A Hill-Sachs lesion is a bony defect of the poster- 
osuperior humeral head occurring with anterior shoulder 
instability. It has been considered as an important factor 
associated with recurrence, and the risk of recurrent 
dislocation is increased in the large or engaged type.1 The 
remplissage operation is one of the treatment methods for a 
pathogenic Hill-Sachs lesion. It attaches the poster-
osuperior aspect of joint capsule and the infraspinatus 
tendon to the Hill-Sachs lesion, thereby preventing the 
lesion from engaging into the anterior glenoid.7

Although the rate is low, redislocation can occur even 
after the remplissage operation, and how to treat failed 
remplissage is not yet clear. In this case report we present a 
patient who underwent a revision remplissage operation for 
failed remplissage procedure caused by early exercise and 
trauma.

Case report

A 19-year-old man presented with recurrent anterior 
dislocation of 2-years’ duration in his right shoulder. The 
first dislocation occurred during practicing martial arts back 
fall technique in which his shoulder hit the floor. After-
wards shoulder dislocation occurred 4 to 5 times per month. 

He became reluctant to rotate the shoulder externally due to 
apprehension of dislocation and complained of shoulder 
pain after using the arm. Dislocation also frequently 
ocurred even during sleep. There was no limitation of 
motion on physical examination. However, an apprehension 
test showed a definitely positive result with severe anxiety. 
The sulcus test was grade II, and the Gagey sign was also 
positive, demonstrating joint laxity. A bony Bankart lesion 
was not noted on plain radiographs and computed tomog-
raphy (CT) images, but a large Hill-Sachs lesion was found 
(Fig. 1, A). Magnetic resonance imaging showed a Bankart 
lesion at the 1-6 o’clock position with an estimated glenoid 
Bony defect of less than 10%. We decided to perform 
arthroscopic Bankart repair and remplissage operation 
simultaneously due to the frequent dislocation and the 
presence of a large Hill-Sachs lesion.

Under general anesthesia, the patient was placed in the 
beach chair position. Physical examination under anes-
thesia revealed the right shoulder was so unstable that 
anterior dislocation was evoked by a minimal anterior 
drawer force. Intra-articular lesions, such as the Bankart 
and Hill-Sachs lesions, were confirmed by views through 
the posterior portal. With the shoulder within 90° of 
abduction and external rotation position, the Hill-Sachs 
lesion became parallel to the anterior glenoid and was 
defined as an engaging one (Fig. 1, B). An anterior portal 
was established through the rotator interval, and a supero-
lateral portal was made lateral to the acromion through 
muscular portion of rotator cuff.

The Bankart repair was performed using 4 bioabsorbable 
suture anchors (Linvatec, Largo, FL, USA) and a simple 
stitch method (Fig. 1, C). For the remplissage procedure,
the viewing portal was switched to the superolateral one. The Hill-Sachs lesion was trimmed with shaver to facilitate capsular healing to the Hill-Sachs lesion. Next, through the posterior portal, 2 bioabsorbable Paladin 5.0-mm suture anchors (Linvatec) were placed on the Hill-Sachs lesion, just lateral to the humeral cartilage. Only 1 suture per each double-loaded anchor was used after discarding the other suture. No. 2 polydioxanone was inserted through the skin using the spinal needle, and the suture limb was passed using a shuttle relay method through the posterior portal. Suture limbs were tied in the subacromial space, approximating the joint capsule and infraspinatus to the Hill-Sachs lesion (Fig. 1, D). The tied knots were located on the infraspinatus muscular portion.

Until 6 weeks postoperatively, only pendulum exercise and passive forward flexion exercise to 90° was allowed. At the 1-month follow-up, passive motion was recovering without pain. Once pain disappeared, the patient started to work on his own authority earlier than expected. However, he returned to our clinic with shoulder pain and the feeling of an unstable shoulder joint 3 months after the operation. He recalled a history of injury twisting his arm externally during lifting heavy objects. A CT arthrogram showed the anteroinferior labrum was attached properly, but the posterior capsule was detached from the Hill-Sachs lesion with leakage of dye through the infraspinatus (Fig. 2, A). Although the patient initially received rehabilitation exercises and supportive care, the instability symptoms did not disappear, and reoperation was done 13 months after the first operation.

Diagnostic arthroscopy revealed the Bankart lesion was well healed (Fig. 2, B), but the posterior capsule was entirely detached from the Hill-Sachs lesion and the suture limbs were separated from the both anchors left inside the joint cavity. A tear of the infraspinatus muscular portion, with a defect, was also noted (Fig. 2, C and D). The remplissage operation was again performed, without adding a procedure for the repaired Bankart lesion. Avoiding the previously inserted anchor positions, 2 CrossFT 4.5-mm bioabsorbable suture anchors (Linvatec) were inserted, and the spinal needle was used to pass the suture limb by using the shuttle relay method, avoiding the ruptured part of joint capsule and the infraspinatus. Again as in the first operation, only 1 suture per each double-loaded anchor was used after discarding the other suture in the revision surgery and tied knots were located on the infraspinatus muscular portion. A final arthroscopic inspection confirmed that the tying suture limbs closed the previous ruptured portion and attached the capsule and infraspinatus to the Hill-Sachs lesion (Fig. 3, A-C).

Passive exercise was performed for 4 weeks after surgery, and active assisted exercise was permitted from 6 weeks. Lifting weights or sports activity was not allowed for 3 months postoperatively. A CT arthrogram performed

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**Figure 1** (A) A preoperative computed tomography image shows a large Hill-Sachs lesion on the posterosuperior part of the humeral head. (B) The large Hill-Sachs lesion is engaging into anterior glenoid rim in the position of external rotation on an arthroscopic view through the posterior portal. (C) Arthroscopic finding shows a well-repaired Bankart lesion. (D) After the remplissage procedure, the capsule is attached to the Hill-Sachs lesion on an arthroscopic view through the superolateral portal.
8 months after the revision operation showed no evidence of dye leakage (Fig. 3, D). The joint capsule and infraspinatus seemed to be well fixed to the Hill-Sachs lesion. At the 1-year follow-up, shoulder range of motion was slightly limited compared with the contralateral side, with anterior elevation of 140°, abduction of 45°, and external rotation of 70° when in shoulder abduction at 90°. However, neither shoulder pain nor instability was found. The visual analog scale score was 0 at rest and 2 at motion. His final Rowe score was 90, and the American Shoulder and Elbow Surgeons score was 92.

Discussion

A large Hill-Sachs lesion of the humeral head tends to engage with the anterior rim of the glenoid during abduction and external rotation of the arm and is closely related to the recurrence of instability. Several techniques have been introduced to address large Hill-Sachs lesions. Purchase et al reported the arthroscopic remplissage operation, which fills the abraded Hill-Sachs lesion with capsule and infraspinatus tendon. This technique converts a Hill-Sachs lesion to an extra-articular one.

The recurrence rate of the instability after an arthroscopic remplissage operation is quite low, at 0% to 9.1%. Purchase et al reported instability recurrences in 2 of 24 patients, both of which were clearly associated with trauma. O’Shea et al reported a redislocation in 1 of 47 patients and considered preoperative hyperlaxity and postoperative trauma as the cause. Zhu et al reported performing an arthroscopic Bankart repair and the remplissage operation in 49 cases of recurrent anterior instabilities and found 4 failures during 2 years of follow-up. This included 1 redislocation, 2 subluxations, and 1 positive apprehension test.

Redislocation after primary surgery for anterior instability is associated with variable patient factors such as patient age, bony Bankart lesion, large Hill-Sachs lesion, inappropriate rehabilitation, and new episode of trauma. Surgical factors include technical error, diagnostic mistake, and failure of fixation. In the patient presented here, we concluded the 3 causes of failure of the index operation were postoperative trauma, the patient’s joint laxity, and inadequate postoperative rehabilitation. Anchor breakage and separated suture limbs were bound to result from postoperative trauma. The patient had joint laxity preoperatively, as revealed by a positive sulcus sign and positive Gagey signs. In addition, the patient did not follow the recommended rehabilitation protocol and returned to his job earlier than expected.

We should not overlook that the knot was placed at the infraspinatus muscular portion where tissue matrix is loose. Failure mode of remplissage in the presented patient was mainly tissue rupture of capsule and infraspinatus muscle. Itoi et al found from studying 41 cadaveric shoulders that the average length of infraspinatus tendon is 23.2 mm when the rotator cuff is intact. Saito et al reported the average length of infraspinatus tendon is 23.2 mm when the rotator cuff is intact.
distance from posterior margin of greater tuberosity to the posterior margin of the Hill-Sachs lesion is 25 mm. These findings suggest that the position of the knot is more likely to be at the muscular portion or musculotendinous junction, considering the infraspinatus tendon length and Hill-Sachs width. Therefore, there is risk of tissue rupture with early motion after a remplissage operation, especially when the knot is tied at a loose muscular portion. This could be another cause of failure of the remplissage operation, and we tried to avoid excessive rehabilitation or trauma until an adequate healing period had passed and to proceed with careful rehabilitation.

This is the first report of revision remplissage operation. We decided to perform a revision remplissage operation rather than a Latarjet-Bristow procedure because the Bankart lesion was well healed and glenoid bone loss was less than 10%. The revision operation was technically demanding due to the previous position of anchors and the presence of an infraspinatus tear. But by avoiding the primary anchor position when inserting anchors and by passing the strand and performing the mattress suture on the medial side of the infraspinatus tear site, they could be controlled. If it was not possible, we should consider a Latarjet-Bristow procedure or osteochondral allograft.

Although symptoms of instability were improved at the 3-month follow-up, some limitation of motion was found. We believed that the limitation of motion results from the attached infraspinatus tendon and posterior capsule over the Hill-Sachs lesion, which act as a check for external rotation. Deutsch and Kroll\(^2\) also reported a decrease in the range of motion after the remplissage operation.

**Conclusions**

The remplissage operation can fail due to a rupture of the joint capsule and the infraspinatus muscle. If glenoid bone defect is not large (\(<10\%\)), a revision remplissage operation can be tried rather than Latarjet-Bristow procedure, even though the infraspinatus and joint capsule are ruptured. Delayed rehabilitation may be necessary to allow adequate healing in case of a large Hill-Sachs lesion.

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References


