



# Arthroscopic and Endoscopic Technique for Subcoracoid Synovial Chondromatosis of the Shoulder Through a Medial Transpectoral Portal

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**Abstract:** Synovial chondromatosis of the shoulder is a rare disorder characterized by metaplastic synovial proliferation, causing multiple loose bodies usually localized intra-articularly. Surgical treatment with open techniques through a deltopectoral approach has been commonly used. The evolution of arthroscopy has allowed a complete joint assessment and the extraction of intra-articular loose bodies with less morbidity than open techniques. Nevertheless, this pathology occurs less frequently in the subcoracoid bursa. Access to this bursa may be more complicated when extracting loose bodies that cause pain and functional limitation in performing activities of daily living. We describe an arthroscopic and endoscopic technique for the treatment of subcoracoid synovial chondromatosis through a medial transpectoral portal, allowing safe loose body extraction under direct visualization around the coracoid process and brachial plexus. The literature was reviewed, and benefits of this endoscopic technique were analyzed.

Synovial chondromatosis is a disorder that affects the synovial tissue of the joints, characterized by the production of cartilaginous nodules in the synovial membrane, joint cavity, and tendon sheaths due to metaplastic proliferation.<sup>1</sup> These nodules, called loose bodies, are of different sizes, compromise mobility, and cause joint pain. The shoulder joint is rarely affected by this pathology, presenting multiple loose bodies, mostly intra-articular, that limit function and produce pain. Larger loose bodies can cause irreversible damage to the articular cartilage. Imaging studies such as radiography, tomography, and magnetic resonance imaging can specifically evidence the location of free bodies. If

conservative treatment fails, surgical treatment should be considered. Extraction of loose bodies from the bursa and/or intra-articular loose bodies can be performed in an open or arthroscopic manner. The latter is considered the best option in most cases because it is less invasive and permits easier fragment visualization.

This article presents an arthroscopic and endoscopic technique for the treatment of synovial chondromatosis in the subcoracoid bursa, using the medial portal to the coracoid (M portal), to obtain direct access to extract the loose bodies. In addition to the advantages of the arthroscopic surgical procedure, this medial approach offers good visualization of the plexus after pectoralis minor release, therefore allowing the reduction of any potential damage to the brachial plexus owing to optimal visualization of the musculocutaneous nerve and axillary nerve.<sup>2</sup>

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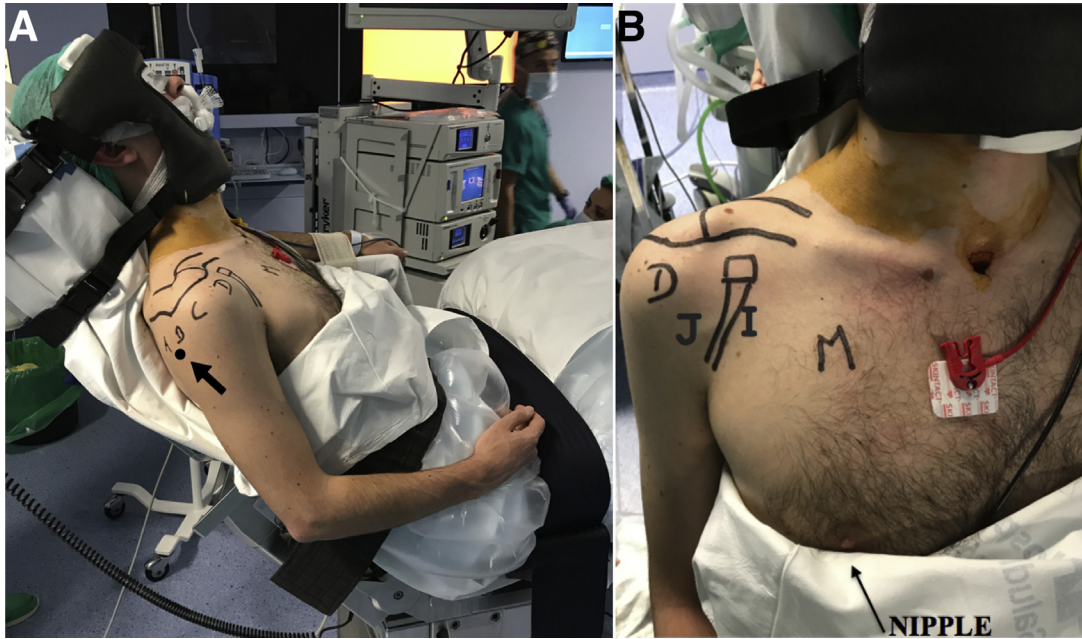
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## Surgical Technique

The main indication for the use of this technique is working medially to the coracoid process in patients with synovial chondromatosis of the shoulder, in whom loose bodies in the subcoracoid bursa produce functional limitation and pain with internal rotation. Under general anesthesia and previous interscalene plexus block, the patient is placed in the beach-chair position without arm traction, with specific head and neck holders to prevent any undesired movement. Surface landmarks for the

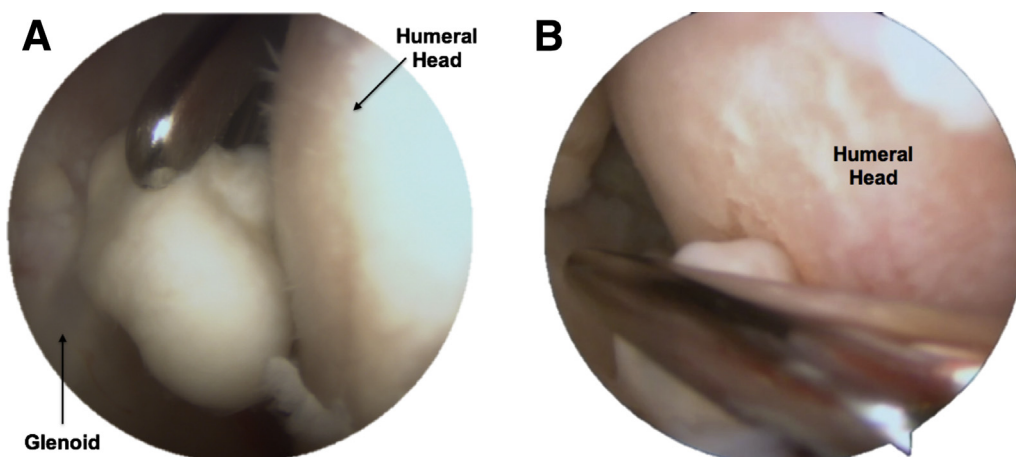


**Fig 1.** (A) The patient is placed in the beach-chair position. The bone references and standard arthroscopic portals in the right shoulder are marked on the skin (A, posterior standard portal, B posterolateral portal, C lateral portal, D anterolateral portal). The 7-o'clock portal is indicated as an accessory portal (arrow). (B) In a frontal view of the right shoulder, the transpectoral portal (M portal) is located 4 to 6 cm medial to the anterior axillary fold, in a vertical line with the nipple. The 2 accessory frontal portals are the anteroinferior portal (J portal) and I portal performed at the tip of the coracoid process, just in front of the origin of the conjoint tendon.

underlying bony anatomy are marked on the skin before the operation is started (Fig 1A). Anterior (E), posterior (A), anterolateral (D), and posterolateral (B) arthroscopic portals are used. Placement of the I portal (in front of the coracoid process) and J portal (anteroinferior portal) is then performed to develop a medial portal (M portal), which is mainly used to have direct access to the subcoracoid area (Fig 1B).

### Step 1: Intra-articular Approach

Viewing is started through a standard posterior portal with a 4.0-mm 30° arthroscope. An anterior portal (E portal) is created at the level of the rotator interval (RI) using an outside-in technique. The superior intra-articular loose bodies are located and later extracted with a grasper (Fig 2A, Video 1). This is followed by axillary pouch evaluation from the standard posterior portal, and loose bodies are removed by means of an additional 7-o'clock portal.



**Fig 2.** (A) The patient is in beach-chair position, right shoulder. Viewing from the posterior arthroscopic portal in the glenohumeral joint, the loose body is extracted with a grasper through the standard anterior working portal. (B) Viewing from the posterior arthroscopic portal, the free bodies located in the axillary pouch are removed through the 7-o'clock portal.

**Table 1.** Pearls and Pitfalls of Arthroscopic and Endoscopic Technique for Subcoracoid Synovial Chondromatosis of Shoulder Through Medial Transpectoral Portal**Pearls**

- Open the RI widely. Create enough room lateral to and in front of the conjoint tendon.
- Create a J portal for improved visualization. Use a switching stick to avoid becoming lost during your initial cases.
- From the J viewing portal, using an outside-in technique, create an I portal just in front of the tip of the coracoid process.
- From the I viewing portal, using an outside-in technique, create the M portal medial to the tip of the coracoid process and in line with the nipple. Use a blunt trocar to dissect the pectoralis major, and aim at the tip of the coracoid process to avoid damaging the brachial plexus.
- Switch the camera from the J portal to the I portal. Note that this allows better visualization in front of the coracoid, as well as medially and/or laterally and under it. Use a water pump initially to improve visualization, but do not overuse high pressures. Note that the bleeding areas are commonly on the medial and lateral sides of the base of the coracoid. Use a radiofrequency device facing laterally.
- Once you have detached the pectoralis minor tendon, pay attention to the brachial plexus and the artery.
- Open the subcoracoid bursa.

**Pitfalls**

- Be aware of not detaching the conjoint tendon from the tip of the coracoid while opening the RI and detaching the coracoacromial ligament.
- Create the J and I portals under direct visualization.
- Avoid placing the medial portal (M portal) too low. Note that it is usually located around 6-8 cm above the nipple.
- Avoid creating the M portal after detaching the pectoralis minor tendon, because it protects the blunt trocar from damaging the plexus and/or artery.

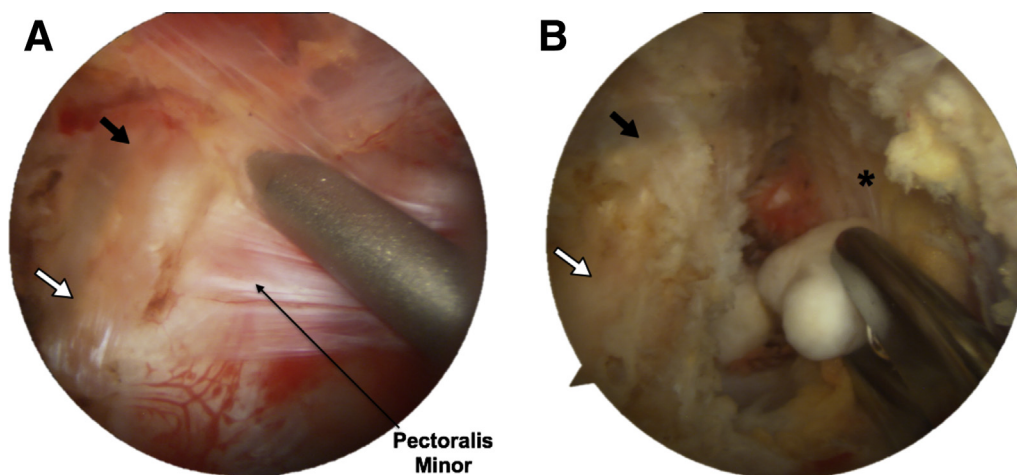
I, portal in front of the coracoid process; J, anteroinferior portal; M, transpectoral medial portal; RI, rotator interval.

located approximately 2 to 3 cm inferior to the posterolateral corner of the acromion and 2 cm lateral to the posterior portal (Fig 2B, Video 1).

**Step 2: Anterior Extra-articular Approach and Visualization**

Once the intra-articular loose bodies have been removed, the subcoracoid bursa must be viewed and approached. Opening the RI widely is necessary to create sufficient space lateral to and in front of the conjoint tendon. This can be performed by using a posterior viewing portal (A portal) and anterolateral working portal (D portal) or, alternatively, by viewing from an anterolateral portal (D portal), detaching the coracoacromial

ligament from the base of the coracoid, and opening the RI from medial to lateral through an anterior working portal (E portal). The clavipectoral fascia must be resected anterior and lateral to the conjoint tendon to allow a higher liquid inflow and therefore create room for visualization under the anterior deltoid and pectoralis major muscles. Creation of an anteroinferior portal (J portal) located in front of the subscapularis is then performed to improve anterior visualization (Video 1). Viewing from this portal with the 30° optic facing 90° to the right (in the case of a right shoulder), the surgeon visualizes the lateral side of the coracoid. By use of an outside-in technique, the I portal is located just in front of the coracoid process (Table 1). Switching the camera to the I portal, again using an outside-in technique, the surgeon creates a medial



**Fig 3.** (A) The patient is in beach-chair position, right shoulder. Through the I portal, the coracoid process (black arrow), conjoint tendon (white arrow), and pectoralis minor are visualized. (B) With good visualization from the I portal (performed in front of the tip of the coracoid process), a disc pincer is introduced through the M portal (transpectoral medial portal) to extract the loose bodies located in the subcoracoid bursa, directing the pincer toward the lateral side to avoid injuring the plexus (asterisk). The black arrow indicates the coracoid process; white arrow, conjoint tendon.



**Table 2.** Advantages and Disadvantages of Arthroscopic and Endoscopic Technique for Subcoracoid Synovial Chondromatosis of Shoulder Through Medial Transpectoral Portal

Advantages	
The technique is safe when used under direct visualization.	
The M portal is the same portal used for procedures such as the arthroscopic Latarjet procedure, so it can be used in other procedures as well.	
The M portal should be in line with the glenoid surface. This is important when using screws to fix anterior glenoid neck fractures.	
Disadvantages	
A learning curve and outside-the-box anatomy knowledge are required.	
Bleeding can occur at the base of the coracoid. The surgeon should avoid dissecting too far proximally. The limit is the conoid ligament to avoid damaging the suprascapular nerve.	
M, transpectoral medial portal.	

transpectoral portal (M portal). This portal is placed under direct visualization, introducing a needle through the pectoralis major muscle. It is located 4 to 6 cm medial to the anterior axillary fold, in a vertical line with the nipple. The M portal is used to obtain direct and best access for the extraction of the loose bodies that are located in the subcoracoid bursa (Fig 3A).

### Step 3: Pectoralis Minor Release, Subcoracoid Bursectomy, and Loose Body Removal

Viewing from the I portal with the 30° optic facing laterally, with a radiofrequency device (90-S MAX Energy Probe; Stryker, San Jose, CA), also looking laterally through the M portal, the surgeon releases the pectoralis minor tendon from proximal to distal. Distally, the pectoralis minor tendon turns into muscle, and the surgeon must be aware of not going too far distally to avoid damaging the musculocutaneous nerve. After the release is completed, the subcoracoid bursa is approached and opened lateral to the brachial plexus under the coracoid process. With a spinal pincer grasp (Intervertebral Disc Pincer; Stryker), loose bodies are removed gradually from the medial portal (Fig 3B, Video 1).

### Postoperative Protocol

Postoperatively, the shoulder is placed in a sling, and early rehabilitation is started on the following day with passive and active-assisted exercises. After 4 weeks of sling wear, full range of motion and progressive strengthening exercises can be started under physiotherapeutic supervision.

## Discussion

Synovial chondromatosis is a rare pathology of unknown origin that affects the synovial tissue, tendons, and bursa of the joint.<sup>3</sup> It occurs mainly in monoarticular form between 30 and 50 years of age, being 3 times more frequent in men than in women. The knee joint is the

most commonly involved joint, followed by the hip, elbow, shoulder, and wrist.<sup>4</sup> Although the reasons for development of synovial chondromatosis are not known, it has been suggested that the synovial chondroid metaplastic focus becomes peduncular; then by breaking off, it becomes a free loose body within the joint.<sup>5</sup> These free fragments may undergo endochondral ossification or cause erosive damage to the joint surface.

Previously, treatment of synovial chondromatosis of the shoulder has been described with an open approach after arthrotomy, synovectomy, and removal of loose bodies in the joint. Recently, some studies have shown excellent results with arthroscopic treatment, because of precise loose body extraction, lower morbidity, early joint mobility, and rapid recovery.<sup>6</sup> Synovial chondromatosis of the shoulder not only is present in an isolated form in the glenohumeral joint but also can affect other bursal regions, such as the subdeltoid and subacromial bursa. Loose bodies in the subcoracoid bursa were previously reported by Demirhan et al.<sup>7</sup> in a case in which an open arthrotomy through an anterolateral approach was performed.

We present an arthroscopic and endoscopic approach for loose body extraction around the coracoid bursa. The medial arthroscopic portal (transpectoral portal) is located 4 to 6 cm medial to the anterior axillary fold, usually in a vertical line with the nipple.<sup>8</sup> Through this approach, we can obtain excellent visualization and direct access to the following anatomic zones of the shoulder: (1) coracoid process, (2) conjoint tendon, (3) plexus, (4) subcoracoid region, and (5) subscapular muscle. For arthroscopic treatment of synovial chondromatosis of the shoulder, in which loose bodies are present in the subcoracoid bursa, the M portal offers direct working access to perform such a procedure. During the use of this technique, the axillary and musculocutaneous nerves, as well as the brachial plexus and vessels, must be located so as not to injure them, as described by Lafosse et al.<sup>2,8</sup> for the arthroscopic Latarjet procedure. After conservative treatment failure, we suggest that this condition can be successfully treated with arthroscopic loose body removal and synovectomy through an endoscopic subcoracoid approach using a medial transpectoral portal.

After this treatment is performed, postoperative rehabilitation is important. Recent studies have indicated that early rehabilitation helps to achieve satisfactory results within a few days of surgery, showing a significant improvement in ranges of movement and reducing pain.<sup>5</sup> Use of the M portal is not a contraindication for early rehabilitation.

The M portal is used in other arthroscopic techniques in the shoulder such as the Latarjet procedure. It is important because it offers clear advantages when using arthroscopic instruments toward the subcoracoid bursa, coracoid process, or glenohumeral joint, avoiding injury to the vascular and nerve structures that are located in the

medial region as a result of direct visualization (Table 2). The described technique performed through a medial transpectoral portal is an excellent alternative to the open approach, because it is performed completely arthroscopically, expands visualization, offers appropriate working access, decreases morbidity, allows early rehabilitation, and contributes to excellent results for the patient.

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