

Iliac Bone Graft for Recurrent Posterior Shoulder Instability with Glenoid Bone Defect

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Recurrent posterior shoulder instability is a debilitating condition that is relatively uncommon, but its diagnosis in young adults is increasing in frequency. Several predisposing factors for this condition have been identified, such as the presence of an abnormal joint surface orientation, an osteochondral fracture of the humeral head or glenoid cavity, and a postero-inferior capsuloligamentary deficit, but their relative importance remains poorly understood. Whilst, conservative treatment is effective in cases of hyperlaxity or in the absence of bone abnormality, failure of conservative treatment means that open or arthroscopic surgery is required. In general, soft-tissue reconstructions are carried out in cases of capsulolabral lesions in which bone anatomy is normal, whereas bone grafts have been required in cases where posterior bony Bankart lesions, glenoid defects, or posterior glenoid dysplasia are present. However, a consensus on the exact management of posterior shoulder instability is yet to be reached, and published studies are few with weak evidence. In our study, we report the reconstruction of the glenoid using iliac bone graft in a patient suffering recurrent posterior shoulder instability with severe glenoid bone defect.

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Key Words: Joint instability; Posterior; Bone graft; Ilium

Posterior shoulder instability comprises of approximately 4% of all recurrent shoulder dislocations. Therefore, it is a relatively rare condition that it is known to be associated with several other conditions such as external trauma, inherited abnormalities, abnormal joint surface orientation like that from excess muscle relaxation, osteochondral fracture of the humeral head or the glenoid cavity, and postero-inferior capsuloligamentary deficit.^{1,2)} Burkhead and Rockwood³⁾ report that conservative treatment is possible in at least 80% of the cases where excess muscle relaxation and bone defect are absent. However, when conservative treatment fails, surgery is required such as a humeral head osteotomy, and an open or arthroscopic transglenoid suture capsulorrhaphy. However, a detailed protocol for the treatment of posterior shoulder instability is yet to be agreed on. Here, the authors report a case of severe posterior glenoid bone defect with shoulder instability, in which the glenoid underwent reconstruction by iliac bone graft.

Case Report

A 21-year-old male visited our Hospital due to discomfort from recurrent dislocation of the posterior shoulder on the right side. According to patient history, the patient experienced the initial posterior dislocation 4 years ago from an external trauma, and subsequently experienced continued discomfort and shoulder instability during exercise, as well as recurrent posterior dislocation. According to physical examination, the functional ability of the shoulder joint was decreased due to these recurrent dislocations. The patient's range of motion decreased substantially, where forward elevation was at 40 degrees, and external rotation was at 15 degrees. Also, the patient scored positive in all of the following tests for shoulder stability; the Jerk test, the posterior drawer test, and the posterior apprehension test. According to X-ray, the right posterior shoulder was dislocated and posterior glenoid bone defect was observed. This was confirmed

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by dual-energy computed tomography (DECT), in which dislocation of the right posterior shoulder was observed and posterior glenoid bone defect was observed in at least 50% towards the left side. Besides, no abnormalities were observed in the rotator cuff or the biceps tendon (Fig. 1). The surgery method used was as follows; first, the patient was given general anesthesia and placed into the correct position. The patient was placed in a lateral position towards the left, and the body slanted backwards at an angle of approximately 30 degrees so that the shoulder was perpendicular to the floor. Secondly, key anatomical structures such as the coracoid process, the clavicle, and the scapular spine were marked. Afterwards, an incision of around 15 cm was made along the axillary line, above and across the shoulder joint, and another incision was made through the soft tissue. At this point, the arm was externally rotated to an angle of 90 degrees and the posterior deltoid lifted up, which was then approached via the deltoid splitting approach and pulled up in order to expose the infraspinatus muscle and teres minor muscle. Each of these muscles was then pulled to the opposite sides, and the posterior capsuloligament approached through here. Then, the

posterior capsuloligament was cut into a T-shape, through which the posterior glenoid was reached. The membrane of the glenoid bone was peeled off and flattened so as to secure an area onto which the autograft was attached. The transplant used was an iliac bone, measuring 2 cm in length and 3 cm in thickness, obtained from the eastern side of the iliac crest. The bone graft was appropriately situated onto the area of deficit and fixated using two cannulated screws of approximately 3.5 mm in size. The shape of the bone graft was then polished using a grinder to fit into the glenoid space. Furthermore, stability was confirmed by approximating the range of motion of the shoulder joint. Here, we found that the postero-inferior capsuloligament was loose, so plication was carried out using an ethibond. After the surgery, the patient was given an abduction brace with a cushion on the abdominal area to block internal rotation, and with this blocked, he was started on partial passive joint exercise and rehabilitative treatment from day one after surgery. The patient used the abduction brace for 6 weeks after surgery, and was allowed to return to his daily routine after 3 months.

In the follow-up at 4 months and 1 year after surgery, both

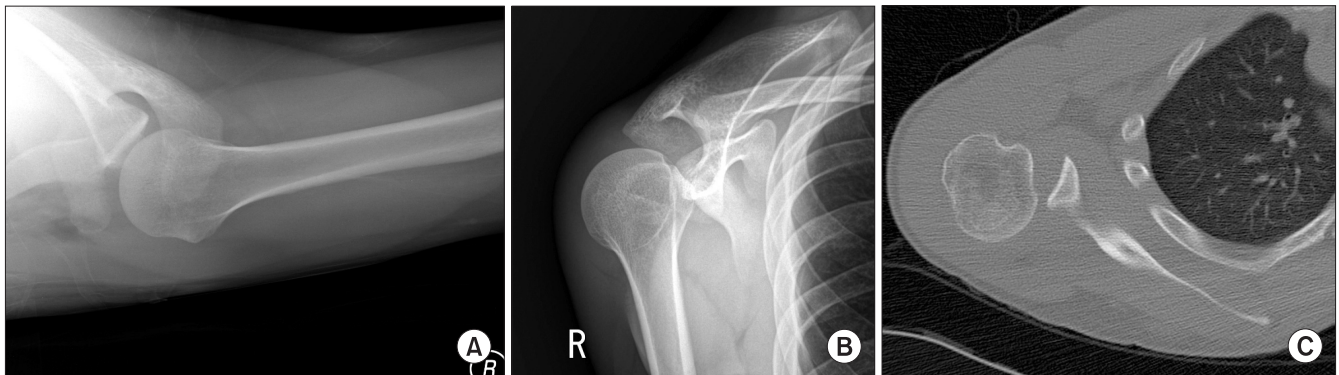


Fig. 1. (A, B) X-ray showing bone defect of the posterior glenoid cavity & posterior dislocation of the shoulder joint. (C) Computed tomography (Proton density axial view) showing severe bone defect of the posterior glenoid and posterior dislocation of the shoulder joint.

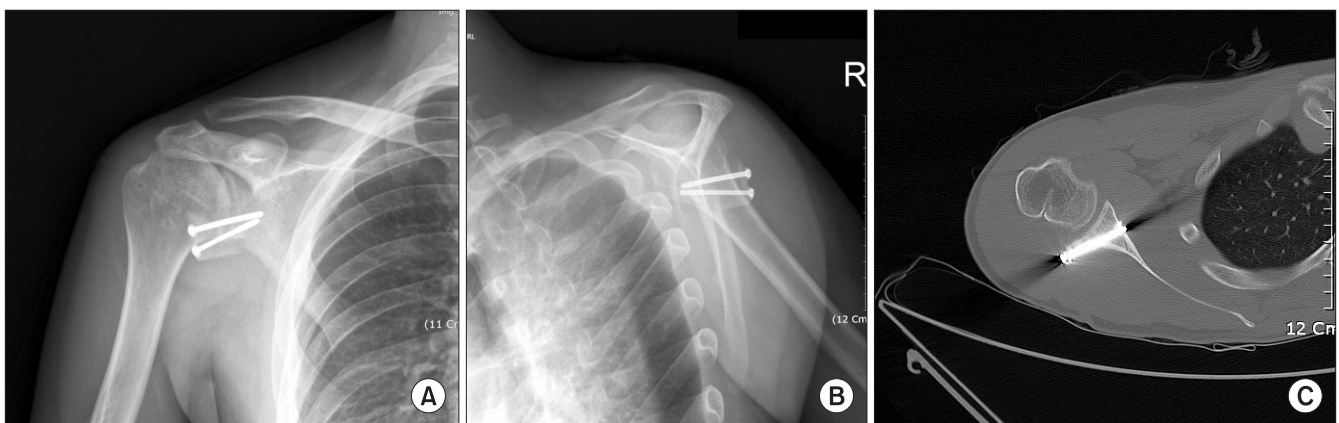


Fig. 2. (A, B) Postoperative X-rays showing glenoid reconstruction using iliac bone graft with AO 3.2 mm cannulated screws. (C) Computed tomography showing well-united bone graft and reduced glenohumeral joint.

X-ray and DECT showed union of the posterior bone graft, and showed no signs of pseudoarthrosis, osteolysis, osteophyte, loss of joint space, and osteoarthritis (Fig. 2). In the physical examination, the patient scored negative in the Jerk test, the posterior drawer test and the posterior apprehension test. Also, the range of joint motion was largely increased compared to pre-surgery levels, and was within normal range. Furthermore, the patient no longer experienced pain or instability.

Discussion

Posterior shoulder instability comprises of approximately 4% of all shoulder instabilities, and its treatment is renowned to be difficult.²⁾ For the treatment of posterior shoulder instability, Beall et al.⁴⁾ have incorporated proprioceptive sensation training and neuromuscular reprogramming in early physiotherapeutic treatment, through which the supraspinatus, infraspinatus and/or the deltoid muscles are strengthened, so as to achieve functional stability. They report a recovery rate of up to 80% in cases where inherited bone deformities are absent. However, they also report that if glenoid bone defect is severe or recurrent shoulder joint dislocation is long-term, surgery is required. Capsulorrhaphy reported good outcomes in the short-term, but is only relevant to cases where external trauma and glenoid bone deformities are absent.^{1,5)} Glenoid bone osteotomy is a technically difficult surgery, and Hawkins et al.²⁾ observed complications in approximately 20% of patients, and dislocations in 41% of patients after surgery.

Conversely, posterior bone graft may be considered as a last resort when all other surgeries have failed. For this surgery, iliac bone from the eastern iliac crest can be utilized, or alternatively, transplantation using the trapezius musculocutaneous flap or the osacromiale is also possible. According to Kouvalchouk et al.,⁶⁾ the reconstruction of the posterior glenoid using posterior pediculated acromial bone block recovered full joint motion and shoulder stability in 5 cases, where successful outcome, such as bone union, was observed via simple radiography. Sirveaux et al.⁷⁾ carried out a study comparing autogenous posterior acromial bone graft and autogenous iliac bone graft in 18 patients. The study was carried out for 13 years, during which recurrent dislocation did not occur in any case, and no significant differences were observed between safety, functional recovery and pain. However, the speed of recovery was significantly faster in the iliac bone graft group. Also reported was a possible complication of continuous pain after surgery when carrying out autogenous bone grafts using iliac bone. This complication occurs from using screws for fixation during surgery. If the screw is too long, or is not fixed at the appropriate location, it may puncture through the opposite cortical bone, at which point the end of the screw may cause continuous pain. What is more, this complication seems to occur at a higher rate in posterior autogenous bone

grafts than in anterior ones. To prevent such a complication, Barbier et al.⁸⁾ reported that sufficient vision must be obtained during surgery, in order to identify the appropriate location on the glenoid, so that a screw of an appropriate size, one with a small diameter, can be selected. One other possible complication is arthritis between the shoulder joint and the humeral head. The risk of this increases if the glenoid surface is not sufficiently polished, which may increase friction between the glenoid and the humeral head. Alternatively, bone regeneration during bone union may also lead to a higher rate of arthritis.⁷⁾ Samilson and Prieto⁹⁾ reported that such arthritis occurred in 4 cases out of 18 patients in their study. Posterior shoulder instability is a rare condition, and although it can be treated by conservative treatment, surgery may be required. In such cases, the technical difficulty of the surgery makes it challenging for inexperienced surgeons. Reconstructive surgery, as used in our study, which uses autogenous bone grafts to increase the anatomical surface area of the glenoid to achieve shoulder stability, are with complications related to iliac bone grafts and are of longer duration compared to other methods. However, their advantages include the ability for strong fixation using screws, which acquires sufficient joint surface for posterior stability, and the relative ease in bone union using autografts.^{7,8)} In our case study, a young and active male patient did not benefit from conservative treatment of over 6 months, and experienced clinically severe posterior glenoid bone defect and posterior shoulder instability. Therefore, an autogenous iliac bone graft was used for glenoid reconstruction. The patient did not acquire any complications, and achieved good clinical results as seen by recovery of shoulder stability, loss of pain and so forth. Our case study showed a successful clinical outcome, and so we report this case with a literature review.

References

1. Fuchs B, Jost B, Gerber C. Posterior-inferior capsular shift for the treatment of recurrent, voluntary posterior subluxation of the shoulder. *J Bone Joint Surg Am.* 2000;82(1):16-25.
2. Hawkins RJ, Koppert G, Johnston G. Recurrent posterior instability (subluxation) of the shoulder. *J Bone Joint Surg Am.* 1984;66(2):169-74.
3. Burkhead WZ Jr, Rockwood CA Jr. Treatment of instability of the shoulder with an exercise program. *J Bone Joint Surg Am.* 1992;74(6):890-6.
4. Beall MS Jr, Diefenbach G, Allen A. Electromyographic biofeedback in the treatment of voluntary posterior instability of the shoulder. *Am J Sports Med.* 1987;15(2):175-8.
5. Neer CS 2nd, Foster CR. Inferior capsular shift for involuntary inferior and multidirectional instability of the shoulder. A preliminary report. *J Bone Joint Surg Am.* 1980;62(6):897-908.
6. Kouvalchouk JF, Coudert X, Watin Augouard L, Da Silva Rosa R, Paszkowski A. Treatment of posterior instability of the shoulder

- joint using an acromial stop with a pediculated deltoid flap. *Rev Chir Orthop Reparatrice Appar Mot.* 1993;79(8):661-5.
7. Sirveaux F, Leroux J, Roche O, Gosselin O, De Gasperi M, Molé 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(5):411-9.
 8. Barbier O, Ollat D, Marchaland JP, Versier G. Iliac bone-block autograft for posterior shoulder instability. *Orthop Traumatol Surg Res.* 2009;95(2):100-7.
 9. Samilson RL, Prieto V. Dislocation arthropathy of the shoulder. *J Bone Joint Surg Am.* 1983;65(4):456-60.