

Cuboid-Navicular Arthrodesis of the Foot After Arthroscopic Resection of Cuboid-Navicular Synchondrosis



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Abstract: Cuboid-navicular synchondrosis is a rare pathology that has historically been treated with open surgery. Open surgery poses complications and precludes satisfactory visibility during the operative treatment of these lesions. Arthroscopic portals typically limit the risk of complications and provide better visibility in small joints. We describe here an original technique of arthroscopic resection followed by cuboid-navicular arthrodesis.

Introduction

Tarsal coalitions are rare pathologies that cause chronic pain in adolescents and young adults.¹ The diagnosis is based on 3D imaging and bone scintigraphy, which make it possible to ascertain the involvement of the synchondrosis in the evolution of the pain experienced by the patient.^{2,3} The usual surgical management consists of resection of the synchondrosis, followed by arthrodesis. Historically, these two procedures are performed by open surgery.^{4,5} The challenge lies in accessing the lesion, which is often difficult in open surgery, especially when it involves the midtarsal joint. Therefore, it can be a source of failure with incomplete resection, persistence of pain, and the need for reoperation.⁶ Synchondrosis between the cuboid and navicular bones is often particularly deep, and resection of the most medial part is difficult in cases of extensive synchondrosis. In order to make this resection more

reliable and limit the risk of complications, we present here an arthroscopic resection/arthrodesis technique for cuboid-navicular synchondrosis.

Surgical Technique

See [Video 1](#) for details of the surgical technique.



Fig 1. The patient is positioned in the lateral decubitus position. A support is fixed on both sides of the pelvis. A cushion is placed under the ankle to be operated on.

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Fig 2. The following anatomical structures are identified, back to front: sural nerve, lateral malleolus, optic portal of the sinus tarsi, instrumental portal, sensory branch of the superficial fibular nerve). This will allow for a safe arthroscopic approach.

Installation and Surgical Preparation

The patient is installed in a lateral decubitus position under spinal anesthesia. The operated foot is

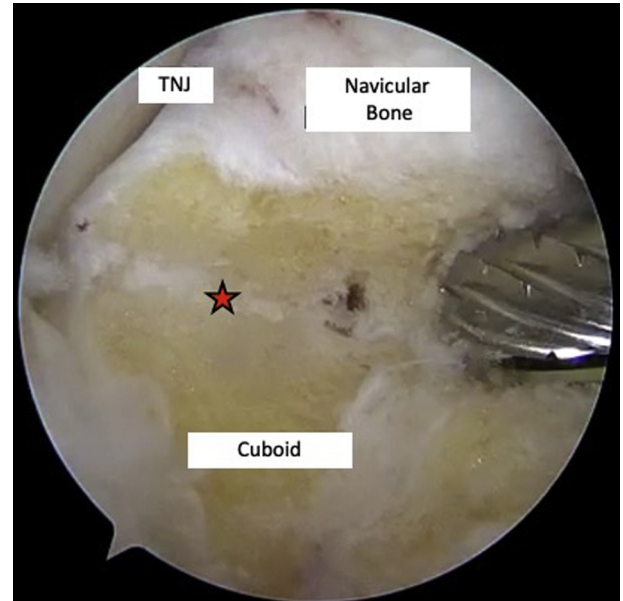


Fig 4. Identification of the synchondrosis during the resection phase. The surgeon begins the resection with the power drill at the anterior edge of the synchondrosis. The white band represented by the star corresponds to the zone of the synchondrosis. It helps to guide the resection. TNJ, talonavicular joint.

positioned on a cushion and protrudes slightly from the cushion to induce a varus, allowing opening of the sinus tarsi (Fig 1). Antibiotic prophylaxis is administered in accordance with the recommendations of the French Society of Anesthesia and Resuscitation. A

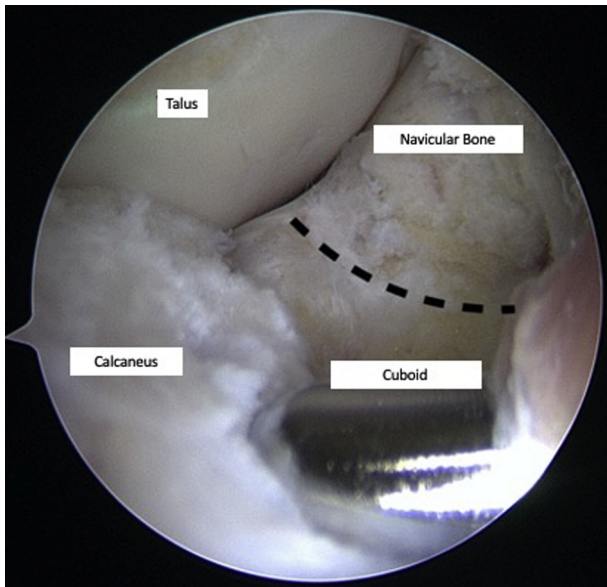


Fig 3. Arthroscopic view of the synchondrosis before resection. The surgeon should locate the talus on the left and the navicular bone on the right in the upper part of the arthroscopic image. In the lower part of the image, the calcaneus on the left and the cuboid on the right are located. The dashed line represents the area of cuboid-navicular synchondrosis.

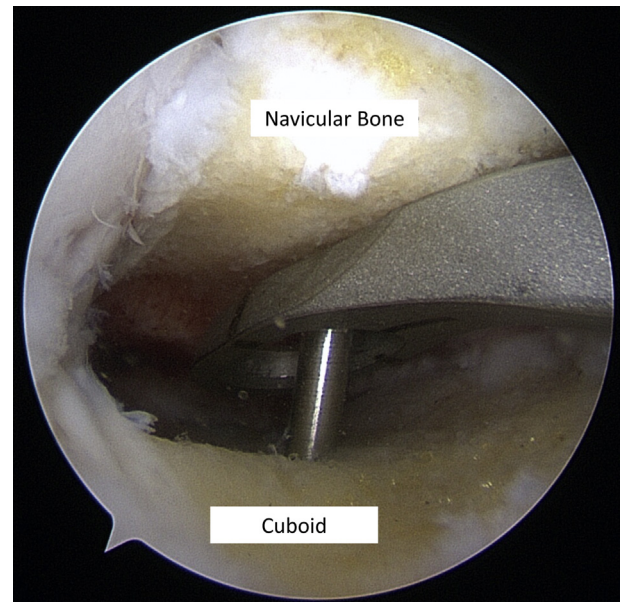


Fig 5. Placement of the guide wire using an anterior cruciate ligament guide. To facilitate osteosynthesis, a guide is placed in the resection area. The navicular bone is located above the guide and the cuboid below. A guide wire is inserted to guide the screwing.



Fig 6. Radiographic control of the positioning of the guide pin using the aiming device.

tourniquet is placed at the root of the thigh and inflated to 100 mmHg above systolic blood pressure.

Arthroscopic Portals

The equipment used is standard arthroscopy equipment with a 4-mm arthroscope. The following different

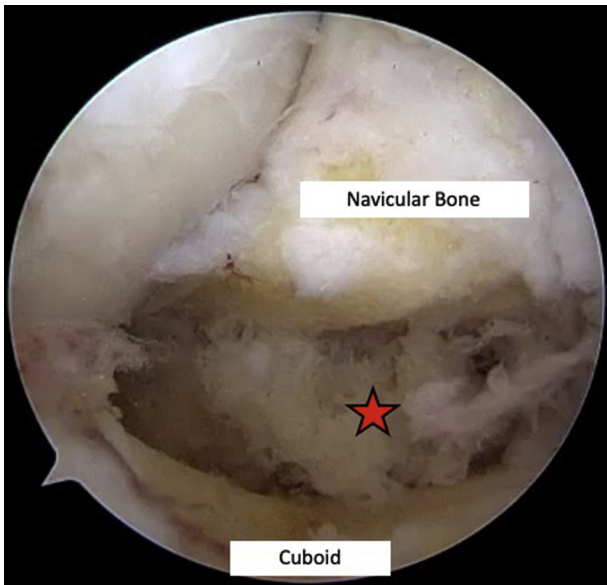


Fig 7. Placement of the graft around the guide pins between the navicular and cuboid bones, to perform the arthrodesis. A graft taken from the calcaneus is introduced into the space created by the resection through both arthroscopic approaches. This will optimize the chances of consolidation of this arthrodesis.



Fig 8. Placement of arthrodesis screws. The screwing is performed under radiographic control and using the guide pin. A short approach is made to the dorsal aspect of the navicular bone, and the screw is directed from the navicular bone to the cuboid. A second screw parallel to the first will be placed to avoid torsional movements within the arthrodesis and to facilitate consolidation.

anatomical structures are identified on the skin: lateral malleolus, sinus tarsi, sensory branch of the superficial fibular nerve, and the sural nerve (Fig 2).

The first portal achieved is the sinus tarsi portal using the technique described by Lintz and colleagues⁷ in the context of performing subtalar arthrodesis via the anterolateral portal. The sinus tarsi is identified by

Table 1. Advantages and Disadvantages of the Technique

Steps	Technical Tips
Arthroscopic portals	Make the first optic portal in the sinus tarsi, which is easily identifiable and accessible
Access to the synchondrosis	Once the sinus tarsi has been cleared, following the anterior subtalar joint leads to the talonavicular joint (Video 1) and to the site of synchondrosis
Resection of the synchondrosis	Identify the most lateral edge then start the resection of the lateral edge towards the talonavicular joint, following the white fibrous band (photo 4)
Osteosynthesis	The use of a guide, placed under arthroscopy, makes the path of the screws more reliable (Photo 5 and video 4)

Table 2. Technical Tips and Tricks

Advantages	Disadvantages
Minimally invasive portal: limited risk of infection Better joint visibility than with open surgery	Longer learning curve than with open surgery Risk of injury to the dorsal cutaneous branch of the superficial fibular nerve
Higher fusion rate of arthrodesis with arthroscopy than open surgery	Navigation difficulties (an image intensifier is required in case of doubt)
Facilitates osteosynthesis using an ACL guide	

digital palpation, and an incision of ~4 mm is made. A tissue dissection is made with Halsted forceps, and then the arthroscope is inserted into the sinus tarsi.

A second portal is made about 2 cm further anterior in the axis of the foot. A needle is used to come in to contact with the arthroscope. Once contact is established, the portal can be made following the path of the needle, and the shaver is placed in contact with the arthroscope.

Approach and Resection of the Synchondrosis

Once the portals have been made, the first step is to free the sinus tarsi in order to locate the anterior subtalar joint. This joint guides the surgeon to the talonavicular joint, which is also released using the shaver (Video 1). The synchondrosis is located at the juncture between the talus, navicular bone, calcaneus, and cuboid (Fig 3). The lateral edge of the synchondrosis is identified, and then the resection can start with a motorized burr (Video 1). The synchondrosis is easy to identify and follow during the resection because there is a fibrous area within the bone that guides the surgeon (Fig 4). Resection around the talus must be performed carefully to avoid damaging the talar cartilage. The resection is complete when the navicular can be mobilized using a trocar without difficulty (Video 1).

Screw Arthrodesis Under Arthroscopic and Radiological Control

Once the resection is performed, if the situation requires it, arthrodesis can be performed. In order to make the positioning of the arthrodesis screws more reliable, a guide is introduced under arthroscopic control at the level of the arthrodesis area, and then guide pins are put in place (Fig 5). The positioning is checked by radiographic control (Fig 6). An ipsilateral calcaneus graft is harvested using the conventional technique and placed in the arthrodesis site (Fig 7). Finally, two cannulated screws of 4.3-mm diameter (F.A.S.T. screw, SERF, Lyon, France) are placed to complete the arthrodesis (Video 1 and Fig 8).

Postoperative Protocol

The patient is immobilized in a removable boot and remains non-weight bearing for a period of 6 weeks.

Dressing changes are carried out 3 times a week until healing is achieved, and physiotherapy is started on day 21 to recover the range of motion of the ankle. A radiographic assessment is carried out on day 45 to allow resumption of full weight bearing and removal of the boot, in the absence of complications.

Discussion/Conclusion

The use of arthroscopy to perform arthrodesis after resection of cuboid-navicular synchondrosis makes it possible to simplify the procedure and makes it more reliable (Tables 1 and 2).

There is a paucity of literature on this subject. Most publications are related to talocalcaneal or calcaneocuboid synchondrosis, which are much more frequent. Only around 10 “case reports” offer results concerning this pathology,⁸ all of which use open surgery and do not suggest arthroscopy as the preferred approach.

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