



Technical note

Arthroscopic treatment of posterior instability of the shoulder with an associated reverse Hill–Sachs lesion using an iliac bone-block autograft



Weihui Qi^{a,b,c}, Jingdi Zhan^{a,b,c}, Zijian Yan^{a,b,c}, Jian Lin^{a,b,c}, Xinghe Xue^{a,b,c}, Xiaoyun Pan^{a,b,c,*}

^a Department of Orthopaedic, The Second Affiliated Hospital and Yuying Children's Hospital of Wenzhou Medical University, Wenzhou 325000, China

^b Key Laboratory of Orthopaedics of Zhejiang Province, Wenzhou 325000, China

^c The Second School of Medicine, Wenzhou Medical University, Wenzhou, Zhejiang, China

ARTICLE INFO

Article history:

Received 23 December 2018

Accepted 27 March 2019

Keywords:

Posterior instability of the shoulder

Reverse Hill–Sachs lesion

Iliac bone-block autograft

Arthroscopic treatment

ABSTRACT

Posterior dislocation of the shoulder is often accompanied by an impression fracture in the anterior surface of the humeral head, called a reverse Hill–Sachs injury. This bone defect can engage on the posterior glenoid rim, which can lead to recurrent instability and progressive joint destruction. We describe a new arthroscopic procedure that fills the reverse Hill–Sachs lesion with an iliac bone-block autograft and repairs the posterior articular capsule arthroscopically, which can stabilize the posterior shoulder. It avoids the need to detach the subscapularis tendon and can reduce the risks associated with open procedures.

Level of evidence: V, technical note.

© 2019 Elsevier Masson SAS. All rights reserved.

1. Introduction

Posterior shoulder instability is much less common than anterior instability, and about 5% of shoulder instability is posterior [1,2]. Traumatic posterior shoulder dislocations can lead to impression fractures in the anterior surface of the humeral head, i.e., a reverse Hill–Sachs lesion. This bone defect can engage on the posterior glenoid rim and form the Abnormal joint, which will lead to mechanical symptoms, pain, or re-dislocation of the shoulder. Conservative treatment has positive results in most patients, although 65 to 80% of cases develop recurrent posterior dislocation. Surgical intervention is indicated for recurrent posterior dislocation caused by an engaging reverse Hill–Sachs lesion, not only to stabilize the shoulder but also to help avoid progressive joint destruction and early osteoarthritis. A posterior capsulolabral repair does not treat instability effectively in patients with engaging reverse Hill–Sachs lesions [3–5]. Current techniques for addressing the anterior humeral head defect can be subdivided into non-anatomical, anatomical, and substitution techniques. The non-anatomical techniques transfer the subscapularis tendon insertion and suture it at the site of the reverse Hill–Sachs lesion to limit

maximum internal rotation and to prevent engagement of the humeral defect in the posterior part of the glenoid, as described by McLaughlin in 1952 [6]. By contrast, the goal of anatomical procedures is to restore the original shape of the humeral head with a variety of different bone-grafting techniques [7,8]. Some authors advocate hemiarthroplasty or total shoulder arthroplasty as the treatment of choice if the bone defect exceeds 50% of the articular surface or in the case of dislocations over 6 months in duration when the bone quality is poor. With advances in arthroscopic techniques, autologous iliac bone grafting has been applied in many arthroscopic operations [9]. This article describes an arthroscopic approach that can be used to place an iliac bone-block autograft in the reverse Hill–Sachs lesion.

2. Surgical technique

The patient underwent a complete physical examination and other examinations preoperatively. Computed tomography (CT; Fig. 1A and B) and magnetic resonance imaging (MRI; Fig. 1C and D) confirmed the posterior dislocation of the shoulder and a defect in the humeral head, and were used to measure the defect angle.

After a combination of general anesthesia and an interscalene regional block, the dislocation was reduced with the patient in the supine position. Then, the patient was placed in the lateral decubitus position and tilted backwards approximately 30°. The shoulder

* Corresponding author. 109# Xueyuan Xi Road, Wenzhou 325027, China.
E-mail address: panxy9046@163.com (X. Pan).

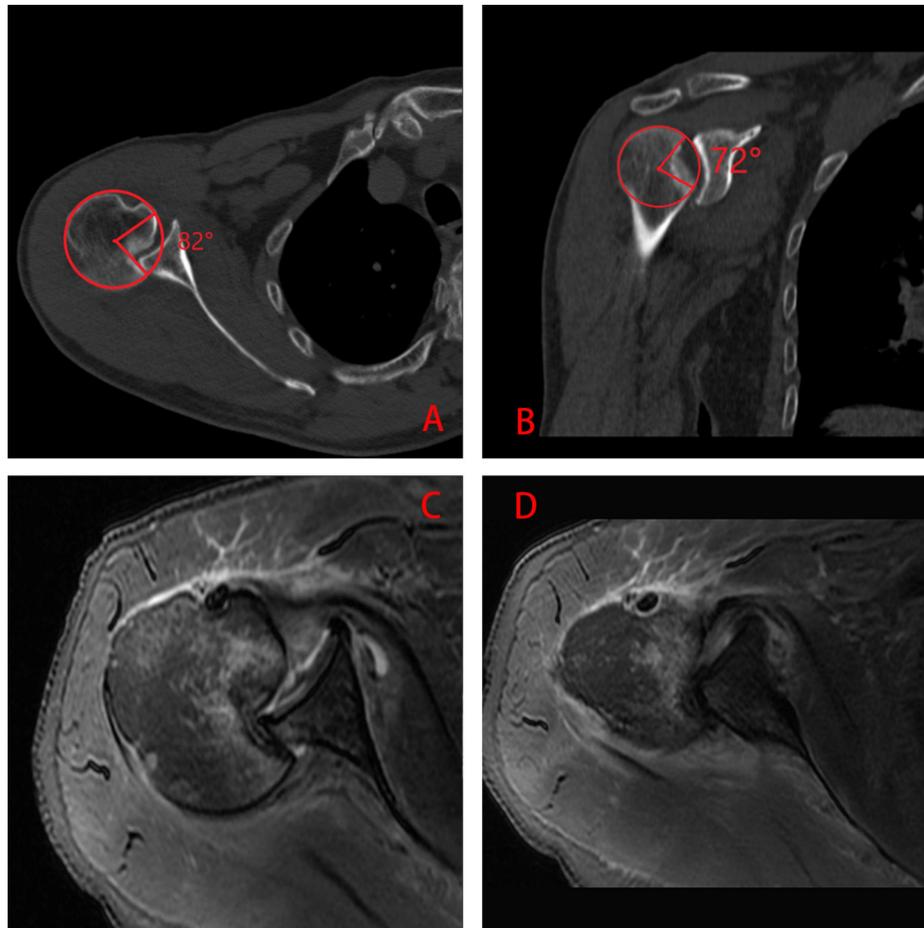


Fig. 1. Computed tomography (A, B) and magnetic resonance imaging (C, D) of the right shoulder showing the humeral head and reverse Hill-Sachs lesion, and its angle from the humeral head.

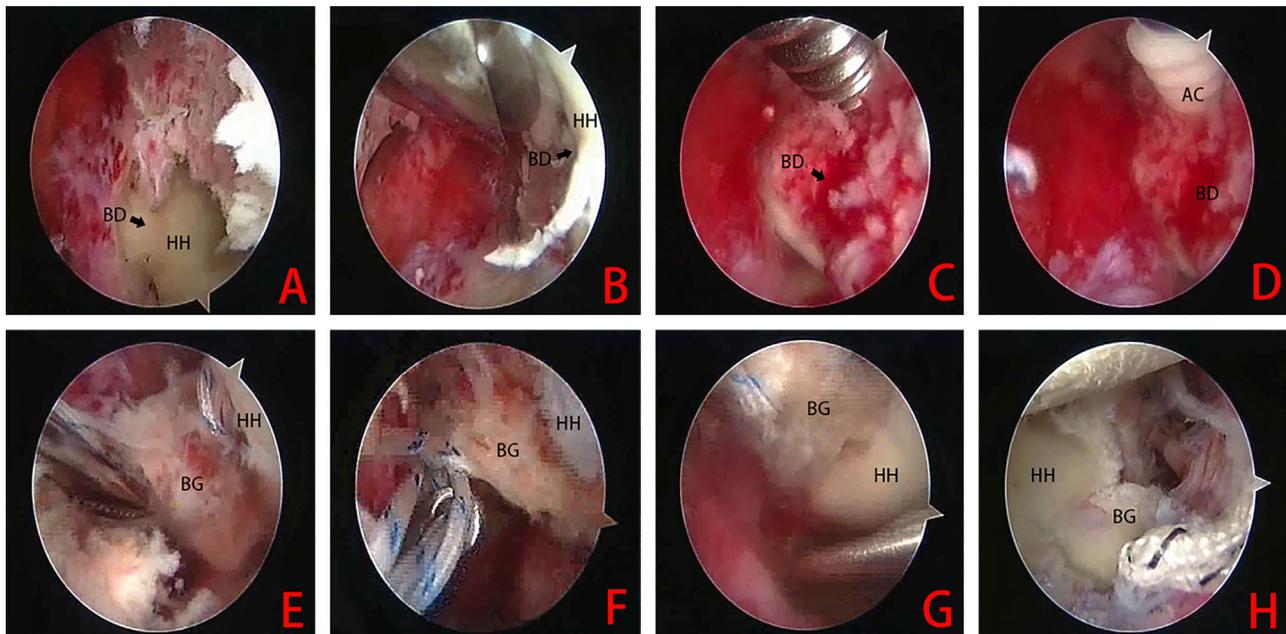


Fig. 2. Right shoulder (lateral decubitus position) viewed from the anterolateral viewing portal. The bone defect in the humeral head (A). Right shoulder (lateral decubitus position) viewed from the anterolateral viewing portal, operated through the anterior portal. The surface of the engaging reverse Hill-Sachs lesion is roughened (B). Right shoulder (lateral decubitus position) viewed from the anterolateral viewing portal, operated through the anterior portal. The anchor is placed in the bone defect (C, D). Right shoulder (lateral decubitus position) viewed from the anterolateral viewing portal, operated through the anterior portal. An anchor suture is passed through four small holes in the prepared iliac bone graft and tied (E, F). Right shoulder (lateral decubitus position) viewed from the anterolateral viewing portal. The iliac bone graft is in the correct place (G, H). HH, humeral head; BD, bone defect in the humeral head (the reverse Hill-Sachs lesion); BG, iliac bone graft; AC, anchor.

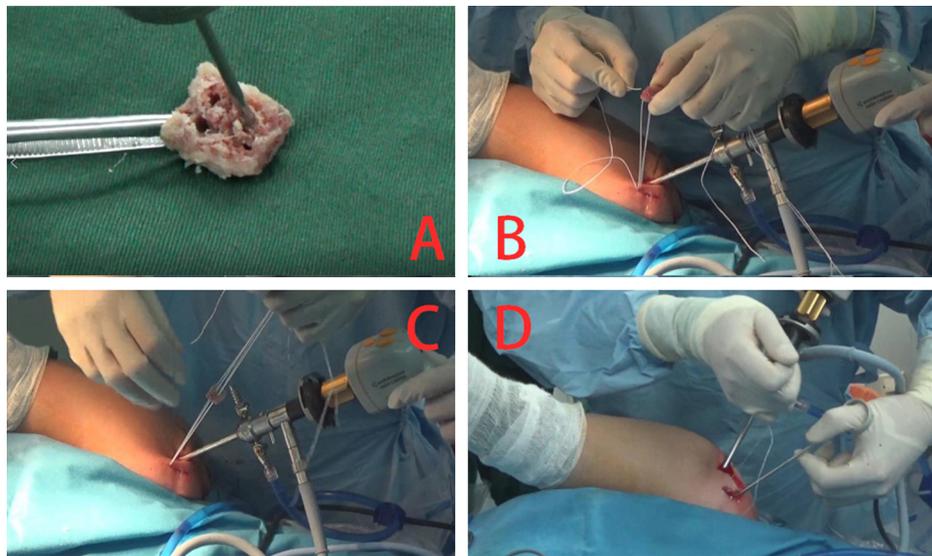


Fig. 3. Four small holes are made in the iliac bone graft with a Kirschner wire (A). The suture is passed through the bone and tied externally (B–D).

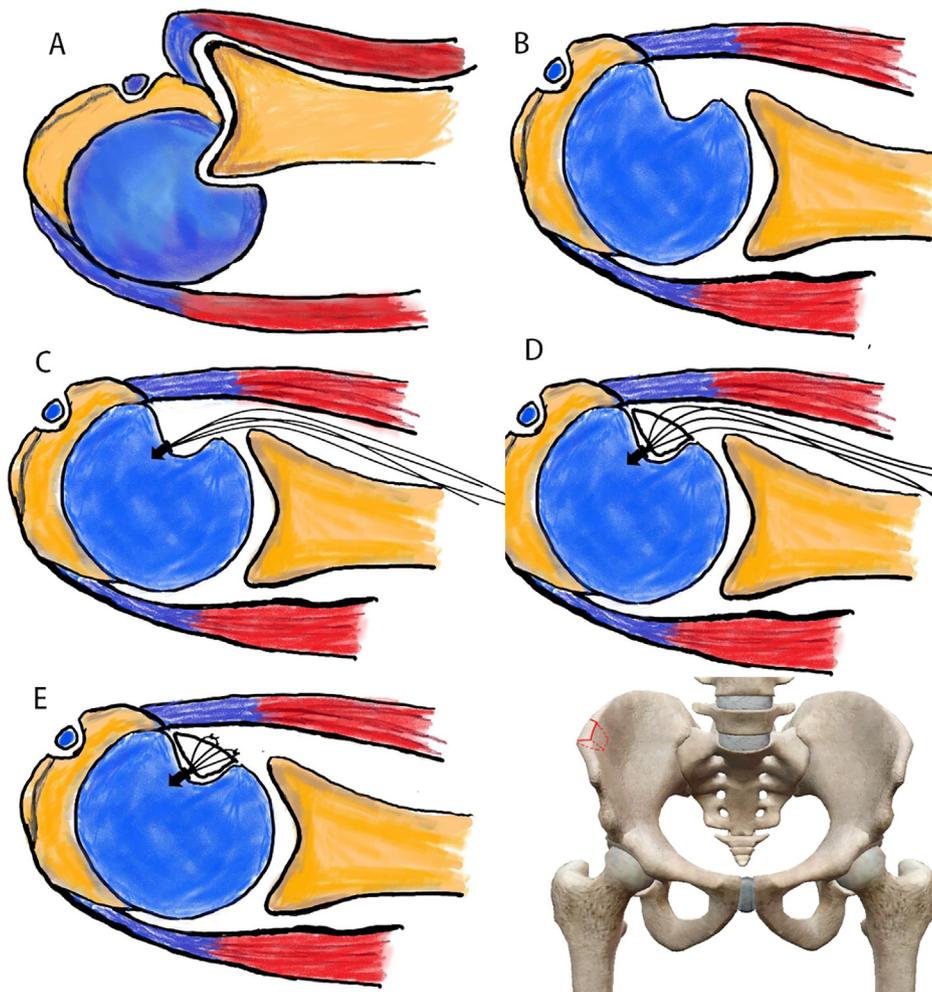


Fig. 4. Sketch of the operative procedure.



Fig. 5. The x-ray examination and CT on the first postoperative day (A, B). CT at 3 (C) and 12 (D) months postoperatively.

was placed in 30° of abduction and 15° of forward flexion and 15 lb of distal traction was applied to the arm. The bony landmarks and potential skin portals were marked.

Four portals were used in this operation: an anterior portal, superior to the lateral subscapularis muscle and medial to the long head of the biceps brachii; an anterolateral portal, 2 cm below the lateral edge of the acromion in line with its anterior edge; a posterior portal, 1.5 cm inferior and 2 cm medial to the posterolateral corner of the acromion; and a posterolateral portal, 2 cm below the lateral edge of the acromion in line with its posterior edge.

It is useful to transfer the camera to the anterolateral portal to examine the posterior capsulolabral attachments and the size, depth, and location of the bony injury of the anterior humeral head (Fig. 2A). With the camera in this position, the posterior draw test can confirm the direction of instability and the degree of translation. Internal rotation of the arm can demonstrate the likelihood that the reverse Hill–Sachs lesion can engage the posterior glenoid. After diagnostic arthroscopy, we found a 2 × 2 cm bone defect in front of the humeral head and an injury of the posterior inferior glenoid labrum and joint capsule, with hyperemia of the intraarticular synovial membrane. The proliferative synovial membrane was resected by radiofrequency ablation. Then, the surface of the engaging reverse Hill–Sachs lesion was roughened, including the degenerative bone and cartilage, using a burr in reverse mode, until we observed fresh bone and blood (Fig. 2B).

When we finished preparing the defect, a longitudinal incision was made at the anterior superior iliac spine. A 2 × 2 cm piece of

autologous iliac bone was removed with a bone knife and trimmed to the shape of the humeral defect. Then, we made four small holes in the graft with a Kirschner wire (Fig. 3A).

Through the existing portal, the anchor cannula with the obturator was passed over the subscapularis tendon through the anterior portal (its position can be located with a spinal needle). The anchor was placed in the center of the reverse Hill–Sachs lesion (Fig. 2C and D). Then, the anchor suture was passed through the four small holes in the iliac graft (Fig. 3B–D) and tied (Fig. 2E, 2F). As a result, the iliac bone graft was in the correct place in the humeral head bone defect (Fig. 2G and H).

Next, the camera was switched to the posterior portal. After abrading the inferior and posterior aspects of the capsule, two suture anchors were placed in the posteroinferior glenoid surface, within 2 mm of the glenoid rim, through the posterolateral portal under the guidance of a spinal needle to maintain a downward angle toward the posteroinferior aspect of the glenoid. Then, the suture was passed through the posteroinferior glenoid labrum and joint capsule, and tied.

The patient's shoulder was kept in a functional position (abduction 45°, flexion 30°, external rotation 15°) for 6 weeks postoperatively.

The surgical procedure is illustrated in Fig. 4.

3. Clinical follow-up

At the 12-month follow-up, the Constant score had increased from 77 to 94 points and the Rowe score had increased from 50 to 95 points. A stable iliac crest bone graft was seen on X-rays (Fig. 5A)

and CT (Fig. 5B) on the first postoperative day, and on CT 3 (Fig. 5C) and 12 (Fig. 5D) months postoperatively.

4. Discussion

Many arthroscopic procedures have been developed to treat posterior instability. These techniques are similar to anterior techniques and usually include a repair of the posterior Bankart lesion combined with a capsular shift [10–19]. Adjunctive anterior procedures such as a superior capsule shift or rotator interval closure have been described to support the restoration of posterior stability [20–23], although some recent biomechanical data suggest that these may not have much of an effect on posterior stability [23]. The surgeon should address the disruption of the bony anatomy associated with an engaging reverse Hill–Sachs lesion. The reconstruction of defects in the humeral head using an allograft restores joint stability, relieves pain, and leads to long-term clinical improvement [24–26]. Our most important novel contribution in this study was the arthroscopic technique we used to treat posterior instability of the shoulder with an associated reverse Hill–Sachs lesion using an iliac bone-block autograft. It is the first published clinical case on this technique. Besides the advantages of arthroscopy, such as the smaller incision and reduced tissue injury, the most important advantage of our new surgical technique is that it offers the greatest anatomic restoration possible. In addition, the posterior articular capsule can be repaired, which is impossible with an open operation.

5. Conclusion

Many techniques for treating posterior instability of the shoulder have been described. We developed a new surgical technique that led to a good outcome in our patient. We believe that this new technique is useful for treating posterior instability of the shoulder with an associated reverse Hill–Sachs lesion. However, more clinical and biomechanical research is needed to support this novel technique.

Disclosure of interest

The authors declare that they have no competing interest.

Funding sources

There is no funding source.

Authors' contribution

Xiaoyun pan, Weihui Qi, Xue xinghe: complete surgery.
Jian Lin, Zijian Yan: review literature.
Weihui Qi: write the manuscript.
Xiaoyun pan, Jingdi Zhan: check.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <https://doi.org/10.1016/j.otsr.2019.03.017>.

References

- [1] Gerber C, Nyffeler RW. Classification of glenohumeral joint instability. *Clin Orthop Relat Res* 2002;65–76.
- [2] O'Brien SJ, Pagnani MJ, Fealy S, et al. The active compression test: a new and effective test for diagnosing labral tears and acromioclavicular joint abnormality. *Am J Sports Med* 1998;26:610–3.
- [3] Bigliani LU, Pollock RG, McIlveen SJ, et al. Shift of the posteroinferior aspect of the capsule for recurrent posterior glenohumeral instability. *J Bone Joint Surg Am* 1995;77:1011–20.
- [4] 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;16:677–94.
- [5] Steinmann SP. Posterior shoulder instability. *Arthroscopy* 2003;19:102–5.
- [6] Mc LH. Posterior dislocation of the shoulder. *J Bone Joint Surg Am* 1952;24 A:584–90.
- [7] Hawkins RJ, Neer 2nd CS, Pianta RM, et al. Locked posterior dislocation of the shoulder. *J Bone Joint Surg Am* 1987;69:9–18.
- [8] Wooten C, Klika B, Schleck CD, et al. Anatomic shoulder arthroplasty as treatment for locked posterior dislocation of the shoulder. *J Bone Joint Surg Am* 2014;96:e19.
- [9] Russo R, Maiotti M, Taverna E. Arthroscopic bone graft procedure combined with arthroscopic subscapularis augmentation (asa) for recurrent anterior instability with glenoid bone defect: a cadaver study. *J Exp Orthop* 2018; 5:5.
- [10] Antoniou J, Harryman 2nd DT. Arthroscopic posterior capsular repair. *Clin Sports Med* 2000;19:101–14 [vi–vii].
- [11] Bahk MS, Karzel RP, Snyder SJ. Arthroscopic posterior stabilization and anterior capsular plication for recurrent posterior glenohumeral instability. *Arthroscopy* 2010;26:1172–80.
- [12] Goubier JN, Iserin A, Duranthon LD, et al. A 4-portal arthroscopic stabilization in posterior shoulder instability. *J Shoulder Elbow Surg* 2003;12:337–41.
- [13] Kim SH, Ha KI, Park JH, et al. Arthroscopic posterior labral repair and capsular shift for traumatic unidirectional recurrent posterior subluxation of the shoulder. *J Bone Joint Surg Am* 2003;85-A:1479–87.
- [14] Bradley JP, Forsythe B, Mascarenhas R. Arthroscopic management of posterior shoulder instability: diagnosis, indications, and technique. *Clin Sports Med* 2008;27:649–70.
- [15] Williams 3rd RJ, Strickland S, Cohen M, et al. Arthroscopic repair for traumatic posterior shoulder instability. *Am J Sports Med* 2003;31:203–9.
- [16] Wolf EM, Eakin CL. Arthroscopic capsular plication for posterior shoulder instability. *Arthroscopy* 1998;14:153–63.
- [17] Clavert P, Furioli E, Andieu K, et al. Clinical outcomes of posterior bone block procedures for posterior shoulder instability: multicenter retrospective study of 66 cases. *Orthop Traumatol Surg Res* 2017;103:S193–7.
- [18] Metais P, Grimberg J, Clavert P, et al. Posterior shoulder instability managed by arthroscopic acromial pediculated bone-block. Technique. *Orthop Traumatol Surg Res* 2017;103:S203–6.
- [19] Andrieu K, Barth J, Saffarini M, et al. Outcomes of capsulolabral reconstruction for posterior shoulder instability. *Orthop Traumatol Surg Res* 2017;103:S189–92.
- [20] Millett PJ, Clavert P, Hatch 3rd GF, et al. Recurrent posterior shoulder instability. *J Am Acad Orthop Surg* 2006;14:464–76.
- [21] Provencher MT, Mologne TS, Hongo M, et al. Arthroscopic versus open rotator interval closure: biomechanical evaluation of stability and motion. *Arthroscopy* 2007;23:583–92.
- [22] Wirth MA, Groh GI, Rockwood Jr CA. Capsulorrhaphy through an anterior approach for the treatment of atraumatic posterior glenohumeral instability with multidirectional laxity of the shoulder. *J Bone Joint Surg Am* 1998;80:1570–8.
- [23] Yamamoto N, Itoi E, Tuoheti Y, et al. Effect of rotator interval closure on glenohumeral stability and motion: a cadaveric study. *J Shoulder Elbow Surg* 2006;15:750–8.
- [24] Alepuz ES, Perez-Barquero JA, Jorge NJ, et al. Treatment of the posterior unstable shoulder. *Open Orthop J* 2017;11:826–47.
- [25] Gerber C, Catanzaro S, Jundt-Ecker M, et al. Long-term outcome of segmental reconstruction of the humeral head for the treatment of locked posterior dislocation of the shoulder. *J Shoulder Elbow Surg* 2014;23:1682–90.
- [26] Khira YM, Salama AM. Treatment of locked posterior shoulder dislocation with bone defect. *Orthopedics* 2017;40:e501–5.