Restorative Tissue Transplantation Options for Osteochondral Lesions of the Talus: A Review

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KEYWORDS

• Osteochondral lesion of talus • Osteochondral allograft • Osteochondral autologous transplant • DeNovo • PRP

KEY POINTS

- Larger osteochondral lesions of the talus greater than 1.5 cm^2 have increased risk for healing complications.
- Osteochondral autograft transfer improves functional outcomes and pain scores in medium to short-term periods.
- Most of the success rate of osteochondral allografts is based on retrospective case series with limited outcome data.
- Autologous chondrocyte implantation has been shown to improve American Orthopedic Foot and Ankle Society scores but most studies do not correlate results with specific characteristics of the lesion.
- There are limited clinical data to support the use of platelet rich plasma, hyaluronic acid, bone marrow aspirate concentrate, or juvenile cartilage for osteochondral lesions of the talus.

INTRODUCTION

Osteochondral lesions of the talus (OLTs) are more common than previously thought. They are associated with trauma and are frequently involved in patients presenting with ankle sprains or fractures. The range of OLTs occurring after ankle trauma has been reported to be between 10% and 75%.[1–4]

Diagnosis can be difficult because plain radiographs may miss more than half of osteochondral lesions.[5] On clinical examination, there is not a specific test that is diagnostic for osteochondral lesion of the talus. Patients may present with diffuse nonspecific tenderness, or the pain may be more specific over the medial or lateral talus. Computed tomography (CT) and MRI are frequently used for the evaluation of suspected OLT. MRI is typically preferred for assessing the integrity of the overlying cartilage in nondisplaced lesions. CT scans are better at showing cystic lesions that may be overestimated with the edema seen on MRI. In addition, CT scans have been reported to be more accurate at determining lesion size.[6]

Various classification schemes have been devised, with some based on radiographic findings and some based on intraoperative arthroscopic findings regarding the condition of the osteochondral fragment. The Berndt and Harty classification is based on plain radiography (**Box 1**), the Hepple classification is based on MRI, and the Ferkel and Sgaglione classification is based on CT scan.[7,8]

The authors have nothing to disclosure.

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Box 1
Berndt and Harty radiographic classification

Stage I: subchondral compression (fracture)

Stage II: partial detachment of osteochondral fragment

Stage III: completely detached fragment without displacement from fracture bed

Stage IV: detached and displaced fragment

Stage V: subchondral cyst present

From Wodicka R, Ferkel E, Ferkel R. Osteochondral lesions of the ankle. Foot Ankle Int 2016;37(9):1025; with permission.

After diagnosis of a symptomatic OLT, initial treatment is nonoperative. This may include anti-inflammatories, immobilization, and protected weightbearing. The main contraindication to nonoperative treatment is an acute injury with displacement. In these cases, prompt operative management is indicated to either resect or perform reduction and internal fixation of the fragment.[9]

Surgical intervention is indicated for the remainder of osteochondral lesions that have failed conservative management. Bony or ligament reconstruction may also be necessary at time of surgery. Ankle arthroscopy is the most common treatment modality for OLT. Often, the osteochondral lesion is treated with debridement or marrow stimulation. Penetration of the subchondral plate leads to release of mesenchymal stem cells and growth factors that forms a clot that develops into fibrocartilage. This type-I collagen has different biomechanical properties than native articular hyaline cartilage, which is composed primarily of type-II collagen. Debridement and marrow stimulation have been well reported in the literature and shown to be effective for lesions less than 1.5 cm^2.[10] This cutoff of 1.5 cm^2 is based on several prior studies, and lesion size has been accepted widely as the most commonly used predictor of clinical outcomes after bone marrow stimulation for OLT. However, recent literature has failed to detect a significant correlation between lesion size and clinical outcomes after bone marrow stimulation.[11] In fact, a recent systematic review found that lesion sizes greater than 107.4 mm^2 and 10.2 mm in diameter are significantly correlated with poorer clinical outcomes.[11] The investigators reported that the variability in calculating lesion size area makes the current cutoff of 1.5 cm^2 inaccurate.

Arthroscopic treatment of osteochondral lesions has been associated with worse outcomes for large cystic lesions. Shoulder lesions of the talus are also challenging because the curved geometry is hard to reproduce. Uncontained osteochondritis dissecans (OCD) of the talar shoulder have more complicated clinical outcomes than those with a contained nonshoulder lesion.[12] In these cases, restorative tissue transplantation options include use of autograft, allograft, autologous chondrocyte implantation (ACI), and juvenile cartilage allograft transplantation. This article focuses on these transplantation options and seeks to provide an up-to-date evidence-based summary of the literature.

OSTEOCHONDRAL AUTOGRAFT TRANSPLANTATION SYSTEM

Osteochondral autograft transplantation system (OATS) involves harvesting cylindrical blocks of cartilage and bone from a donor site such as

- Trochlea and sulcus terminalis of the ipsilateral knee
- Superolateral aspect of the lateral femoral condyle (Fig. 1)
- Ipsilateral distal tibia
- Ipsilateral talus.

Although osteochondral autologous transplantation has traditionally been used as salvage for failed primary treatment, its use as the primary procedure has been supported by several studies. Benefits of OATS allows for bony healing with hyaline cartilage and no concern for an immune response destroying the graft. Disadvantages include donor site morbidity and

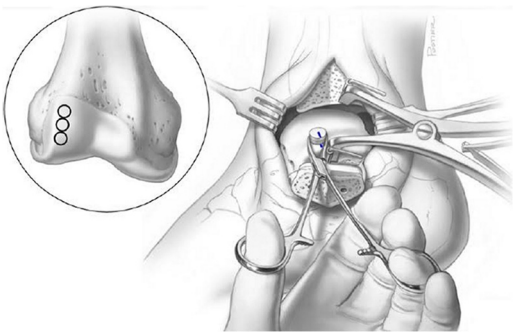

Fig. 1. Autologous osteochondral transplantation harvested from the knee. One or more cylindrical grafts are transplanted into the talar lesion, taking care to keep the articular surface congruent. (*From* Murawski CD, Kennedy JG. Operative treatment of osteochondral lesions of the talus. J Bone Joint Surg Am 2013;95(11):1049; with permission.)