Arthroscopic Screw Removal After Arthroscopic Latarjet Procedure

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Abstract: Arthroscopic Latarjet procedure is an efficient and reliable approach for the treatment of shoulder instability. Nevertheless, the screws fixing the bone block may sometimes be responsible for pain and uncomfortable snapping in the shoulder that is triggered during active external rotation. We propose an all-arthroscopic technique for screw removal in cases of complications involving the screws from a Latarjet procedure. The all-arthroscopic screw removal is reliable and efficient. This procedure is indicated in more cases than thought because of the bone block resorption. It permits a revision of the glenohumeral joint in case of persisting pain.

Shoulder dislocations and anterior instability are frequent conditions in young athletes. This population represents 90% of the shoulder dislocation population. The Latarjet procedure (arthroscopic or open) is a reliable and efficient technique to treat anterior shoulder instability.[1] First performed in 2005, the technique was published in 2007.[2] Since then, it has evolved considerably, continues to evolve, and has become reliable and reproducible.[3,4]

Nevertheless, several complications[5] have been reported, for example, dislocation recurrence, bone block fractures, bone block lyses,[6] bone block malposition,[7] posterior pain on the tip of the screw, or muscle ache in the infraspinatus due to a conflict on the screws.[8]

We are presenting our technique to remove the screws when they become inconvenient, or painful,[9] if the bone block has secondarily moved, or in any need of revision,[10,11] such as the need to change the bone block from the coracoid process to an iliac crest bone block.[12]

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Surgical Technique

Anatomy

This surgical procedure does not only take place in the glenohumeral joint but further anteriorly, in the area we call the anterior shoulder (Video 1). We defined the areas of the shoulder linked to the vicinity of the neurovascular structures (Fig 1): the anterior shoulder, the posterosuperior shoulder, and the inferior shoulder.

Three lines starting at the center of the glenoid define these 3 areas. The anterior shoulder is between the lines going to the base of the coracoid and to the inferior border of the subscapularis muscle (SSC). Those going to the base of the coracoid and to the teres minor muscle define the posterosuperior shoulder. And those going to the teres minor muscle and to the inferior border of the SSC define the inferior shoulder.

The anterior shoulder contains the brachial plexus and the axillary artery and branches, and the posterosuperior shoulder contains the suprascapular nerve and the supraclavicular brachial plexus. The inferior shoulder contains the axillary nerve. The anterior shoulder is where most of the extra-articular endoscopic surgeries take place (e.g., large SSC tears, arthroscopic Latarjet, revisions of Latarjet with iliac crest bone blocks, arthrolysis).

In the procedure to remove the screws, most of the work is performed in the anterior shoulder, which often involves identifying and dissecting the brachial plexus

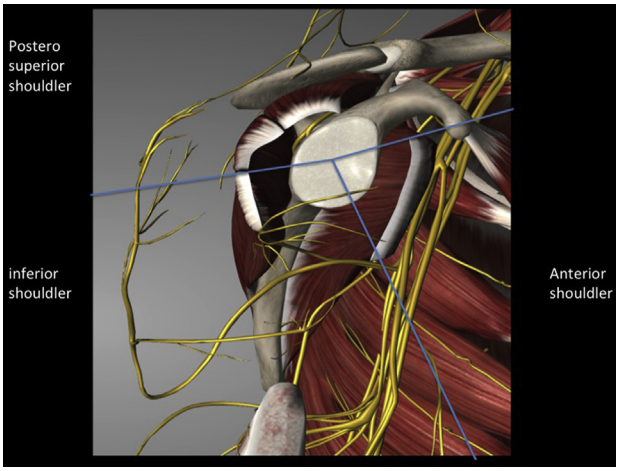

Fig 1. Anatomic representation of the compartments of the shoulder. From a sagittal plane, 3 lines starting from the center of the glenoid divide the shoulder into 3 compartments: the anterior shoulder, the posterosuperior shoulder, and the inferior shoulder.

and terminal branches so as not to damage it during the procedure.

Equipment

To remove the 3.5-mm coracoid cannulated screws and their top hats, we use the following equipment: 1 glenoid K-wire, one 2.5-mm cannulated screw driver, one 3.5-mm cannulated coracoid screw, 1 top hat screwdriver, and 1 Trump cannulated pushing device. All the instruments we use are from DePuy Mitek (Raynham, MA).

Procedure

To ease the reproducibility of the procedure, the technique is divided into 4 steps. The surgery is performed under general anesthesia, associated to an interscalenic block. The patient is positioned in a beach chair position without any traction on the arm, to allow a mobilization of the upper limb during the procedure. This requires the help of an assistant dedicated to this matter. Table 1 explains the tips, pitfall, and key points of this technique.

Table 1. Tips and Pitfalls

Tips	Portal placements: Use a needle to place the portal under endoscopic control, adapting to the anatomy
	Place the M portal perfectly in the axis of the screws, using a K-wire to determine the direction
	Use a switching stick to retract the subscapularis in steps 2 and 3
	Use the Trump (pushing device) to push the screw while unscrewing it
	Use radiography and preoperative computed tomographic scan to evaluate the position and direction of the screws
Pitfalls	Screw breaking
	Difficulty of subscapularis dissection
	Adhesions with the axiliary nerve
Key points	Switch the optic portal from posterior to lateral
	Expose the subscapularis
	Locate the axillary nerve
	Use K-wire and pushing device
	Never try to place the K-wire without using the coracoid screw
	Keep the K-wire in place until the top hat is grabbed

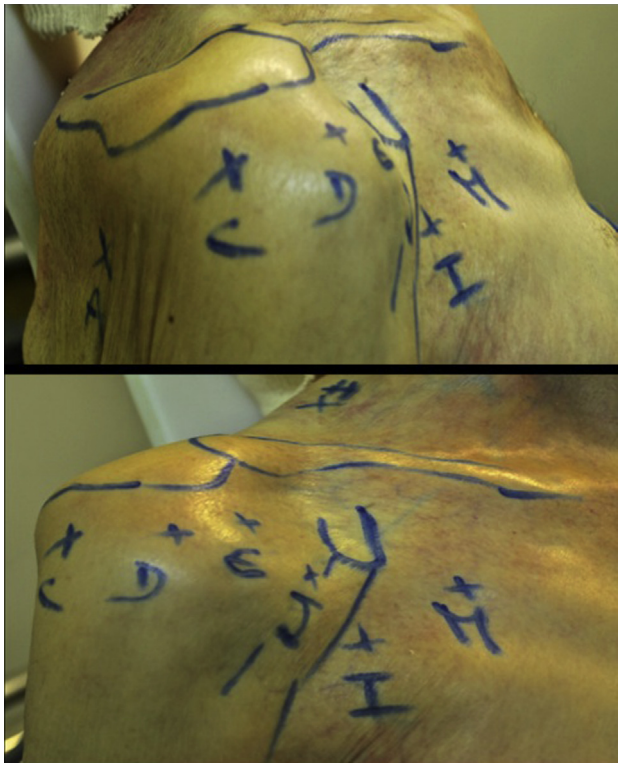

Fig 2. Arthroscopic Latarjet approaches in the right shoulder. Portal A: posterior view. Portals D and E: lateral view, exposition with switching stick, instrumental portal. Portal M for the split, and the specific instruments for screw removal.

Four arthroscopic approaches are used. As shown in Figure 2, the A portal is the posterior optic approach in the soft point. The D portal is the anterolateral approach, parallel to the upper border of the SSC and lined up with it. It is used to visualize the bone block, find out the split in the SSC, dissect the anterior and posterior faces of the SSC, and expose the screws.

The E portal is the anterior approach placed in the rotator interval. It is a useful approach for visualization from the anterior. It allows the use of a switching stick, which improves the exposition when used as a retractor. The M portal, medial to the conjoint tendon, is used to spot out the infraclavicular brachial plexus, with which there are a lot of adhesions in this context of revision. It helps to improve the split in the SSC and to unscrew the screws and top hat with the adapted screwdrivers.

First Step: Exploration of the Joint

It is an essential step to spot out the bone block, evaluate its dynamic stability,[13] and the aspect of the anterior and posterior labrum.

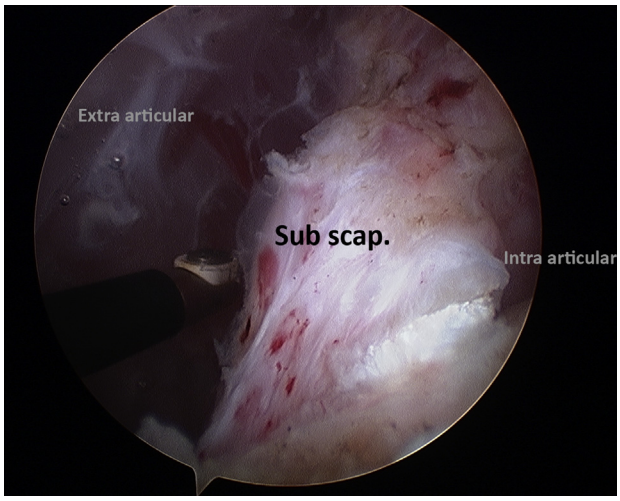

Fig 3. Exposition of the upper border of the subscapularis muscle in the left shoulder, lateral view, in the axis of the subscapularis. The upper border and anterior aspect of the subscapularis muscle is dissected to find the level of the split and reproduce it. Through the split, the hardware will be exposed and removed. The portals used to perform this step are A, C, D, and E.

Second Step: Exposition of the Screws

1. The arthroscope is now placed alternatively in the A and E portals.
2. Next, the rotator interval is opened and the fibrosis from the anterior and posterior faces of the SSC is dissected (Fig 3).

The anterior capsula and a neo–middle glenohumeral ligament are most commonly reconstituted in the context of revision. Both these structures are opened and reclined from the 2 o'clock to the 5 o'clock position at the anterior face of the bone block to expose the screws.

3. To ease this dissection, the switching stick is placed in the E portal in the space between the bone block and the SSC to retract the SSC anteriorly, which will increase the working space before the bone block and the screws (Fig 4).

Third Step: Exposition of the SSC and the Split

1. First, the lateral border of the conjoint tendon is exposed.
2. The arthroscope is then switched from the A to the E portal using the switching stick.
3. Through the M portal, the radiofrequency device is used to dissect the infraclavicular plexus and to perform the split in the SSC in front of the bone block. At this stage of the procedure, the surgeon must be perfectly aware of the position of the axillary nerve, which represents a great danger while doing the split in the SSC. The size of the split can be smaller than during the first procedure.
4. The radiofrequency device is then passed through the split to complete the exposition of the screws (Fig 5).

Fourth Step: Removal of the Screws and Top Hats

1. A long 3.5-mm cannulated fixation screw (DePuy Mitek) is placed through the M portal and brought in front of the inferior screw (Fig 6).
2. Through this cannulated screw, we introduce a long K-wire that we push through the bone block, the glenoid, and the skin at the posterior aspect of the shoulder (Fig 7A). This step must be performed smoothly, so as not to break the K-wire. If any resistance is felt, the axis must be checked before continuing.
3. The long 3.5-mm cannulated screw is then removed, and the K-wire remains (Fig 7B).

Fig 4. Representation of the setup showing the switching possibility in the left shoulder. The arthroscope is in the A portal, the radiofrequency device in the E portal, and the switching stick in the D portal, which is used as a retractor to expose the space in which the radiofrequency device works. The switching stick can be placed anywhere under vision control, and then the arthroscope cannula will be placed over it, with the arthroscope switched to this new position.

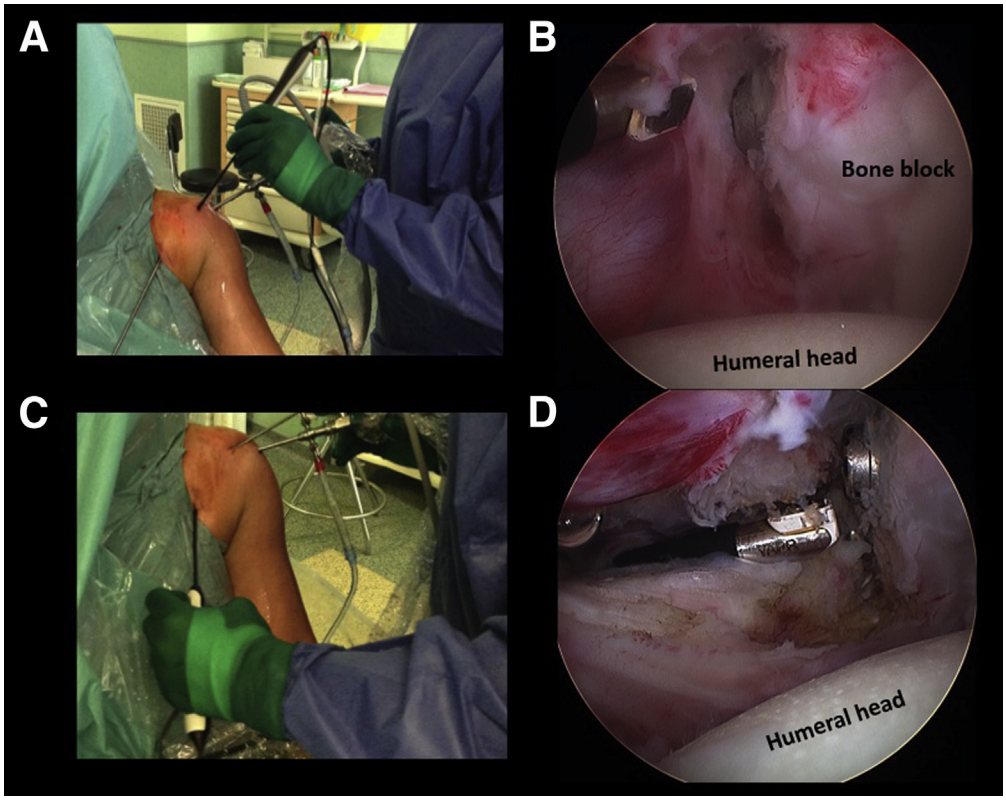

Fig 5. Exposition of the screws in the left shoulder with the patient in a beach chair position. (A and B) Using the radiofrequency device in the E portal and the arthroscope in the A portal, the rotator interval is opened and the subscapularis exposed. Then the space around the bone block is dissected, and the screws are exposed using alternatively the radiofrequency and the shaver device. (C and D) The position of the radiofrequency is switched to the M portal, its direction now anterior to posterior, perpendicular to the axis of the subscapularis muscle. The split is found, dissected, and opened. The visualization portal can be C or E, enabling the arthroscope to switch from an extra-articular to intra-articular view. The screws' exposition is thus completed.

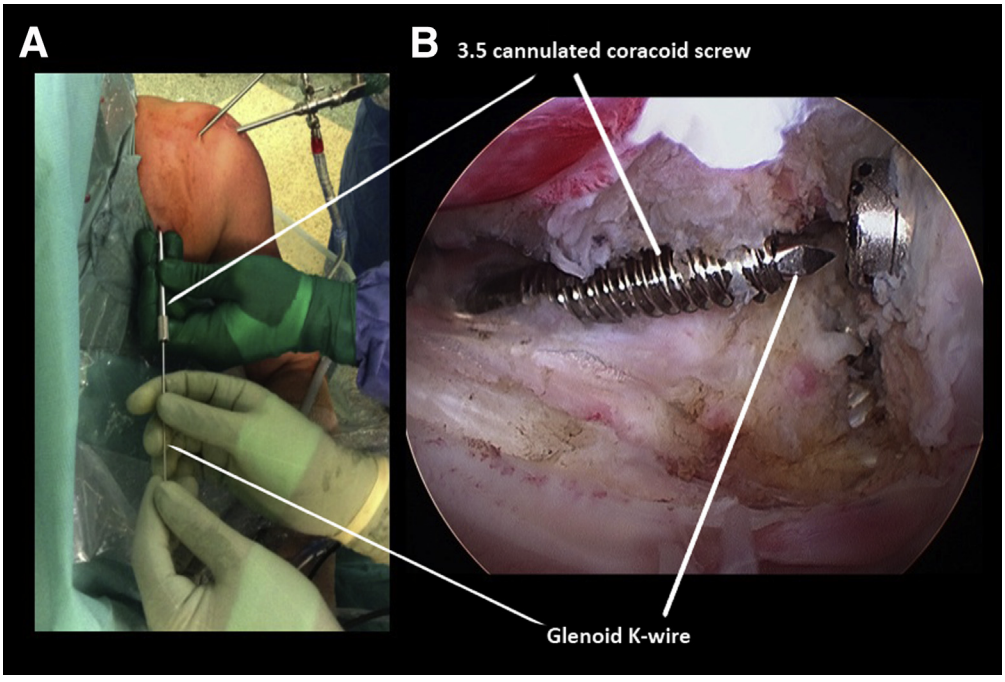

Fig 6. Introduction of the 3.5-mm coracoid cannulated fixation screw through which the K-wire that will be used to find the axis of the screw is inserted. Left shoulder: lateral view. (A and B) A 3.5-mm cannulated coracoid screw is introduced through the M portal, with a K-wire in it. The cannulated coracoid screw helps to safely guide the K-wire to the screw thought the split. The K-wire is then placed in the axis of the screw and pushed through it.

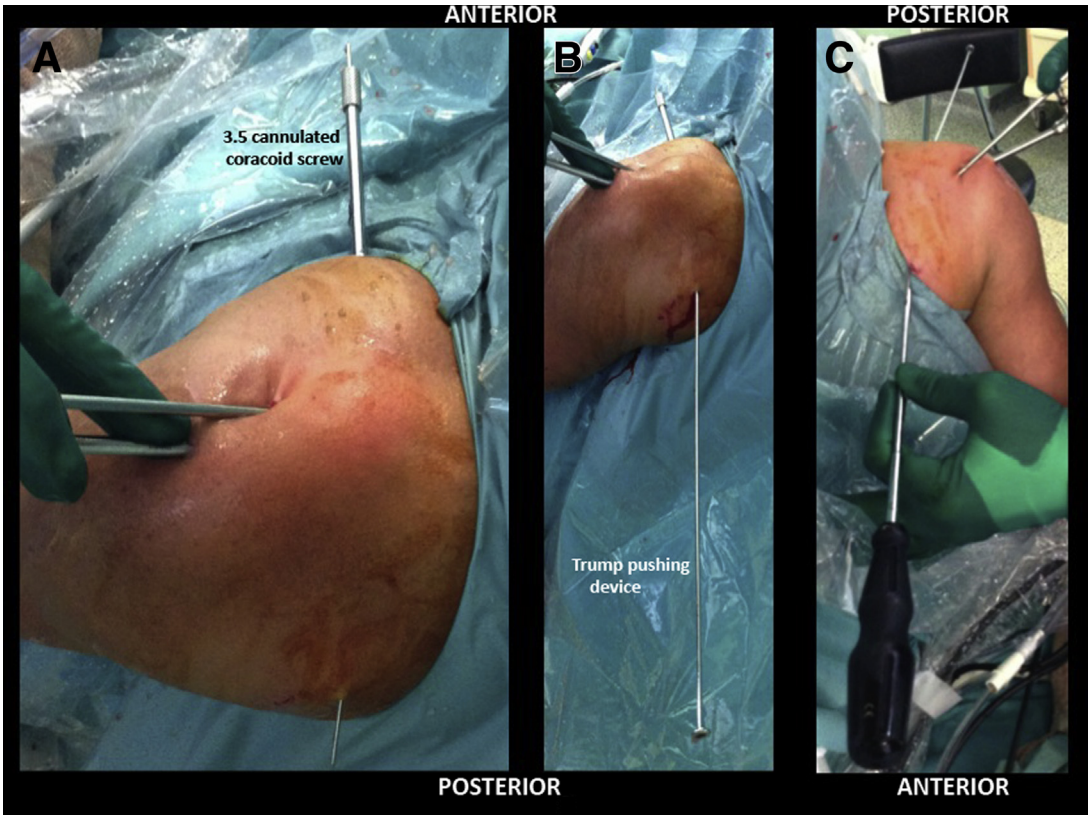

Fig 7. Use of the pushing device. (A) The K-wire is pushed through the skin posteriorly, following the axis of the screw. (B) A cannulated pushing device is introduced posteriorly on the K-wire and will be used to push the screw forward while it is unscrewed anteriorly. (C) The fixing coracoid cannulated 3.5-mm screw is removed, and the screwdriver is introduced on the K-wire.

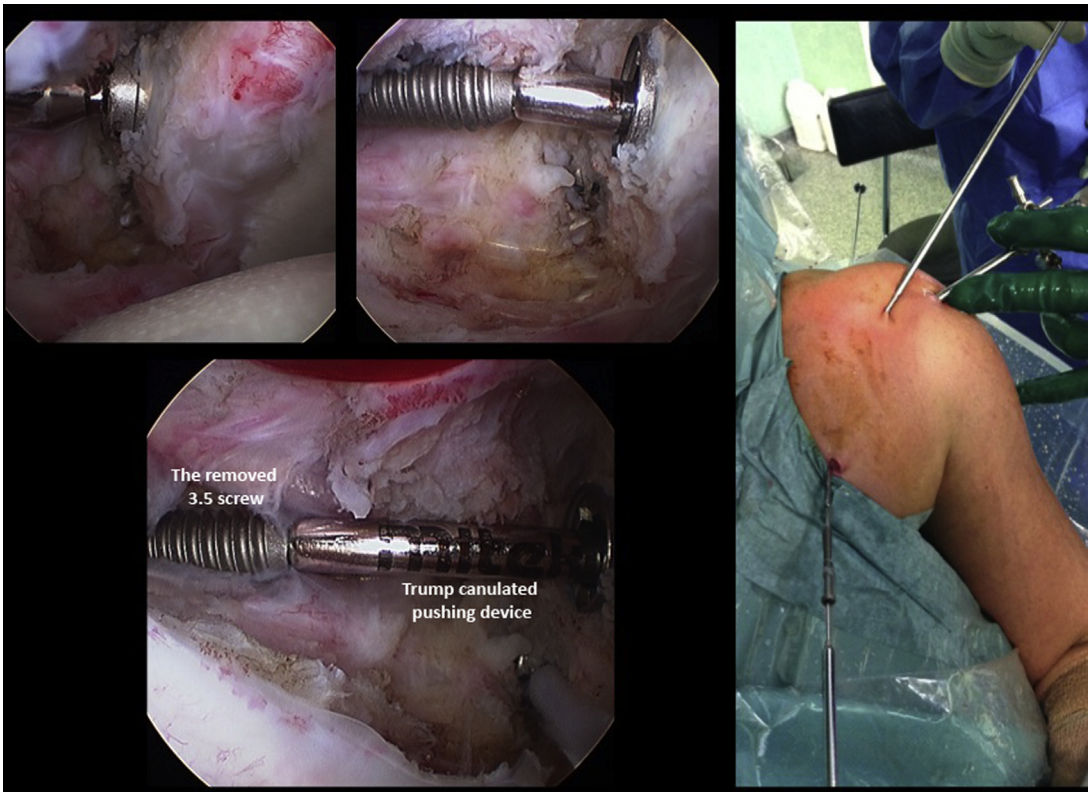

Fig 8. Removal of the screw in the left shoulder with the patient in a beach chair position, lateral view. A combined movement is performed unscrewing and pushing the screw from the posterior with the pushing device.

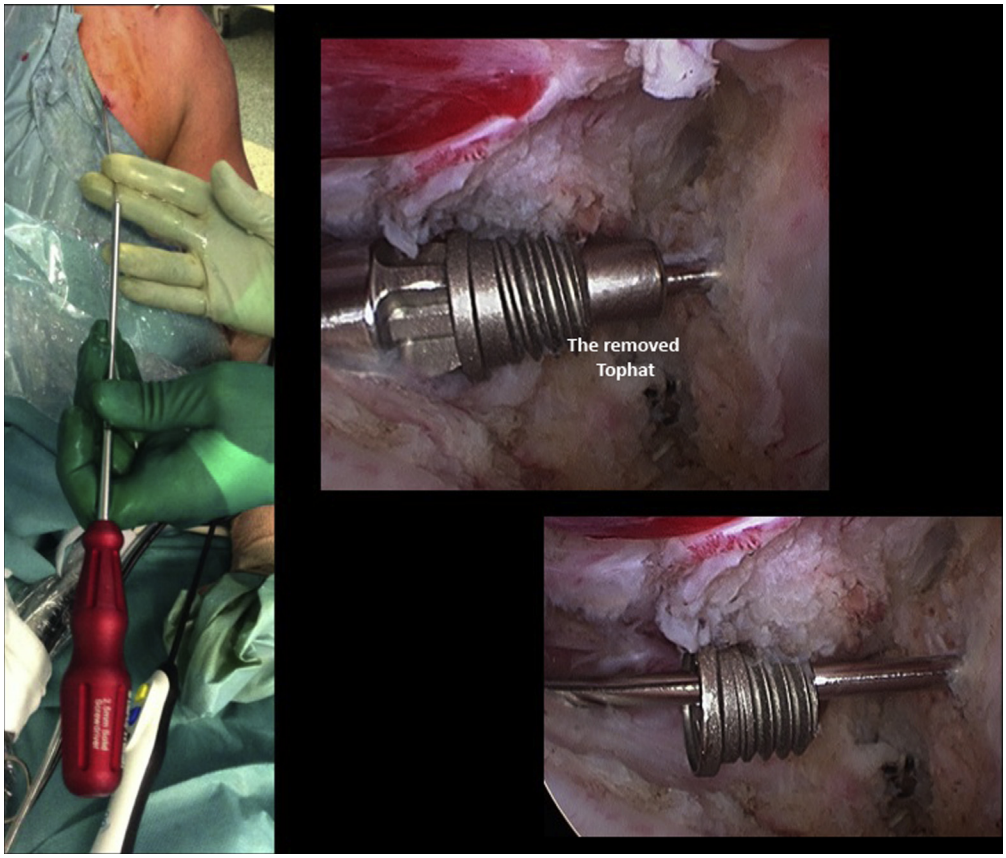

Fig 9. Unscrewing the top hat: In this step, a different screwdriver is introduced and the top hat is unscrewed. The K-wire must not be removed until the graspers securely grab the top hat.

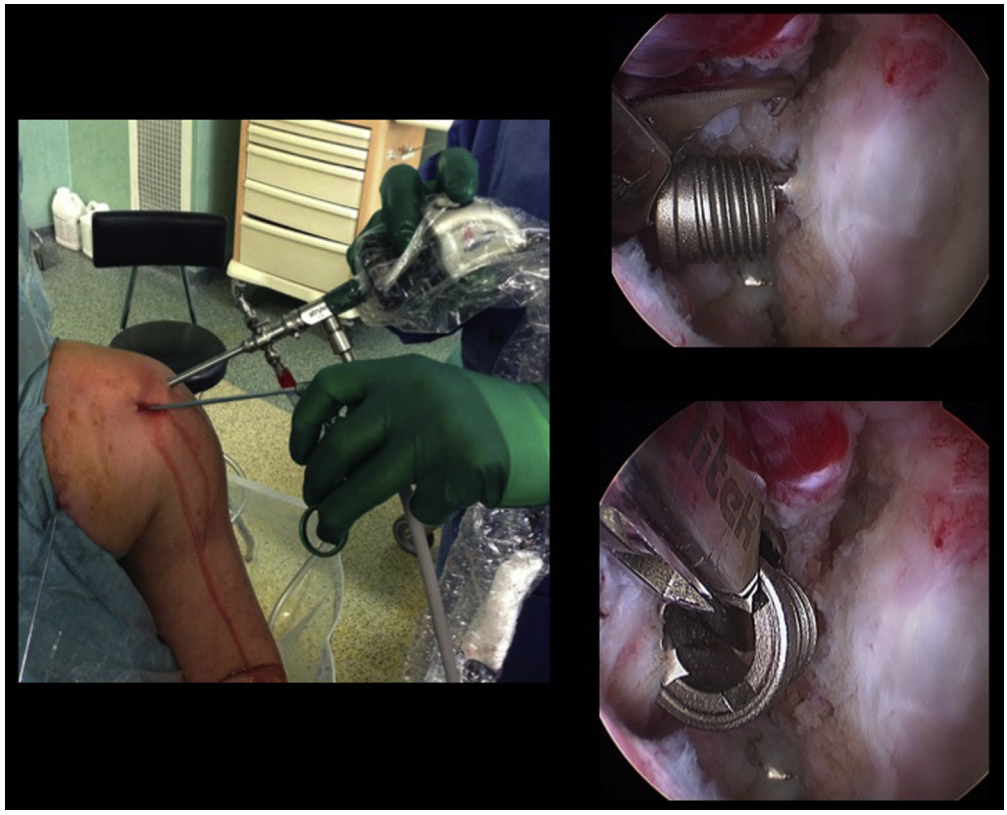

Fig 10. Removal of the top hat through the E portal.

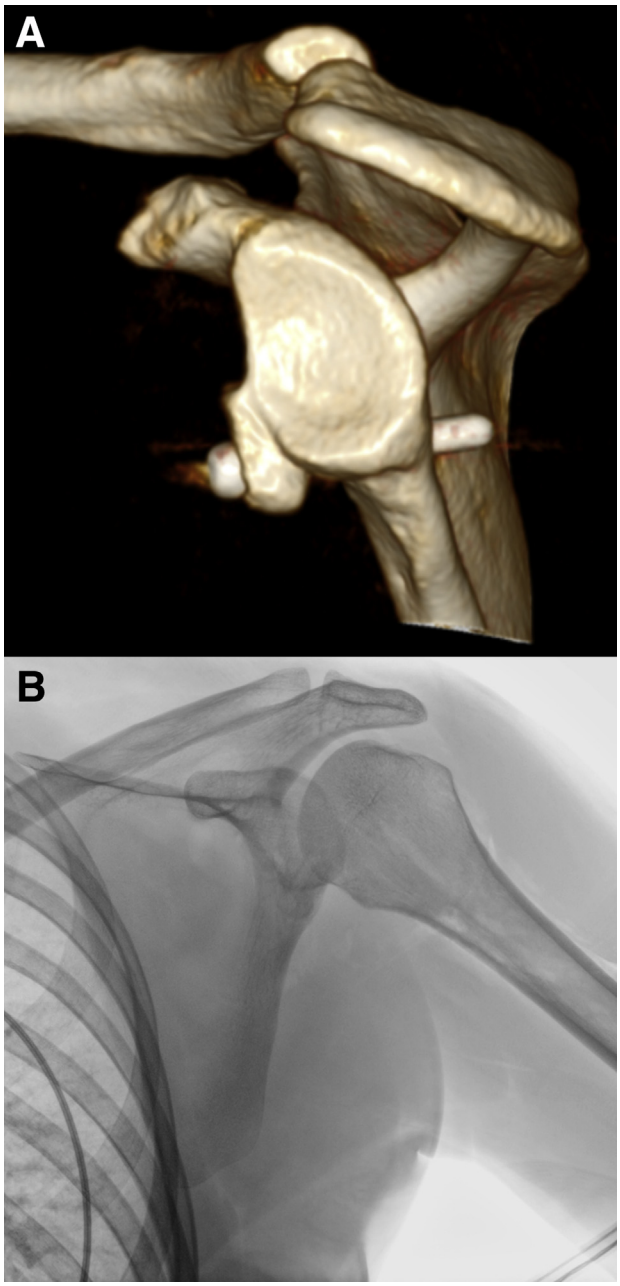

Fig 11. Preoperative computed tomographic scan 3-dimensional reconstruction showing a too long inferior screw (A) and postoperative radiograph (B).

4. The cannulated screwdriver (DePuy Mitek) specific for the bone block screws is placed on the K-wire (Fig 7C), keeping in mind the axis all along.
5. Meanwhile, the pushing device (DePuy Mitek) is introduced posteriorly on the K-wire (Fig 7B). This device is cannulated, its diameter smaller than the screw's, and will enable to push on the screw posterior to anterior while it is unscrewed.
6. Two coordinated motions are then performed: unscrewing the screw from the front and pushing on it from the rear. The screw is thus extracted through the M portal (Fig 8).
7. Next, a second screwdriver, specific for the top hat, is introduced (DePuy Mitek). The top hat is then unscrewed. So as not to lose the top hat in the shoulder, the K-wire must remain until the grasper securely grabs the top hat (Fig 9).
8. As soon as the top hat is completely unscrewed, a grasper is introduced superiorly through the E portal to grab the top hat. When the grasp is stable and reliable, the K-wire is backed up a few inches away through the M portal and the top hat removed through the E portal (Fig 10).
9. The wire must not be removed completely from the M portal at this stage, because it will be needed to remove the second screw and top hat. It must indeed remain under visual control, because there is a great risk of damage to the nerves around, particularly the axillary nerve.[14]
10. The exact same procedure is repeated for the second screw and top hat, with no need to again introduce the K-wire trough the M portal because it was left in place all along (Fig 11).

Discussion

A conflict between the upper screw and the SSC is frequent at this stage, triggering a clicking sensation in active external rotation, often painful for the patients. We believe the osteolysis of the upper part of the bone block has a biomechanical meaning. Indeed, the relationship between the humeral head and the bone block is mostly on the inferior part of the bone block. The lack of pressure against the upper part of the bone block is probably responsible for its osteolysis. The second hypothesis is that the vascularization of the bone block may come from the conjoint tendon, which is attached to the lower part of the bone block (tip of the coracoid process). We are currently studying these 2 hypotheses.

In some of our first cases of arthroscopic Latarjet, the screws were too long.[15] In a few cases, this was responsible for a conflict posteriorly with the suprascapular nerve at the spinoglenoidal notch, responsible for pain, and sometimes infraspinatus muscle palsy, which recovered after screw removal.[16,17]

Table 2. Indications and Contraindications

Indications	Pain on the tip of the screws, posterior pain, bone block lyses
Contraindications	None
Risks	Axillary nerve, musculocutaneous nerve, cartilage lesion, damage on the subscapularis
Advantages	Endoscopic control of stability, endoscopic evaluation of arthritis
	Easier dissection, smaller split on the subscapularis

One of the limits in our results is that the relief of the patients' symptoms (pain and click sensation) might come not only from screw removal but also from the arthrolysis performed while dissecting the anterior shoulder. We have no way of determining which part of the operation is the most effective in patients' symptom relief.

A very positive and unique aspect of our all-arthroscopic screw removal technique is that it permits an exploration of the shoulder in cases of persisting pain in the unstable shoulder. The surgeon can assess the absence of conflict between the bone block and the humeral head and look for osteoarthritis. It will also allow an arthrolysis procedure and provide extra range of motion in case of shoulder contracture. Table 2 summarizes the indications, contraindications, risks, and advantages of this technique.

Several authors have reported hardware removal but mainly in cases of painful open reduction internal fixation for proximal tibial or humerus fractures. In most of the cases, these procedures were performed along with an arthroscopic arthrolysis.[18-20] An arthroscopic removal of a Bristow hardware was described in 1990.[9]

Our technique is different from these because it is performed for a specifically arthroscopic designed hardware after an all-arthroscopic Latarjet technique. However, it seems similar to any other arthroscopic hardware-removing technique because it enables the surgeon to perform associated arthroscopic diagnosis or arthrolysis.

The arthroscopic Latarjet procedure is safe and reliable. It is reproducible in the hands of experienced arthroscopic surgeons. The technique is nevertheless constantly evolving, with the modification of a few steps and the improvement of technical devices. We have had few complications in our series of arthroscopic Latarjet procedures; nevertheless, screws can sometimes be a concern. We show how to safely and simply manage screw removal procedures, when needed.

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