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One block arthroscopic removal of a loosened glenoid component after total shoulder arthroplasty

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Abstract
Total shoulder arthroplasty (TSA) has become a widely used technique to treat gleno-humeral osteoarthritis. One patient having undergone total shoulder arthroplasty came to our clinic for chronic pain and limited range of motion. The clinical examination and preoperative diagnosis suggested a glenoid component loosening. The patient underwent a “one block” arthroscopic removal of the loosened glenoid component with successful outcome. We discuss the indication of arthroscopy in TSA.

Keywords: Total shoulder arthroplasty, arthroscopy, glenoid component loosening

Introduction
Total shoulder arthroplasty (TSA) is currently successfully used to treat gleno-humeral arthritis, proximal humeral fractures and aseptic necrosis of the humeral head with the number of cases estimated on the rise. The weak link in TSA is the glenoid component as shown by several different studies, with an estimated glenoid loosening incidence varying from 12.5% to 96% [8]. Diagnostic of glenoid component loosening can be easy, based on pain and evolutive radiolucent lines apparent on x-rays, or can be challenging when there is pain but no radiolucent lines.
To our knowledge, there are currently only two studies discussing the arthroscopic removal of a loosened glenoid component [3, 7]. In these studies, the polyethylene component was removed after being cut in several parts. This technique leads to risks of scratching the metallic humeral head and dispersing free particles within the joint.
We report for the first time the arthroscopic removal of a loosed glenoid component in one block, and discuss the place of arthroscopy in diagnostic and treatment of chronic painful total shoulder arthroplasty.

Case report
A 56-year-old butcher patient who had underwent total shoulder arthroplasty at another hospital was referred at two years prior to his arthroscopy. The initial clinical history and examination showed the following details. The patient had been satisfied with the surgical outcome for one year after TSA (Figure 1). He sustained a fall with a trauma to the right shoulder and started to complain about a painful shoulder. The clinical examination showed a slightly less functional shoulder with decreased range of motion as compared with the non-operated left-side. The patient underwent X-rays, ultrasound, tomography, scintigraphy during his follow-up in our institution. Pain did not decrease during the follow-up period, on the contrary it increased. Basic laboratory work-up (complete blood count, erythrocyte sedimentation rate, C-reactive protein) and joint aspiration were negative.
The X-rays were compared with earlier plain radiographs and showed no periprosthetic radiolucencies compared with the initial post-operative X-rays. The arthro-CT scan suggested possible glenoid component loosening (Figure 2).
No other lesions touching the rotator-cuff or the biceps were demonstrated with the complementary imaging techniques. The patient continued to complain of an anterior painful shoulder and the retained diagnosis were either a loosened glenoid component or pain associated with the long head of the biceps tendon (LHB) (in the operating file, no comment was made about previous tenotomy of the LHB).
Faced with this diagnostic dilemma it was decided that the patient would undergo an arthroscopy of the right shoulder as this would enable to confirm the suspicion of a loosened glenoid component and possibly treat any soft tissue lesions.

Surgical technique

Patient placed in the classic beach-chair position with a standard posterior portal and a anterior portal through the rotator interval were used. After introduction of the posterior portal, synovial fluid was sent was sent for bacteriological analysis. During arthroscopic
evaluation, the LHB was not visualised and the superior border of the subscapularis was intact. A synovectomy and debridement were performed around the glenoid in order to facilitate the visualisation of the shoulder joint and a probe was then inserted through the anterior portal to evaluate the glenoid component stability (Figure 3a). The component was easily detached by slow backwards and forwards movements of the probe. The rotator-cuff interval was slightly widened, and an additional synovectomy was realised around the prosthetic component through an additional external portal (Figure 3b); the keel was removed from the glenoid bone using a tissue elevator.

In this case, the Aequalis glenoid component (Tornier, Montbonnot Saint Martin, France) has a native hole in the middle of the keel, made for cement fixation purpose. This native hole was filled in with cement and a drill was used to clear the hole from cement (Figure 4a).

Then, using a Neviaser portal located on the superior part of the shoulder, a 1.5mm stainless steel wire was introduced in the joint and passed through the hole of the keel and then grasped through the anterior portal (Figure 4b). The superior extremity of the wire was then pulled and bent in the joint so that both ends of the wire, catching the glenoid keel, could be pulled out through the rotator-cuff interval after small additional opening of the skin (Figure 5a). Finally, a shaver and curette were used to remove the remaining cement and ream the bone of the glenoid cavity to make it bleed (Figure 5b).

Because the patient was still very active, it was decided with his agreement that no new glenoid component would be implanted during the procedure.

The arthroscopic removal of the glenoid was a technical success. The patient was discharged the day after surgery (Figure 6). A sling was worn during 3 weeks and he then started physiotherapy. There were no operative or perioperative complications.

Fig 1: Post-operative X-ray of the shoulder after total shoulder arthroplasty, showing no radiolucencies or loosening of the glenoid component

Fig 2: Arthro-CT scan suggesting possible glenoid component loosening in the patient's shoulder

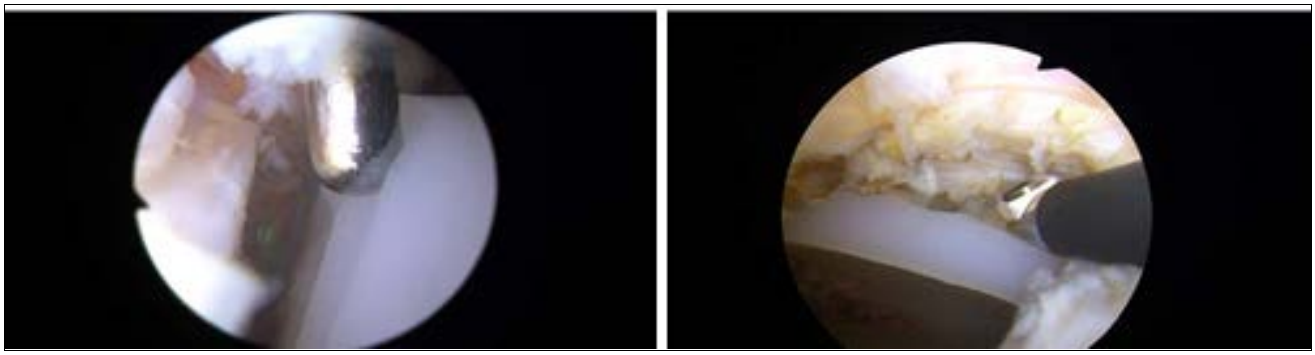

Fig 3a: Arthroscopic view showing the evaluation of the glenoid component stability with a probe during surgery.

Fig 3b: Synovectomy and debridement around the prosthetic glenoid component performed through an additional external portal

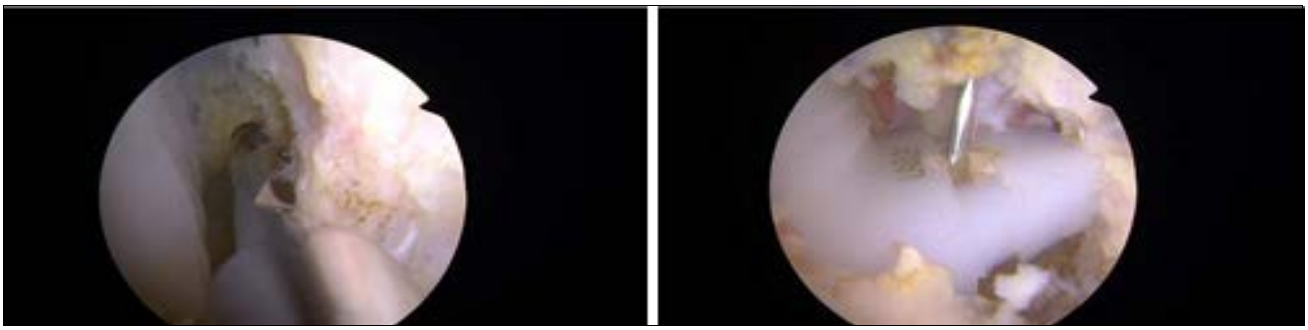

Fig 4a: Drill being used to clear cement from the hole in the keel of the glenoid component during arthroscopic surgery.

Fig 4b: A 1.5mm stainless steel wire passed through the hole in the keel of the glenoid component, grasped through the anterior portal.

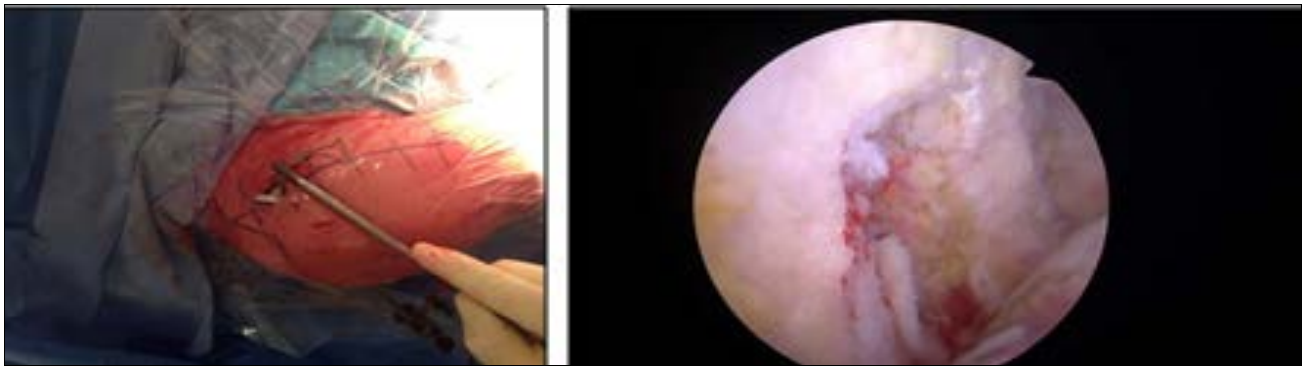

Fig 5a: The glenoid keel being pulled out through the rotator-cuff interval after the wire is bent and secured

Fig 5b: Bone reaming of the glenoid cavity after the removal of the glenoid component to promote bleeding

Fig 6: Post-operative image showing the patient's shoulder with no perioperative complications after the arthroscopic removal of the glenoid component

Discussion

Glenoid component in TSA is the weak point of the procedure.

Studies have shown the benefit of using polyethylene (PE) components rather than metal backed components [2]. As our understanding of the different factors affecting glenoid polyethylene component loosening changes, the design has improved and it seems to be evidence to suggest that pegged, curved-backed cemented components have a longer life span in comparison to keeled, cemented components [6, 8, 10]. However, glenoid aseptic loosening occurs over time with the use of all cemented polyethylene and it still remains an issue leading to revision surgery.

The radiographic diagnosis of glenoid component loosening has been studied especially using the radiolucent lines apparent on plain radiographs [10, 11]. Later studies have compared the accuracy of plain radiographs with computed tomography as a diagnostic tool for glenoid component loosening to improve accuracy and the use of MRI has also been studied [11].

It has been thought that radiolucent lines adjacent to the glenoid were associated with an increased risk of prosthetic failure but Fox *et al*. showed that early radiolucency affecting the keel was the major concern regarding the risk for clinical failure of the glenoid component.

In the meta-analysis of Vavken *et al*. it was shown that pegged glenoid components have better results than keeled components, but the radiolucencies of the two groups were similar [10]. In an earlier study Yian *et al*. compared the use of plain radiographs and tomography to detect radiolucent lines around the glenoid component [11], the CT-scan enabled to detect radiolucencies with greater sensitivity and reproducibility. In the evaluation of a painful shoulder following TSA the role of MRI has also been discussed mainly for its ability to detect soft tissue and cartilage lesions or infection.

Regardless of these advances in imaging techniques the evaluation of component failure as the cause of chronically painful TSA remains difficult and diagnostic arthroscopy has been used by Bonutti *et al* [2] for unexplained painful total shoulder arthroplasty.

Arthroscopy has been successfully used in repairing rotator cuff tears, as well as treating biceps tendinitis, impingement syndromes [5, 9]. All these studies shown successful results in the arthroscopic treatment of these associated lesions. Arthroscopy was not only enabled to confirm the pre-operative diagnosis, but sometimes it also enabled further diagnosis like postarthroplasty capsular fibrosis with arthroscopic capsular release as shown by Tytherleigh-Strong *et al* [9].

Recently Gee *et al* [4] have used arthroscopic repair to treat atraumatic posterior shoulder instability using capsulorrhaphy. Arthroscopic reduction of a chronically dislocated reversed shoulder arthroplasty was performed by Arriazza and co-workers [1]. The retrieval of the glenoid component by arthroscopic means has been discussed in articles by O'Driscoll and co-workers [7] as well as by Carr *et al* [3]. Both these studies showed good results after arthroscopic removal of the glenoid component. The glenoid component was cut into four pieces with three sets of cuts using a 4 to 6-mm osteotome inserted through the anterior portal by O'Driscoll while Carr described retrieval of the glenoid component after cutting it in several sections using a large 5mm burr.

In our case, the glenoid component was removed in one piece. The price to pay was only a larger skin incision (2cm) at the retrieval site. The advantages of retrieving the glenoid component in one piece are avoiding damage to the humeral head component either with the osteotomes or with the burr, there are no polyethylene debris left in the joint space, as it could be the case after fragmentation of the glenoid component.

Shoulder arthroscopy is less invasive than open surgery, does not violate again the important subscapularis tendon. It allows cement removal, bone reaming with a curette and bone grafting. It leads to shortened hospital stay, improved recovery time and decreased morbidity.

The drawback of this study is that we have only one patient and that the follow-up is insufficient to discuss in detail the patient outcome. This surgical approach was chosen because the patient was still professionally active and did not want to undergo a more restrictive and difficult revision surgery. We also wanted to avoid recurrence of glenoid component loosening.

In those cases when glenoid component replacement seems useful, open surgery remains mandatory.

Conclusion

The use of arthroscopy as a treatment method after total shoulder arthroplasty still needs to be researched. The studies so far have only contained small numbers of patients, but the results seem positive in all studies.

We propose a one block arthroscopic removal of failed glenoid component, to avoid risk of damage to the humeral head or subscapularis tendon, and abundant polyethylene debris in the joint, in those patients who do not need or do not want a glenoid component reimplantation with even less predictive result.

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Declaration of competing interest

The authors declare no conflict of interest

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