Technical Pearls for Hip Arthroscopy in the Management of Synovial Chondromatosis

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Abstract

Synovial chondromatosis of the hip is often underdiagnosed. A high index of suspicion and good quality imaging studies are therefore essential. A wide array of long and curved instrumentation is needed at surgery. Efficient use of time and an organized surgical approach are critical to decrease joint distraction time and potential complications. A successful outcome, with pain relief and return of joint function and range of motion, is predicated on incremental follow-up.

Arthroscopic intervention of the hip has been reported for loose bodies, synovial plicae, synovial chondromatosis, pigmented villonodular synovitis, and rheumatoid and septic arthritis.[1-6] Unlike standard radiologic imaging, hip arthroscopy allows the surgeon to inspect, biopsy, and treat within a single procedure. Unlike arthrotomy, hip arthroscopy avoids the risks of an extensive surgical exposure as well as prolonged rehabilitation and the risk for osteonecrosis.

Synovial chondromatosis is a rare condition in which foci of cartilage develop in the synovial membrane of joints, bursae, or tendon sheaths as a result of metaplasia of the subsynovial connective tissue (Figure 1). Extracapsular involvement may occur when the loose bodies penetrate out of the joint to adjacent structures, such as tendons and bursae.[7] Secondary calcification and ossification are common, and multiple cartilaginous loose bodies are found when the metaplastic foci become pedunculated and detached.[8]

These loose bodies, either ossified or nonossified, can become trapped in the acetabular fossa, gutter, and cause pain (Figure 2). The number of loose bodies within each joint may range from a handful to hundreds, and removal may consequently be a challenge. Nevertheless, an organized and efficient approach that optimizes access, visualization, adequate joint distraction, and appropriate instrumentation for addressing central and peripheral compartment lesions will minimize potential difficulties. Recent improvements in technique and instrumentation have made hip arthroscopy effective for diagnosing and managing synovial chondromatosis[9] and a variety of other intra-articular problems. Many hip disorders that are managed arthroscopically once went undetected and untreated.

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Technical Pearls

Arthroscopy can be performed with the patient supine or lateral. With the patient in the lateral decubitus position, a dedicated hip distractor (Innomed, Savannah, Georgia) is applied to the well-padded leg and ankle (Figure 3). A regular fluoroscopic table is necessary. The patient must be carefully padded at the perineum to avoid neuropraxic injury.

Position and Joint Distraction

The femur is placed in slight flexion (approximately 10-20°) with the foot in neutral or slight external rotation. Positioning the hip more than 20° can translate the sciatic nerve anteriorly, endangering it with the inserting trocar. Excessive external rotation of the femur also

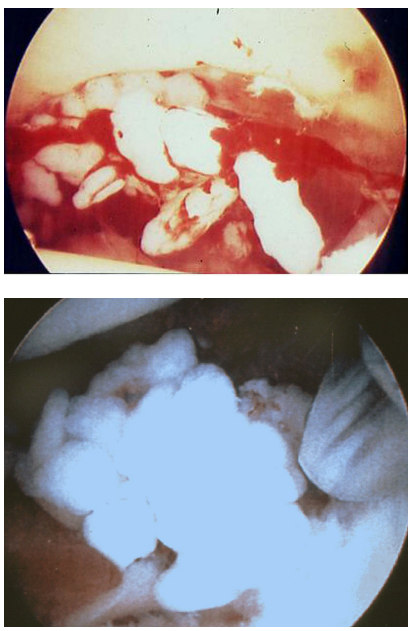

Figure 1. Synovial chondromatosis, a condition of synovial metaplasia with 4 or more osteochondral loose bodies.

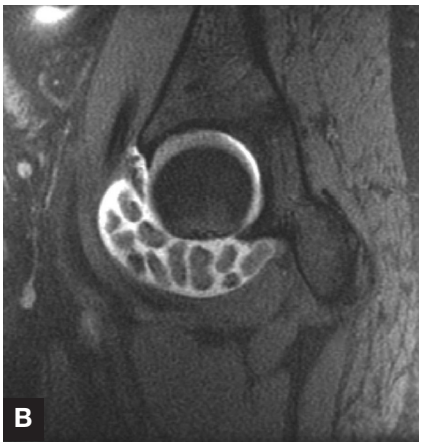

Figure 2. Radiographic (A) and magnetic resonance imaging (B) showing loose bodies in the hip joint.

moves the greater trochanter posteriorly, making it more likely to deflect the inserting trocar toward the sciatic nerve. The well-padded perineal post is perpendicular to the long axis of the thigh, 10 to 15 cm distal to the ischial tuberosity. This distal placement of the post avoids pressure on the pudendal nerve and allows a cantilever effect on the proximal femur when traction is applied to lift the femoral head up from the medial wall of the acetabulum and over the transverse acetabular ligament.[10] After skeletal muscle relaxation, but before skin preparation, fluoroscopy is used to determine the degree of distraction required. Axial distraction is applied with the leg abducted, usually between 0° and 20°, depending on the patient's neck–shaft angle and the depth of the acetabulum. Adequate visualization and cannula insertion require the femoral head to be distracted at least 7 to 10 mm between the articular surfaces. When distraction is suboptimal, visualizing and maneuvering instruments within the joint are challenging, and unexpected loss of traction can further lead to articular damage and instrument breakage. Traction should be less than 1 hour at a time for the central compartment. Peripheral compartment surgery is performed without distraction. The distractor is subsequently relaxed after adequate distraction has been confirmed with fluoroscopy. Standard skin preparation and draping follow.

Figure 3. A dedicated hip distractor with the patient in the lateral decubitus position (Innomed, Savannah Georgia).

Once the spinal needles are inserted into the joint, joint fluid is aspirated to confirm proper location. A blunt, conically tipped trocar is then inserted for controlled penetration of the hip capsule to create an arthroscopic portal. Portal placement requires palpation, identification, and marking of the anatomical landmarks, particularly the femoral neurovascular bundle. The procedure requires 2 or more portals: direct anterior, anterior paratrochanteric, or anterolateral, proximal trochanteric, superior paratrochanteric, or posterolateral, and direct posterior have all been well described.[11] The superior paratrochanteric portals pass through fewer muscle planes and minimize chance of injury to the lateral femoral cutaneous nerve; these portals also allow the trocars to puncture the superior hip capsule, which is thinner. The senior author (JCM) prefers the anterior and superior paratrochanteric portals initially,[12] as they allow visualization of the entire articular portion of the joint in 95% of cases

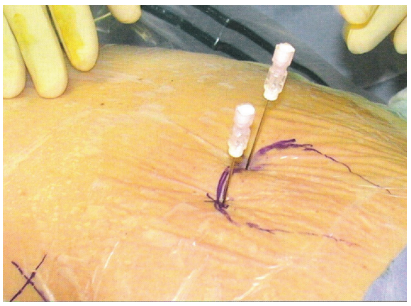

Figure 4. The senior author's (JCM) preferred arthroscopic portals: Anterior superior paratrochanteric portal, which gives excellent visualization of the femoral head, anterior neck, anterior labrum, and synovial tissues beneath the zona orbicularis; and the Posterior superior paratrochanteric portal, used for viewing the posterior capsule, posterior labrum, and posterior femoral head.

(Figures 4, 5). After the portals are established, the hip is distended with normal saline to overcome the joint's native intra-articular negative pressure. Pressure-sensitive high-volume lavage is required for optimal visualization.

Hip Joint

The hip joint has both intra-articular (central) and peripheral compartments. Hip pathology is often found within the intra-articular region. The peripheral compartment, which is intracapsular but extra-articular, may also contain lesions that are overlooked with traction alone because synovial disease often involves the capsule, and loose bodies may therefore sequester in the peripheral recesses.

Central Compartment

Loose bodies tend to aggregate in the fossa of the central compartment (Figure 6) and may be encased within the pulvinar soft tissue. The arc of curvature of the femoral head also presents a challenge to accessing the joint, particularly with straight tools. Adequate distraction, curved instrumentation, inserted with half-pipe and telescoping cannulas (Arthrex, Naples, Florida), are therefore essential for successful removal of loose bodies. Loose bodies may also be trapped

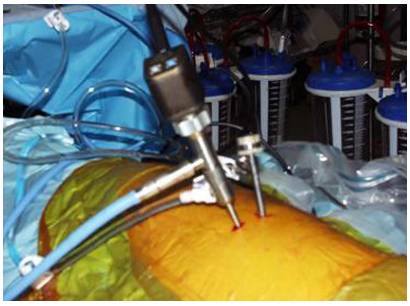

Figure 5. The senior author's (JCM) preferred arthroscopic portal sites with the patient in the lateral decubitus position.

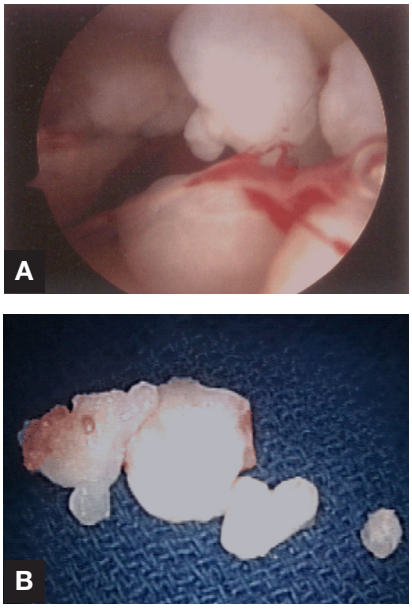

Figure 6. (A) An intra-operative view of the loose bodies prior to removal; (B) post-loose body removal.

in the gutters, within the labrocapsular recesses. Although most of the joint can be seen with a standard 30° arthroscope, the 70° arthroscope and an accessory portal are useful in such cases. An accompanying synovectomy with an arthroscopic shaver and/or electrothermal device would also be critical to help minimize the chance of recurrence.

Peripheral Compartment

After the central compartment is addressed, peripheral compartment lesions can be accessed by releasing traction and flexing the hip from 20° to 40°. The 70° arthroscope is essential for visualization here, and a third portal may be needed to improve access and permit a partial capsulectomy with the electrothermal device or "banana" knife. Large, well-fixed bodies may be left alone provided they do not interfere with joint articulation.

Difficult Loose Body Removal

The depth of the hip joint requires specially designed and lengthened arthroscopic instruments that can pass through the cannulae, protecting the soft-tissue structures surrounding the hip. Extralong, curved shaver blades with either convex or concave surfaces allow operative arthroscopy around the femoral head. Long suction punches and hand tools, such as alligator graspers, both straight and curved, are needed for resection and aspiration of soft tissue and loose bodies. Removal of large loose bodies may require morsellization, displacement, and telescoping cannulae. A half-pipe cannula is sometimes needed to introduce curved instruments and improve ease of passage, as large loose bodies are extracted from the portal. A partial synovectomy can be performed with either straight or curved extralong shavers. Flexible electrothermal devices with precise control of temperature and coagulation are useful for debriding torn labral and chondral flaps or inflamed synovial tissue folds. White-zone labral and chondral lesions should be judiciously debrided or resected back to a stable base and healthy tissue while preserving the capsular labrum. Accessing and removing extra-articular loose bodies in the psoas bursa, for example, may require combined arthroscopic and mini-open approaches.

Conclusion

Hip arthroscopy plays an important role in early detection and management of synovial chondromatosis, a condition that can be challenging to diagnose using conventional methods. Loose bodies in synovial chondromatosis, when untreated, can cause and accelerate irreversible damage to the chondral surface and labrum.

In the senior author's (JCM) experience with 41 cases thus far, representing the largest North American series, arthroscopic management allowed for a definitive diagnosis, removal of 5 to 300 loose bodies—particularly those clustered within the fossa—management of chondral damage, and synovectomy. Although the rate of disease recurrence despite intervention was approximately 10%, arthroscopy could be repeated, and remained beneficial to patients with mild to moderate degenerative changes.

As previously reported, complications occur in 0.5% to 5% of patients and are most often related to joint distraction.[13,14] Transient neuropraxia is the most common injury.[13,14] Damage to the labrum on entry into the joint, or scuffing of the femoral head, can be avoided by using an image intensifier to confirm adequate distraction.

As there is a steep learning curve to the technique, and maneuvering in a deep joint is a challenge, proper patient positioning and adequate hip distraction are important for success. Use of adequate portals, saline fluid dynamics, and tapered telescoping cannulae helps prevent instrument breakage and scuffing of articular surfaces. Electrothermal devices, long curved shavers, and long graspers are needed to reach formerly inaccessible areas. Generous padding of the perineum, leg, and ankle, combined with minimal distraction time, helps prevent neurovascular complication.

Specific long-term prospective outcome data for arthroscopic hip surgery are still needed to refine its role in orthopedic practice. A validated, self-administered questionnaire assessing nonarthritic hip pain in patients with high activity demands and expectations can be used before intervention and after treatment.[15]

Summary

Synovial chondromatosis of the hip is underdiagnosed. A high index of suspicion and good quality imaging studies are therefore essential.

A wide array of long and curved instrumentation is needed at surgery.

Efficient use of time and an organized surgical approach are critical to decrease joint distraction time and potential complications.

A successful outcome, with pain relief and return of joint function and range of motion, is predicated on experienced surgical technique and incremental follow-up.

Authors' Disclosure Statement

The authors report no actual or potential conflict of interest in relation to this article.

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