



# Shoulder Arthroscopy after Shoulder Arthroplasty

# 44

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## Abstract

Persisting pain and complications after shoulder arthroplasty negatively affect the success of the surgery. These problems could be overcome by arthroscopy which offers several advantages, including minimal invasiveness, less soft tissue damage, faster healing, reduced rates of open surgery rates and, in some cases, better visualization. Arthroscopy can be used successfully in the diagnosis of infection after shoulder arthroplasty, treatment of instability, impingement and rotator cuff tears, diagnosis of component loosening  $\pm$  removal of component, loosening of contractures, treatment of biceps pathologies, and debridement of pain-eliciting soft tissues. Arthroscopy after arthroplasty is more difficult than standard glenohumeral arthroscopy due to the previous postoperative changes and mirror phenomenon during surgery. In addition, various challenges may be encountered depending on the type of arthroplasty applied and the disease requiring arthroscopic intervention. Therefore, arthroscopy after shoulder arthroplasty requires experience.

## Keywords

Shoulder · Arthroplasty · Arthroscopy · Total shoulder arthroplasty · Reverse shoulder arthroplasty · Partial shoulder arthroplasty · Arthroscopic surgery

## 44.1 Introduction

- Periprosthetic joint infection, loosening or malposition of components, instability, acromioclavicular osteoarthritis, subacromial impingement, rotator cuff tear, adhesive capsulitis, and synovitis are the common causes of pain after shoulder arthroplasty component [1].

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- Revision of shoulder arthroplasty can be one of the most compelling procedures for the shoulder. The surgeon and patient should be aware of the limited expectations regarding the outcome as well as the likelihood for further operations. Apart from the complications directly related to prosthetic components (loosening, infection, malposition, and fracture); soft tissue stability, impingement and rotator cuff tears are all potential causes of failure after shoulder arthroplasty [2].
- Shoulder arthroscopy is an important tool in the diagnosis and treatment equipment of an orthopedic surgeon [1]. This has changed the management of glenohumeral instability, rotator cuff disease, biceps injury, and other shoulder conditions [2]. In addition to native shoulder problems, arthroscopy can be used as a diagnostic and therapeutic tool in patients with pain complaints after shoulder arthroplasty and in the management of complications [1–4].
- Compared to open surgery, arthroscopy offers several advantages in the management of complications, which can be listed as minimal invasiveness, less soft tissue damage, faster healing, and in some cases better visualization [4].

## 44.2 Indications

- Diagnosis of implant malposition or loosening in cases with pain and/or loss of range of motion and radiological diagnosis remains indecisive. Surgical intervention (e.g., bursectomy and synovectomy) can be performed on soft tissues that cause pain [2, 5].
- Performing biopsy to grow the suspected pathogen in culture to confirm or rule out infection [6].
- Diagnosis and treatment of impingement syndrome (e.g., subacromial decompression and synovectomy) [1, 5, 7].
- Performing capsular release in patients with adhesive capsulitis and/or contracture [1, 7].
- Diagnosis of glenoid loosening and minimally invasive removal of the component [8, 9].

- Diagnosis and treatment of rotator cuff tears [2, 4].
- Subscapular nerve abnormalities [3].
- Diagnosis and treatment of dynamic instability in patients with shoulder instability (e.g., capsular narrowing) [3, 10].
- Loose body excision [4].
- Diagnosis and treatment of septic arthritis [3, 7].
- Diagnosis and treatment of pathological conditions of the biceps (e.g., arthroscopic debridement and biceps tenodesis) [3, 11].
- Diagnosis of polyethylene component dissociation in reverse shoulder prosthesis [12].
- Diagnostic purposes before revision surgery.
- Resection of distal clavicle in the presence of acromioclavicular arthrosis [2].
- Subscapularis insufficiency is one of the complications of shoulder arthroplasty [3, 4, 10]. There are no studies on subscapularis repair or treatment via tendon transfers or allograft after shoulder arthroplasty. However, indications about arthroscopic treatment can be expanded with studies over time.

### 44.3 Contraindications

- In cases where it is obvious that definitive treatment will require an open procedure, arthroscopy should be considered futile and therefore relatively contraindicated [3].
- If removal of glenoid component is to be performed, it is relatively contraindicated if the portal needs to be enlarged in order to remove the glenoid component (e.g., metal-backed component); or the glenoid bone loss is so extensive that the humeral head cannot be contained into the glenoid after removal of the glenoid component [8].
- In rotator cuff repair, arthroscopic approach is applied by avoiding the surface of the humeral component and by modifying the insertion point of the suture anchors if necessary. This can cause difficulties [4]. In case of suspicion about the suitability of rotator cuff repair for arthroscopy in preoperative planning, open repair could be planned.

### 44.4 Author's Preferred Technique

#### 44.4.1 Preoperative Planning

- General principles of arthroscopy are often applicable in shoulder arthroplasty patients. Preoperative physical examination, skin suitability, surgeon's experience, and appropriate patient position selection according to the planned surgery may ease surgery. Preoperative plain radiographs can assist the surgeon in surgical planning and working diagnosis. Preoperative computed tomogra-

phy (CT) and magnetic resonance imaging may be helpful in detecting bone and soft tissue conditions. However, metal artifacts caused by arthroplasty implants may hamper such benefits [13, 14].

- Surgery can be performed using a standard 4.0-mm 30°-arthroscope. A 4.0-mm shaver is required in cases where bursectomy and/or synovectomy will be performed. In addition, probe, grasper (for loose body excision), curette, and radiofrequency ablation probe may be required as components of routine shoulder arthroscopy.
- In cases where subacromial decompression is required, a 4.0-mm burr may provide practicality to the surgeon. Again, plastic working cannulas can be used in rotator cuff repair and inserted through the anterior portal to avoid scratching the implants. In addition, anchor and/or transosseous sutures may be required for rotator cuff repair. An osteotome should be available to remove the glenoid component.
- A shoulder table should be employed in the beach chair position, while a traction device is necessary in the lateral decubitus position. Special care should also be taken not to scratch the arthroplasty implants. Poor maneuverability of the arthroscope may also complicate this situation in the presence of postoperative adhesions. New needle-sized 0°-arthrosopes may aid surgery by facilitating joint maneuvering and avoiding mirror phenomenon [4].

#### 44.4.2 Patient Positioning

- While performing shoulder arthroscopy in arthroplasty patients, either of the lateral decubitus and beach chair positions can be used [4, 5, 8]. The surgical procedure to be applied is important in selecting the position. Both positions could be selected if diagnostic arthroscopy and biopsy will be performed. In the beach chair position, instability examination can merely be performed by moving the arm since the arm is not fixed from the contralateral side. In order to get access to the surgical site without damaging arthroplasty implants, the joint space can be expanded by lateralizing the humerus. Moreover, mobility of the humeral head may provide convenience to the surgeon during removing the glenoid component.
- Surgical anesthesia can be performed through general or scalene block anesthesia. General anesthesia may be more advantageous because the patient remains immobile in the beach chair position.

#### 44.4.3 Portal Design

- *Posterior portal:* Standard shoulder arthroscopy is performed with the posterior portal, the first imaging portal.

It is located 1.5–2 cm inferior and 1 cm medial to the acromion's posterior edge. In arthroplasty cases, this portal can be placed more proximal than the traditional posterior portal, typically 1 cm below the lower surface of the posterolateral acromial corner, to avoid the widest part of the humeral head [4].

- *Anterior portal:* The rotator interval portal in standard shoulder arthroscopy is used. This portal can be created with an outside-in technique and under direct visualization. When appropriate, aligning the anterior portal with the previous deltopectoral incision may reduce additional wound scarring. This portal is used for diagnostic arthroscopy, examination of glenoid component loosening, and biopsy.
- *High anterior portal:* This portal is used in cases where the glenoid component should be excised and removed, and the osteotome is placed in this portal [8].
- *Lateral, anterolateral, and posterolateral portals:* These portals are useful for subacromial bursoscopy and particularly for subdeltoid and subacromial contracture release and arthroscopic rotator cuff repair.
- All of the implant factors including its type, size (also components), or localization contribute to the level of difficulty experienced during arthroscopic assessment of the joint [3]. In fact, the glenohumeral joint space may be slightly displaced (e.g., it becomes lateralized in the reverse shoulder prosthesis) depending on the characteristics of the arthroplasty and the surgical application. Therefore, it may be necessary to slightly modify the localization of the portals in arthroplasty patients.

#### 44.4.4 Step-by-Step Description of the Technique

- The location of the posterior portal is determined while the patient is in the beach chair position. A blunt cannula is used to avoid damaging the implants.
- While opening the posterior portal, slight lateral traction on the humerus facilitates entry into the glenohumeral joint when the arm is adducted and internally rotated [2].
- The posterior cannula is directed to the superior side of the joint at the entrance to minimize scratching of the implant [15]. At the same time, translation of the humeral head in the sagittal plane and identification of the joint space before the opening of the posterior portal helps the surgeon to guide insertion of the posterior cannula.
- After the posterior portal was opened, a 4.0-mm scope is placed into the cannula and the joint is inflated with constant pressure via an arthroscopy pump. Visualization is provided.
- Afterward, the position of the anterior portal in the rotator interval is determined with the help of a spinal needle.

Then, a blunt cannula is inserted with the outside-in technique. The cannula should be carefully reinserted under direct vision with arm traction to avoid damaging the prosthesis [2].

- Due to adhesions that occur after arthroplasty, however, it may not be possible to provide imaging, especially in cases with capsular fibrosis. In such cases, it may be necessary to open the anterior portal blindly with the outside-in technique [7].
- After the anterior portal is opened, the visual field can be increased by cleaning the intra-articular tissues with the help of a shaver. In patients with capsular fibrosis, it may be necessary to loosen the capsule by inserting the probe of the radiofrequency ablation device into the joint. This allows the joint to open slightly, providing higher exposure. This procedure is repeated until a sufficient range of motion is achieved [2, 7].
- View and orientation may be difficult due to the mirror phenomenon on the metal implant. It can be challenging even for experienced surgeons. Therefore, it may be beneficial to change the direction of the camera to the opposite direction of the metal humeral head or the glenosphere [2, 4].
- Afterward, intra-articular diagnostic arthroscopy or dynamic joint instability examination can be performed. Surgical procedures for the planned treatment are followed after diagnostic arthroscopy.
- *Biopsy:* In cases where joint biopsy will be performed, joint fluid is aspirated without giving antibiotics to the patient. A single dose of prophylactic antibiotics can then be administered. Soft tissue samples should be taken from different points, and if possible, also from the metal-implant and implant-bone interfaces [7, 15]. The samples should then be immediately cultured in the operating room environment.
- *Glenoid component loosening examination and removal:* Similar to the technique described by Bonutti et al., the loosening of the glenoid components can be evaluated by placing a probe between the polyethylene and the glenoid surface [9]. In cases where removal of the glenoid component is planned due to loosening, the location of the high anterior portal is determined via spinal needle. The glenoid component can be removed by dividing it into three separate parts using the technique described by O'Driscoll et al. with the aid of an osteotome inserted through this portal [8].
- *Subacromial bursoscopy, subacromial decompression, and rotator cuff repair:* The cannula in the standard posterior portal is moved to the subacromial region. Lateral portal is opened in cases where debridement or subacromial decompression will be performed. Shaver-assisted debridement and burr-assisted decompression could be performed. Additional portals may be required for rotator cuff repair or distal clavicle resections.

- After surgery, a negative pressure drain is placed into the joint through one of the portals.

#### 44.4.5 Complications and Management

- Infection may occur after arthroscopy.
- There is a risk of compartment syndrome secondary to fluid extravasation after arthroscopy. In order to reduce this risk, care should be taken and pump devices that provide constant pressure and continuous flow should be used. The device should be set to minimum pressure and flow rates that allow for intra-articular visualization.
- Crashing of arthroscopic instruments is one of the complications of arthroscopy. Extra caution should be exercised due to the presence of mirror phenomenon in arthroplasty patients and limitation of joint maneuver in patients with joint capsular fibrosis.
- The risk of scratching implants and components is another problem. No complications related to this condition have been reported [4]. Theoretically, however, an eroded or uneven humeral component articulated with a polyethylene glenoid component may increase polyethylene erosion and the risk of premature failure of the prosthesis [8]. Therefore, care should be taken to protect the implant components.
- Periprosthetic fracture may occur during arthroscopy [3]. It is necessary to avoid excessively compelling maneuvers and be careful while performing arm movements.

#### 44.4.6 Postoperative Care

- The drain is removed on postoperative day 1.
- The sutures are removed during outpatient visit after 2 weeks.
- Postoperative follow-up may vary depending on the arthroscopic treatment applied.

### 44.5 Summary

- Arthroscopy offer advantages to the surgeon in the management of complications of shoulder arthroplasty.
- Limited studies with small sample sizes exist on shoulder arthroscopy in arthroplasty patients. Indications and advantages of arthroscopy may be expanded with the designation of devices and studies over time.
- The surgeon's training and skill level in arthroscopy after arthroplasty are particularly important in alleviating its

specific problems. It is important to note that success rates will escalate if a highly skilled surgeon with a wealth of experience in performing arthroscopy undertakes arthroscopy of all prosthetic joints [3].

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