypothesis was to prove that posterior bone block augmentation of the posterior glenoid is an effective and safe method for the treatment of recurrent posterior shoulder instability with engaging reverse Hill–Sachs lesion.

Anatomic reconstruction with soft-tissue procedures only may result in recurrent posterior instability in the presence of bony lesions; up to 44% of injured shoulders remain unstable. Arthroscopic fixation of the torn labrum is not the ideal line of treatment in such cases [18].

In the literature, there are many surgical options to address this problem. Some authors recommend anatomic reconstruction of the humeral head defect using

Figure 9

Postoperative clinical examination. (a) Forward elevation, (b) abduction, (c) external rotation, (d) internal rotation, and (e) stable shoulder autologous bone grafts or osteochondral grafts in impression fractures less than 40%, with good bone quality of the residual humeral head and absence of osteoarthritis [19]. For cases with impression fractures of less than 33% of the humeral head, some authors recommend nonanatomic reconstruction using McLaughlin procedure or a modified technique [19]. In elderly and low-demand patients with large humeral defects (>45%), a primary joint replacement is a good treatment option [20]. Rotational osteotomy of the proximal humerus has also been described in the literature, but other authors do not recommend this technique because of technical difficulty, a high percentage of osteoarthritis progression, and the risk for humeral head necrosis [21].

Posterior bone block augmentation remains a relatively safe procedure. The first description of this technique for posterior shoulder instability has been by Hindenach [22]. McLaughlin [23] used a combination of a bone block and capsular plication. Sirveaux *et al.* [24] described the use of an iliac crest bone graft in nine cases or an acromion pediculated bone block in nine cases originally described by Kouvalchouk *et al.* [25].

A study on 21 patients with recurrent posterior post-traumatic instability treated with open posterior bone block, harvested from iliac crest, was presented by Servien *et al.* [26] and coauthors with an average follow-up of 6 years and good clinical outcomes in constant score (93 points). Eleven (55%) of the 20 patients had no pain, and 16 (80%) patients had normal and symmetric external rotation. One patient had a postoperative posterior dislocation, and two patients had positive apprehension with adduction and internal rotation. These three patients were considered as clinical failures, but they were satisfied with their results and all of them were able to return to sports at preinjury level. In one case, there was a graft lysis, but with a very good clinical result.

In 2009, Barbier *et al.* [27] presented a report of eight patients in an average follow-up of 3 years after posterior bone block augmentation with iliac crest bone graft. Seven of these eight cases were post-traumatic and the nontraumatic one was secondary to an epileptic seizure episode. All patients had recurrent dislocations. Postoperatively, there was no nonunion or recurrence. Only four patients were able to return to their preoperative level of sports. All patients were found to have normal range of motion in abduction and anterior elevation, but in three patients, external rotation was limited by an average of 20°. The mean postoperative constant score was 96.25 points. Three patients required an additional procedure, two for hardware removal and one for posterior deltoid repair. At a mean of 3 years of follow-up, their study showed good and satisfactory results in 80% of cases.

Lafosse *et al.* [28], published his experience with arthroscopic posterior bone block augmentation. He emphasized that the new arthroscopic technique for posterior bone block augmentation was effective, repeatable, and successful.

It is obvious that there is an agreement among authors that the best solution to address posterior shoulder dislocation with engaging reverse Hill–Sachs lesion is to extend the concavity of the glenoid's bony articular arc. This procedure dramatically increases the shoulder's ability to resist off-axis loads (Fig. 4). If a simple soft-tissue repair is carried out in the face of significant bone deficiency, an off-axis load will be resisted only by soft tissue. However, a bone block reconstruction extends the glenoid's articular arc so that the off-axis loads are resisted by bone. This obviously provides a stronger construct than a purely soft-tissue constraint.

The reason that a glenoid bone graft can prevent engagement of a humeral bone lesion is that the graft extends the glenoid arc to such a degree that the shoulder cannot internally rotate far enough to engage the reverse Hill–Sachs lesion over the graft. This dramatic improvement in stability as a result of noncapsular constraints underscores the potential advantages of this procedure over purely capsular procedures. The good result in this study is particularly striking in view of the fact that many of these patients represented a worst-case scenario of bone deficiency.

Our results are comparable to other studies previously mentioned as regards patient satisfaction, absence of considerable postoperative complications, and absence of postoperative recurrence of dislocation or subluxation. Servien and Walch had better results in their study (constant score 93 points and nearly normal external rotation), compared with that reported in our study (constant score 87.5 and average 55° external rotation). This is probably due to the long interval between injury and surgery in our study (12 months). We noticed that the articular cartilage of the humeral head in all of our cases was greatly softened and sometimes the head was deformed from recurrent dislocations. This led to some persistent loss of external rotation postoperatively. In the overall, we managed to stop the dislocation process and patients were able to perform their activity of daily living, and four of them returned to their previous jobs and they were satisfied with their surgeries. One patient had to modify his activity to a lighter work. The possible explanation to this is the mild deformity of the humeral head that led to limited improvement of his external rotation and forward elevation but he had no recurrence of dislocation and no pain with regular activities.

The limitation of this study is the small sample size (five cases); this is due to the rare nature of this particular entity of shoulder surgery.

The fact that all patients returned to their preinjury level of activity and they were satisfied with the results proves our hypothesis that the posterior bone block augmentation of the posterior glenoid is a reliable option to treat recurrent posterior shoulder instability with engaging reverse Hill–Sachs lesion.

Our results showed very minimal complications of the procedure; again this proves that the procedure is safe and reproducible.

Conclusion

The posterior bone block can successfully restore the stability and function of the shoulder in patients with recurrent posterior dislocation with significant engaging reverse Hill–Sachs lesion in which arthroscopic soft-tissue reconstruction is not a reasonable option. This technique can be used for combined soft tissue and bony defects as well as for revisions after previous soft-tissue reconstructions.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1 Matsen FA 3rd, Lippitt SB, Rockwood A Jr, Charles WA, Michael A. Glenohumeral instability, vol 1. The shoulder. 4th ed. Philadelphia, PA: Saunders Elsevier; 2008:621–622.
2 McLaughlin H. Posterior dislocation of the shoulder. J Bone Joint Surg Am 1952; 24-A:584–590.
3 Hawkins RJ, Neer CS 2nd, Pianta RM, Mendoza FX. Locked posterior dislocation of the shoulder. J Bone Joint Surg Am 1987; 69:9–18.
4 Bradley JP, Baker CL 3rd, Kline AJ, Armfield DR, Chhabra A. Arthroscopic capsulolabral reconstruction for posterior instability of the shoulder: a prospective study of 100 shoulders. Am J Sports Med 2006; 34:1061–1071.
5 Savoie FH 3rd, Holt MS, Field LD, Ramsey JR. Arthroscopic management of posterior instability: evolution of technique and results. Arthroscopy 2008; 24:389–396.
6 Shah N, Tung GA. Imaging signs of posterior glenohumeral instability. Am J Roentgenol 2009; 192:730–735.
7 Edelson JG. Localized glenoid hypoplasia. An anatomic variation of possible clinical significance. Clin Orthop Relat Res 1995; 321:189–195.
8 Brewer BJ, Wubben RC, Carrera GF. Excessive retroversion of the glenoid cavity. A cause of non-traumatic posterior instability of the shoulder. J Bone Joint Surg Am 1986; 68:724–731.
9 Burkhart SS, de Beer JF. Traumatic glenohumeral bone defects and their relationship to failure of arthroscopic Bankart repairs: significance of the inverted-pear glenoid and the humeral engaging Hill-Sachs lesion. Arthroscopy 2000; 16:677–694.
10 Hill HA, Sachs MD. The groove defect of the humeral head. A frequently unrecognized complication of dislocations of the shoulder joint. Radiology 1940; 35:690–700.
11 Chen AL, Hunt SA, Hawkins RJ, Zuckerman JD. Management of bone loss associated with recurrent anterior glenohumeral instability. Am J Sports Med 2005; 33:912–925.
12 Bushnell BD, Creighton RA, Herring MM. The bony apprehension test for instability of the shoulder: a prospective pilot analysis. Arthroscopy 2008; 24:974–982.
13 Verma NN, Sellards RA, Romeo AA. Arthroscopic reduction and repair of a locked posterior shoulder dislocation. Arthroscopy 2006; 22:1252.e1–1252.e5.
14 Huijsmans PE, Haen PS, Kidd M, Dhert WJ, van der Hulst VP, Willems WJ. Quantification of a glenoid defect with three-dimensional computed tomography and magnetic resonance imaging: a cadaveric study. J Shoulder Elbow Surg 2007; 16:803–809.
15 Dumont GD, Russell RD, Browne MG, Robertson WJ. Area-based determination of bone loss using the glenoid arc angle. Arthroscopy 2012; 28:1030–1035.
16 Burkhart SS, de Beer JF, Barth JRH, Criswell T, Roberts C, Richards DP. Results of modified latarjet reconstruction in patients with anteroinferior instability and significant Bon loss. Arthroscopy 2007; 23:1033–1041.
17 Latarjet M. Treatment of recurrent dislocation of the shoulder. Lyon Chir 1954; 49:994–1003.
18 Assom M, Castoldi F, Rossi R, Blonna D, Rossi P. Humeral head impression fracture in acute posterior shoulder dislocation: new surgical technique. Knee Surg Sports Traumatol Arthrosc 2006; 14:668–672.
19 Robinson CM, Aderinto J. Posterior shoulder dislocations and fracture-dislocations. J Bone Joint Surg Am 2005; 87:639–650.
20 Gavriilidis I, Magosch P, Lichtenberg S, Habermeyer P, Kircher J. Chronic locked posterior shoulder dislocation with severe head involvement. Int Orthop 2010; 34:79–84.
21 Flury MP, Goldhahn J, Holzmann P, Simmen BR. Does Weber's rotation osteotomy induce degenerative joint disease at the shoulder in the long term? J Shoulder Elbow Surg 2007; 16:735–741.
22 Hindenach JC. Recurrent posterior dislocation of the shoulder. J Bone Joint Surg 1947; 29:582–586.
23 McLaughlin HL. Follow-up notes on articles previously published in the journal: posterior dislocation of the shoulder. J Bone Joint Surg 1962; 44A:1477–1478.
24 Sirveaux F, Leroux J, Roche O, Gosselin O, Gasperi M, Mole' D. Surgical treatment of posterior instability of the shoulder joint using an iliac bone-block or an acromial pediculated bone block: outcome in eighteen patients. Rev Chir Orthop Reparatrice Appar Mot 2004; 90: 411–419.
25 Kouvalchouk JF, Coudert X, Watin Augouard L, da Silva Rosa R, Paszkowski A. Le traitement des instabilités postérieures de l'épaule par buté acromiale pédiculé à un lambeau deltoïdien. Rev Chir Orthop 1993; 79:661–665.
26 Servien E, Walch G, Cortes ZE, Edwards TB, O'Connor DP. Posterior bone block procedure for posterior shoulder instability. Knee Surg Sports Traumatol Arthrosc 2007; 15:1130–1136.
27 Barbier O, Ollat D, Marchaland JP, Versier G. Iliac boneblock autograft for posterior shoulder instability. Orthop Traumatol Surg Res 2009; 95:100–107.
28 Lafosse L, Franceschi G, Kordasiewicz B, Andrews WJ, Schwartz D. Arthroscopic posterior bone block: surgical technique. Musculoskelet Surg 2012; 96:205–212.