

# Arthroscopic Management of Anterior Ankle Synovial Osteochondromatosis



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**Abstract:** Surgical treatment has been recommended as the first choice of therapy in second and third stages of the disease. Complete synovectomy and removal of all loose bodies is advisable for prevention of recurrence of the disease. Recently, arthroscopic treatment of synovial chondromatosis is gaining popularity because of its favorable outcomes and very low complication and recurrence rates. Arthroscopic approach also allows management of concomitant pathology. The purpose of this Technical Note is to describe the technique of arthroscopic synovectomy and removal of loose bodies as treatment of synovial chondromatosis localized in the anterior compartment of the ankle joint.

Synovial chondromatosis is a rare, generally benign condition characterized by the formation of multiple cartilaginous nodules in the synovium of the joints and occasionally on the tendon sheath or bursae. It has traditionally been considered a metaplastic condition. Recent studies support a neoplastic origin for synovial chondromatosis because anomalies of chromosome 6 were observed in some synovial chondromatosis cases.<sup>1</sup>

Synovial chondromatosis can be primary or secondary in origin. Primary synovial chondromatosis is a benign monoarticular disorder. It occurs in an otherwise normal joint in a patient in the third to fifth decade of life. The disease process has been classified into 3 phases. In the first (early) phase, there is active synovitis without loose bodies in the joint. In the second (transitional) phase, there is nodular synovitis along with loose bodies in the joint. In the third phase, loose

bodies are present, but the synovitis has resolved.<sup>2</sup> Histologically, fibroblasts or mesenchymal cells in the subintimal layer of the synovium transform to chondrocytes and start to produce multiple nodules of cartilage. These cartilaginous bodies can be extruded in the joint and may calcify or even ossify.<sup>3</sup> Secondary synovial chondromatosis occurs in older patients in joints previously affected by joint disease such as osteoarthritis, post-traumatic or neuropathic arthropathy.<sup>4</sup>

The symptoms of synovial chondromatosis are usually nonspecific and chronic. It includes pain at rest or on movement, crepitation, joint stiffness or decreased movement, localized or diffuse swelling of the involved joint with palpable loose bodies, and sometimes locking or catching sensation.<sup>5,6</sup>

Surgical treatment has been recommended as the first choice of therapy in second and third stages of the disease. Complete synovectomy and removal of all loose bodies is advisable for prevention of recurrence of the disease. Classically, this is performed with open

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**Table 1.** Indications and Contraindications of Arthroscopic Management of Anterior Ankle Synovial Osteochondromatosis

Indication

Stage 2 or 3 synovial chondromatosis localized at the anterior compartment of the ankle joint.

Contraindications

If the ankle joint is so degenerated that total ankle arthroplasty is indicated.

If the posterior ankle compartment, extensor tendons, flexor hallucis longus tendon or adjacent bursa is also involved by the disease, posterior ankle arthroscopy, extensor tendoscopy, flexor hallucis longus tendoscopy or bursoscopy may also be indicated.



**Fig 1.** Arthroscopic management of anterior ankle synovial osteochondromatosis of the left ankle. The patient is in supine position. Preoperative X-ray film shows the presence of loose bodies (*arrow*) in the anterior ankle compartment.

approach. Postoperative immobilization in a cast for a varying period of time is usually necessary after such open procedure.<sup>5,7</sup>

Recently, a growing pool of evidence is emerging to suggest favorable outcomes for arthroscopic treatment of synovial chondromatosis of the ankle joint.<sup>8</sup> On the basis of the available data, the complication and recurrence rates after arthroscopic management were very low.<sup>8</sup> Arthroscopic synovectomy with excision of loose bodies is a consistent feature of treatment. The arthroscopic approach also allows management of concomitant pathology, such as bursectomy, debridement of osteochondral lesions or involved tendons, and osteophyte resection.<sup>9</sup>

Recovery after these arthroscopic procedures is much shorter in comparison with the open technique, and there is no need for postoperative immobilization.<sup>5,7</sup> This Technical Note describes the technique of arthroscopic synovectomy and removal of loose bodies of the anterior compartment of the ankle joint. This is indicated for stage 2 or 3 synovial chondromatosis localized at the anterior compartment of the ankle joint. This is contraindicated if the ankle joint is so degenerated that total ankle arthroplasty is indicated. If the posterior ankle compartment, extensor tendons, flexor hallucis longus tendon, or adjacent bursa is also involved by the

disease, posterior ankle arthroscopy, extensor tendoscopy, flexor hallucis longus tendoscopy, or bursectomy may also be indicated (Table 1).

## Technique

### Preoperative Planning and Patient Positioning

Preoperative radiography is useful to identify radio-opaque loose bodies and signs of osteoarthritis (Fig 1). Magnetic resonance imaging (MRI) is used to evaluate joint effusion, synovial thickening, the presence of radiolucent loose bodies and other concomitant pathology of the ankle e.g. osteochondral lesion (Fig 2). It is also important to detect any disease involvement of adjacent structures.<sup>10-12</sup> The locations of loose bodies and inflamed synovitis and the presence of concomitant pathologies are important information for surgical planning.

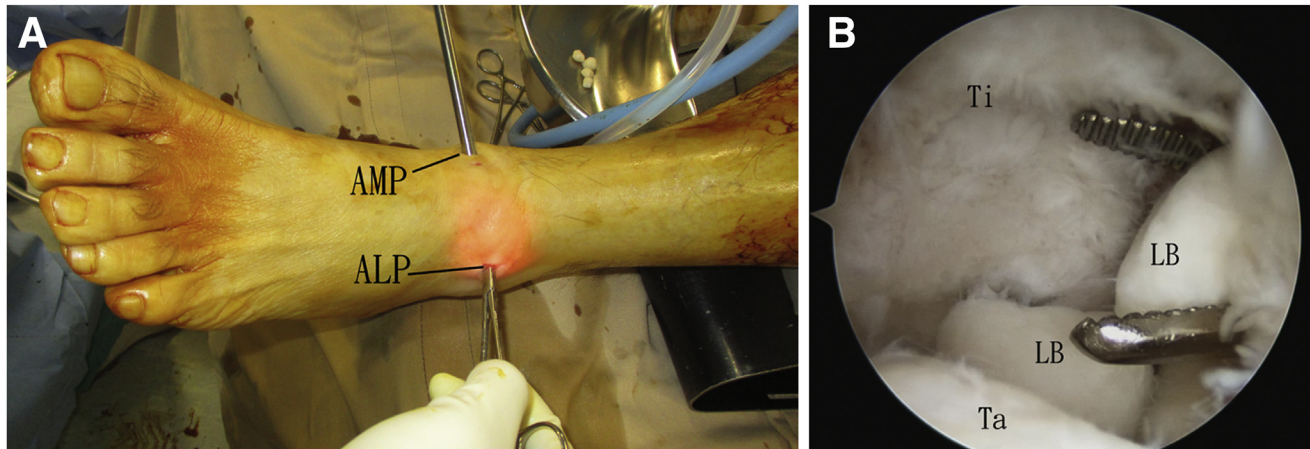
The patient is in supine position. A thigh tourniquet is applied to provide a bloodless operative field. The hip and knee are flexed by placing a triangular supporting frame (Innomed, Savannah, GA) under the knee. No continuous ankle distraction is needed. A 4.0-mm, 30° arthroscope (Dyonics; Smith and Nephew, Andover, MA) is used. Fluid inflow is driven by gravity, and no arthropump is used.

### Portal Placement

The standard anterolateral and anteromedial portals of ankle arthroscopy are used for this procedure. The anterolateral portal is just lateral to the peroneus tertius



**Fig 2.** Arthroscopic management of anterior ankle synovial osteochondromatosis of the left ankle. The patient is in supine position. Preoperative magnetic resonance imaging scan shows the presence of loose bodies (*arrow*) in the anterior ankle compartment.



**Fig 3.** Arthroscopic management of anterior ankle synovial osteochondromatosis of the left ankle. The patient is in supine position. (A) Ankle arthroscopy is performed with the anteromedial portal as the viewing portal and the anterolateral portal as the working portal. (B) Anteromedial portal is the viewing portal. Loose bodies are removed by a hemostat via the anterolateral portal. AMP, anteromedial portal; ALP, anterolateral portal; LB, loose body; Ti, distal tibia; Ta, talar body.

tendon, and the anteromedial portal is just medial to the tibialis anterior tendon. The portals are interchangeable as the viewing and working portals.

#### Removal of Free-Floating Loose Bodies

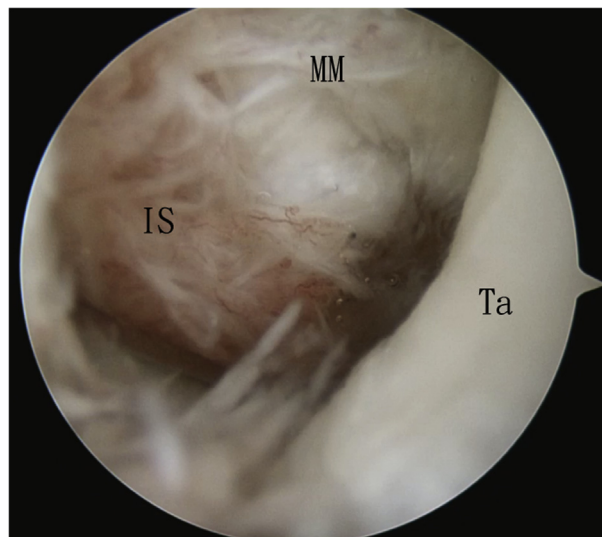
The anteromedial portal is the viewing portal, and the anterolateral portal is the working portal. The free-floating loose bodies of the anterior ankle compartment are removed by a hemostat (Fig 3). If there is size difference of the loose bodies, the small ones are removed before the large ones. This can defer enlargement of the portal incision (as needed for removal of large loose bodies) and collapse of the joint space (as irrigation fluid leaks out). The portals can be switched to ensure removal of all free loose bodies of the anterior ankle compartment.

#### Synovectomy

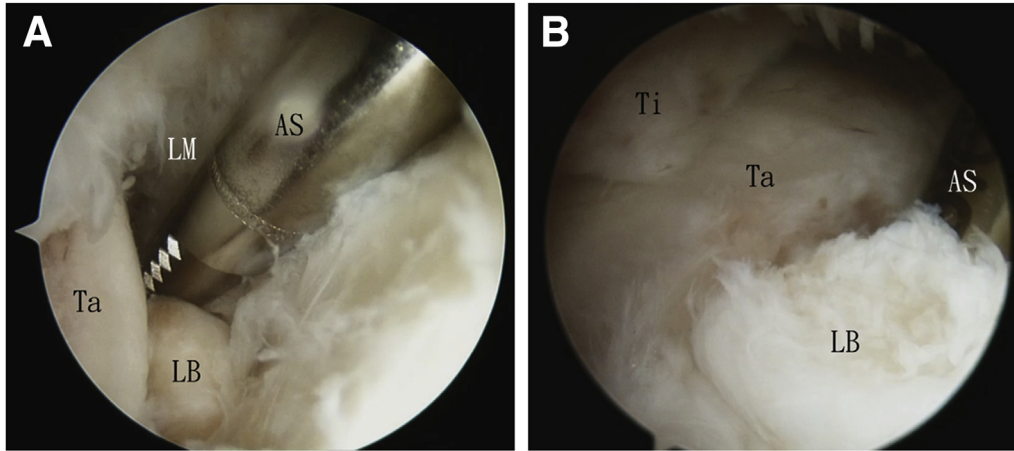
The anterolateral portal is the viewing portal and the anteromedial portal is the working portal. The inflamed synovium is resected with an arthroscopic shaver (Dyonics). The inflamed synovium at the talar neck and around the medial and lateral malleoli should also be resected (Fig 4). The portals can be switched to ensure complete synovectomy of the anterior ankle compartment.

#### Removal of Attached Loose Bodies

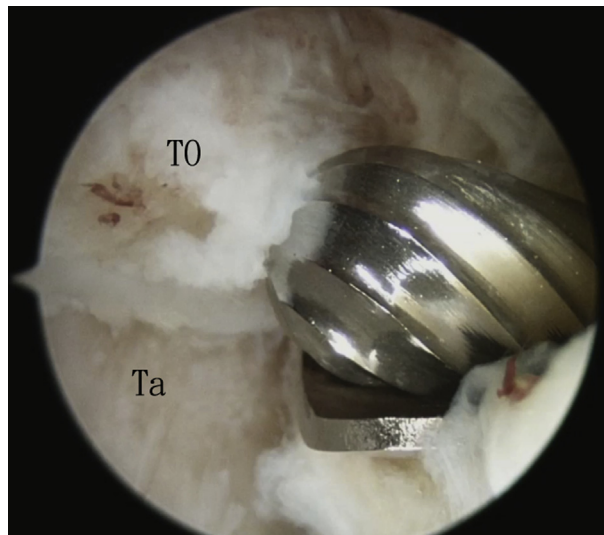
The anteromedial portal is the viewing portal and the anterolateral portal is the working portal. After the synovectomy, the deep-seated attached loose bodies at the lateral ankle gutter and talar neck are exposed. They are detached from the soft tissue and removed by



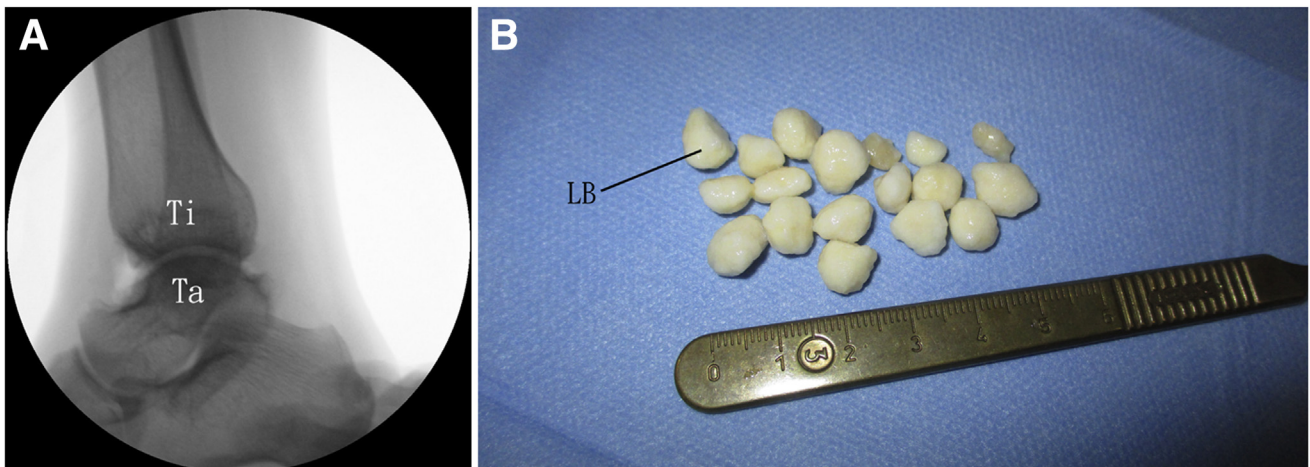
**Fig 4.** Arthroscopic management of anterior ankle synovial osteochondromatosis of the left ankle. The patient is in a supine position. The anterolateral portal is the viewing portal. Inflamed synovium is present at the anteromedial ankle capsule. Ta, talar body; IS, inflamed synovium; MM, medial malleolus.



**Fig 5.** Arthroscopic management of anterior ankle synovial osteochondromatosis of the left ankle. The patient is in a supine position. The anteromedial portal is the viewing portal, and the anterolateral portal is the working portal. (A) Attached loose body is removed from the lateral ankle gutter. (B) Attached loose body is removed from the talar neck. AS, arthroscopic shaver; LM, lateral malleolus; Ta, talar body; LB, loose body; Ti, distal tibia.



**Fig 6.** Arthroscopic management of anterior ankle synovial osteochondromatosis of the left ankle. The patient is in a supine position. The anteromedial portal is the viewing portal, and the anterolateral portal is the working portal. The distal tibial osteophyte is resected by the arthroscopic acromionizer. Ta, talar body; TO, distal tibial osteophyte.



**Fig 7.** Arthroscopic management of anterior ankle synovial osteochondromatosis of the left ankle. The patient is in a supine position. (A) Intraoperative fluoroscopy confirms complete removal of radio-opaque loose bodies. (B) The loose bodies removed. LB, loose body; Ti, distal tibia; Ta, talar body.

**Table 2.** Pearls and Pitfalls of Management of Arthroscopic Management of Anterior Ankle Synovial Osteochondromatosis

Pearls	
	If the loose bodies are of different sizes, the small ones should be removed first.
	The talar neck and medial and lateral ankle gutters should be searched for attached loose bodies.
	The ankle joint should not be distracted before removal of all the loose bodies of the anterior ankle compartment, in order to avoid falling of the loose bodies to the posterior compartment.
Pitfalls	
	If the disease of the posterior ankle compartment is missed, there is chance of recurrence of the disease.

a hemostat (Fig 5). The arthroscope is then switched to the anterolateral portal, and attached loose bodies of the medial ankle gutter are removed with the hemostat via the anteromedial portal.

### Treatment of Concomitant Ankle Pathology

After removal of loose bodies of the anterior compartment, the ankle joint is distracted manually to assess any loose body or inflamed synovium at the posterior compartment. If loose body or inflamed synovium is present in the posterior compartment, posterior ankle arthroscopy can be performed with the patient in the supine position.<sup>13-15</sup>

The ankle joint proper can also be assessed for any pathology, such as osteochondral lesion. In this illustrated case, there is anterolateral ankle impingement. With the anteromedial portal as the viewing portal, the distal tibial osteophyte is resected by a 5.5 mm arthroscopic acromionizer (Dyonics) via the anterolateral portal (Fig 6). During surgery, completeness of removal of radio-opaque loose bodies is confirmed by fluoroscopy (Fig 7, Video 1, Table 2).

## Discussion

Primary synovial chondromatosis frequently leads to secondary osteoarthritis that deteriorates over time.

**Table 3.** Advantages and Risks of Management of Arthroscopic Management of Anterior Ankle Synovial Osteochondromatosis

Advantages	
	Better cosmetic result
	Minimal soft tissue dissection
	Less wound complications
	Adequate joint assessment under magnified arthroscopic visualization.
Risks	
	Injury to the anterior tibial artery
	Injury to the superficial or deep peroneal nerve
	Incomplete synovectomy
	Recurrence of the disease
	Residual loose bodies
	Extensor tendons injury
	Damage of the articular cartilage

Removal of loose bodies and synovectomy at early phase of the disease may prevent the occurrence of secondary osteoarthritis.<sup>16</sup> The aim of the treatment of synovial chondromatosis consists of decreasing pain and limiting the development of early osteoarthritis. Synovectomy and removal of all accessible loose bodies is the surgical treatment of choice. Histological examination of the synovium is important not only to confirm the diagnosis but also to detect any malignant transformation to low-grade chondrosarcoma.<sup>6,17</sup>

The risk of recurrence of primary synovial chondromatosis, which is in close relation to malignant transformation, can be minimized by performing a complete synovectomy of the ankle.<sup>16</sup> If the posterior ankle compartment is also involved by the disease, a combined posterior and anterior arthroscopic procedure within the same operative session should be considered.<sup>16</sup>

The advantages of this minimally invasive technique include better cosmetic result, minimal soft tissue dissection, fewer wound complications, and adequate joint assessment under magnified arthroscopic visualization. The potential risks of this technique include injury to the anterior tibial artery, injury to the superficial or deep peroneal nerve, incomplete synovectomy and recurrence of the disease, residual loose bodies, extensor tendon injury, and damage of the articular cartilage (Table 3). This technique is not technically demanding and can be attempted by the average foot and ankle arthroscopist.

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