



# Arthroscopic-Assisted Osteochondral Allograft Transplantation for Posterolateral Lesions of the Talus Without Fibular Osteotomy

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**Abstract:** Osteochondral lesions of the talus are chondral defects often caused by acute trauma to the ankle such as sprains and fractures. If operative treatment is necessary, microfracture, cartilage replacement, and autologous chondrocyte implantation can be used. We describe a single-step osteochondral allograft transfer to access the posterolateral talar dome that avoids the need for a fibular osteotomy and therefore eliminates morbidity while reducing operative time.

Osteochondral lesions of the talus (OLTs) are common defects that affect both the articular cartilage and the subchondral bone.<sup>1-8</sup> Most OLTs are associated with acute trauma to the ankle, such as sprains or fractures, with up to 73% to 81% of ankle fractures resulting in chondral defects.<sup>1-8</sup> Nontraumatic causes of OLTs include localized ischemia, microtrauma, necrosis, and iatrogenic steroid treatment.<sup>1,2</sup> For smaller, asymptomatic lesions, a nonoperative approach with limited physical activity and nonsteroidal anti-inflammatory drugs can be used.<sup>2,3</sup> However, nonoperative treatment may only temporarily or partially alleviate symptoms because natural cartilage repair is limited owing to the avascular nature of the articular cartilage.<sup>2-5</sup> Current surgical options for treating OLTs include bone marrow stimulation with microfracture, replacement

of the articular cartilage through either an autologous osteochondral transplantation or an osteochondral allograft transplantation (OATS), or autologous chondrocyte implantation. For lesions in the central or posterior talus, access through the use of a fibular or medial malleolar osteotomy traditionally has been recommended. The purpose of this Technical Note is to describe a single-step OATS procedure for the posterolateral talar dome that avoids the need for fibular osteotomy by distal anterior tibial resection. This technique reduces operative time and avoids donor-site morbidity while providing viable chondrocytes through allograft transfer.

## Surgical Technique

### Preoperative Assessment

The preoperative assessment includes a physical examination, weight-bearing radiographs (anteroposterior, lateral, and mortise views), and magnetic

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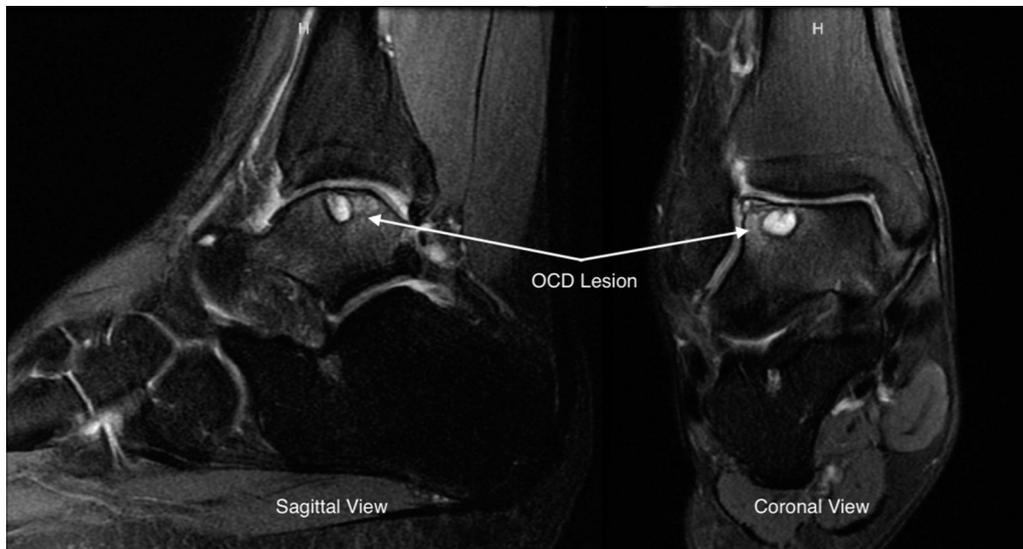
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**Table 1.** Hepple MRI Staging System for Osteochondral Lesions of Talus<sup>9</sup>

	Description
Stage 1	Articular cartilage damage only
Stage 2a	Cartilage injury with underlying fracture and surrounding bony edema
Stage 2b	Stage 2a without surrounding bony edema
Stage 3	Detached but undisplaced fragment
Stage 4	Detached and displaced fragment
Stage 5	Subchondral cyst formation

MRI, magnetic resonance imaging.



**Fig 1.** Sagittal and coronal magnetic resonance imaging of the right ankle showing an osteochondral lesion (OCD) of the posterolateral aspect of the talar dome.

resonance imaging (MRI) or computed tomography of the ankle. Radiographs may show malalignment or degenerative changes, whereas MRI or computed tomography may be used to define the location and size of the lesion. In addition, the Hepple classification may be used to stage OLTs based on MRI findings (Table 1).<sup>9</sup> Figure 1 shows MRI scans of an osteochondral lesion located at the posterolateral aspect of the talar dome.

### Patient Positioning and Preparation

The patient is seen in the preoperative area, and the correct ankle is marked. The patient is transferred to the operating room and placed supine on a standard operative table with a nonsterile padded tourniquet proximally on the operative extremity.

The surgical site is then prepared and draped in the usual sterile fashion under the knee. After an Esmarch

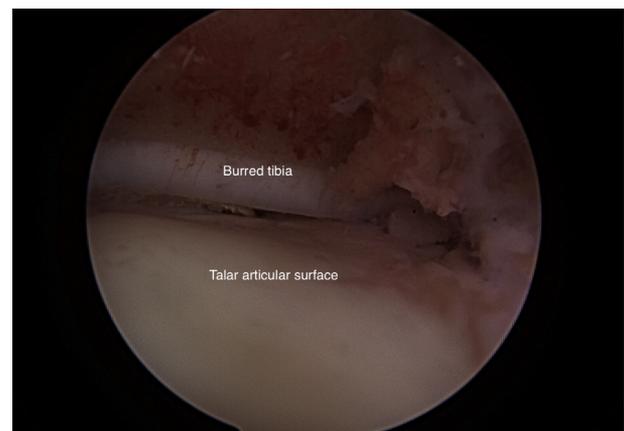
bandage is used to exsanguinate the operative side, the tourniquet, set at 250 mm Hg of pressure, is inflated.

### Diagnostic Arthroscopy

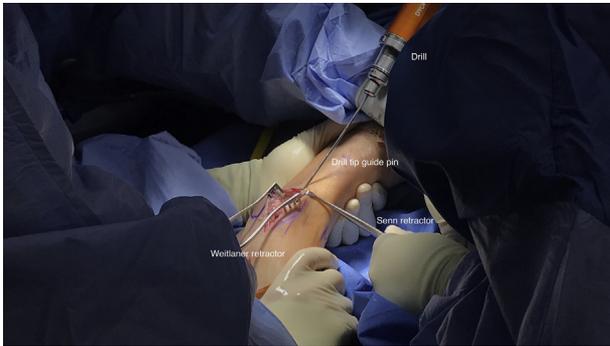
We start with a diagnostic arthroscopy (Fig 2) with the intent of assessing the chondral lesion before performing the arthrotomy. An antero-lateral portal, located just medial to the lateral malleolus, with attention paid to avoid the peroneus tertius and superficial peroneal nerve, is created, and a 30° 4.0-mm arthroscope is introduced. An anteromedial portal is then made by needle localization, medial to the tibialis anterior



**Fig 2.** Arthroscopic photograph of the osteochondral lesion seen at the lateral and central aspect of the right talar dome. Diagnostic arthroscopy is used to assess the osteochondral lesion before performing an arthrotomy.



**Fig 3.** Arthroscopic photograph after burring down the anterior lip of the right tibia, which was necessary to achieve adequate exposure of the lateral talar lesion. If the osteochondral lesion cannot be visualized completely with forced plantar flexion, burring of the tibia or malleolar osteotomy may be performed.



**Fig 4.** Intraoperative photograph of the drill-tip guide pin, which is placed orthogonally and centrally in the osteochondral lesion of the right ankle. Weitlaner and Senn retractors are used subcutaneously for visualization.

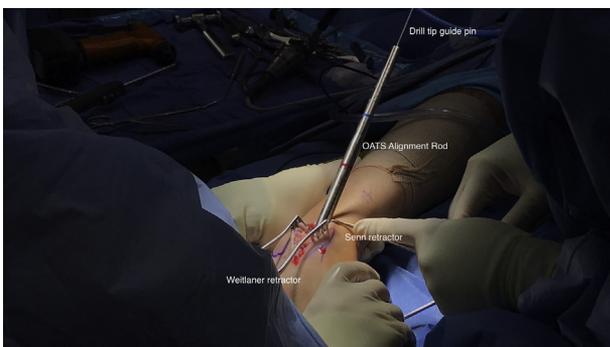
and lateral to the medial malleolus, with attention paid to the saphenous vein.

Once both portals have been created, a diagnostic arthroscopy is performed. The chondral lesion is probed, and any concomitant pathology of the joint is identified. We then proceed with the open OATS procedure.

#### Arthrotomy and Reaming of Chondral Lesion

For central and/or lateral talar lesions, a 3-inch incision is made over the anterolateral border of the fibula and the tibiofibular joint. Careful dissection is performed to avoid any neurovascular structures until the talar dome is reached.

If only the anterior half of the lesion can be visualized with adequate plantar flexion stress, a better exposure can be obtained with either a fibular osteotomy or a controlled burr of 5 to 10 mm of the anterior lip of the tibia (Fig 3). A pin is fired orthogonally in the center of the lesion (Fig 4). On top of the pin, a cannulated cylindrical sizer (Arthrex, Naples,



**Fig 5.** Intraoperative photograph of the cannulated cylindrical sizer device, which is placed over the guide pin to measure the precise diameter of the posterolateral lesion and depth of the right talar hole. The reamer size is then selected based on the lesion diameter. (OATS, osteochondral allograft transplantation.)



**Fig 6.** Intraoperative photograph of a 12-mm cannulated reamer used to core out the osteochondral lesion on the posterolateral aspect of the right talar dome. The guide pin is overdrilled using the coring reamer.

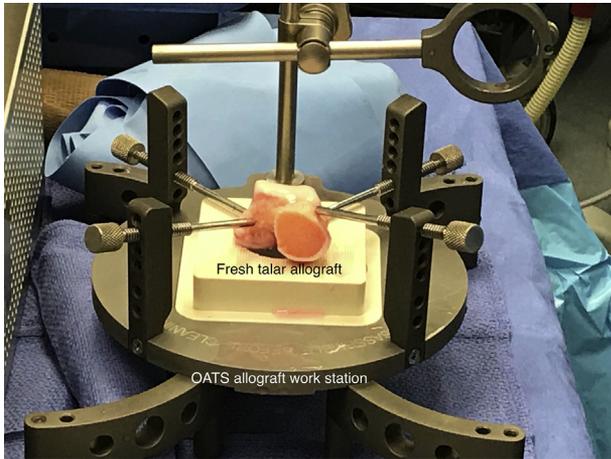
FL) is used to measure the diameter of the lesion to determine reamer size (Fig 5). A calibrated coring reamer (Arthrex) is then used to ream to a depth of 10 mm (Figs 6 and 7). The depth at the anterior (10 mm), posterior (10 mm), medial (10 mm), and lateral (9 mm) positions of the lesion should be measured for proper allograft placement.

#### Donor Talus Harvest and Insertion

An intact talus allograft is placed on an Allograft OATS Workstation (Arthrex) (Fig 8). Accuracy in this step of the process is fundamental to harvest an identical donor chondral plug. The coring reamer previously used for the recipient harvest is carefully placed on top of the donor graft. Once an identical plug is cored out, it is necessary to shape the harvested plug to match the size of the lesion with a small rongeur (Fig 9). The donor plug is then inserted and gently tapped in until flush circumferentially (Fig 10). Range of motion is checked to confirm there is no impingement of the OATS on the distal tibia. These key steps are shown in Video 1.



**Fig 7.** Arthroscopic photograph of the reamed right talar hole on the surrounding articular surface. The guide pin is seen centrally. The depths of the anterior (10 mm), posterior (10 mm), medial (10 mm), and lateral (9 mm) positions are carefully measured.



**Fig 8.** The fresh talar allograft is secured to the osteochondral allograft transplantation (OATS) workstation for donor plug harvesting. A 12-mm reamer is similarly used to core out an identical allograft plug at the same anatomic location on the talus.

### Final Examination and Postoperative Care

For the first 2 weeks, the patient should be placed in a non-weight-bearing splint until wound healing occurs and sutures are removed. The patient may then be fitted into a boot and should remain non-weight bearing for 8 weeks. At 3 to 4 weeks after the procedure, radiographic evaluations should be conducted to ensure routine healing (Fig 11). At this point, physical therapy with gentle range-of-motion exercises, as well as light strengthening, should begin.

At the 8-week mark, the patient may transition from non-weight bearing to partial weight bearing with 2 crutches. One week later, the patient may progress to 25% weight bearing with the assistance of a single crutch. Ten weeks after the procedure, the patient may return to full weight bearing and resume activities as tolerated. The boot may now be replaced with a shoe, but strenuous activity such as running should be



**Fig 9.** Once the donor plug is harvested, it is measured and shaped precisely to fit in the recipient talar hole. Rongeurs may be used to smooth the proximal edges of the allograft plug.



**Fig 10.** Arthroscopic photograph of the allograft plug placed flush with the talar articular surface. After the donor plug is placed, it is gently impacted into the right talar hole. Repetitive impacts are avoided because they may lead to substantial chondrocyte apoptosis and cell death.



**Fig 11.** Postoperative radiograph of the right ankle, lateral view, showing the burred anterior lip of the tibia.

**Table 2.** Advantages and Disadvantages

Advantages
Avoids donor-site morbidity
Reduced operative time
Reduced postoperative pain
More anatomically accurate reconstruction of talus
Can be used with irregularly shaped defects
Avoids risk of fibrous nonunion or malunion
Disadvantages
Risk of allogeneic disease transmission
Increased cost compared with autograft
Potentially lower rate of healing

avoided for an additional 4 weeks. Range-of-motion exercises and strengthening should be continued for 6 weeks after full weight bearing.

## Discussion

If OLTs do not respond to nonoperative courses of treatment or cannot be treated nonoperatively, surgical procedures are often used. In OLTs less than 1.5 cm<sup>2</sup>, microfractures are used to create fibrocartilage at the lesion site.<sup>2,4,6,7</sup> However, Yoon et al.<sup>8</sup> reported that despite short-term symptom relief, patients experience increased pain and decreased function at long-term follow-up.<sup>2</sup> Ahmad and Jones<sup>4</sup> and Yoon et al. hypothesized that the lack of long-term pain relief is due to the inferior biomechanical properties of fibrocartilage relative to native hyaline cartilage, which degrades over time and can result in a symptomatic OLT.<sup>6</sup>

In cases in which OLTs are recurrent and/or larger than 1.5 cm<sup>2</sup>, articular cartilage replacement procedures provide an avenue to restore hyaline cartilage at the ankle joint. Autologous osteochondral transplants involve substituting the OLTs with plugs from the patient's distal femoral condyle, providing the talus with articular cartilage as well as viable chondrocytes.<sup>3</sup> However, transplantations involving an autograft may lead to significant donor-site morbidity that has the potential to significantly interfere with daily activity.<sup>1</sup>

**Table 3.** Pearls and Pitfalls

Tips and pearls
For osteochondral lesions of the central and/or posterior talar dome that are not fully visualized with plantar flexion, the surgeon should carefully burr 5 to 10 mm of the anterior lip of the tibia. This technique avoids the need for fibular osteotomy. The location of the osteochondral defect should match the location of the donor talus from which the allograft plug is harvested. Careful measurement of the depth of the talar hole should be performed at the 12-, 3-, 6-, and 9-o'clock positions for proper allograft placement.
Pitfalls
Removal of cartilage and subchondral bone that excessively surpasses the size of the original lesion
Incorrect sizing of the allograft plug relative to the depth of the recipient hole
Repetitive or uneven impaction of the allograft plug into the talar hole

The proposed technique maintains the benefits provided by autologous osteochondral transplantation while avoiding several concomitant complications (Table 2). Harvesting plugs from an allograft donor avoids additional incisions at the knee, reduces postoperative pain, and decreases operative time. Donor-site morbidity associated with autografts is also avoided. In addition, the use of a talar allograft allows for a more anatomic reconstruction of the talus because harvesting of autografts is spatially constrained by the pre-existing anatomy of the femoral condyle of the knee.

Our technique also minimizes the invasiveness of the procedure by avoiding a fibular osteotomy (Table 3). Although most OLTs are accessible with plantar flexion stress, Muir et al.<sup>10</sup> found that 20% of lesions of the lateral talar dome are inaccessible without an osteotomy. However, performing a malleolar osteotomy carries the risk of fibrous nonunion or malunion.<sup>7</sup> Our technique avoids these risks by burring the anterior lip of the tibia to reach a lesion at the lateral and central aspect of the talus.

A potential disadvantage of our technique is the possibility of allogeneic disease transfer. Care should be exercised to ensure that allografts are thoroughly tested according to safety guidelines outlined by the American Association of Tissue Banks.<sup>5,7</sup> In addition, it has been reported that OATS has lower rates of healing compared with autologous osteochondral transplantation. However, a recent comparison of the 2 techniques by Ahmad and Jones<sup>4</sup> found no statistically significant difference in healing. Ahmad and Jones also argued that the lower healing rates found in earlier reviews may be explained by the lack of prospective and comparative studies. Further research is necessary to identify the best course of treatment for OLTs.

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