Osteochondral Lesions of the Talus

OVERVIEW

Historically, a variety of terms including osteochondritis dessicans, transchondral talus fracture, and osteochondral talus fracture have been used to describe what are now universally referred to as osteochondral lesions of the talus (OLTs). OLTs have been reported to represent approximately 4% of all cases of osteochondral lesions. The incidence of bilateral lesions is approximately 10%. Despite significant recent advances in the treatment of symptomatic OLTs, proper selection of the most appropriate treatment plan remains complex and challenging.

ANATOMY

The talus is the second largest tarsal bone and is comprised of three major parts including the head, neck, and body. Two thirds of the talar surface is covered with articular cartilage that includes five articular surfaces. Neither tendons nor muscles insert on or originate from the talus. The body includes the dome of the talus at the ankle joint and the posterior facet at the subtalar joint.

Recent studies have shown that most osteochondral lesions are not the traditionally described anterolateral and posteromedial lesions, but rather central medial and central lateral lesions. Medial osteochondral lesions are more common than lateral osteochondral lesions. Medial lesions have been described as deeper and larger, extending into subchondral bone and often developing into cystic lesions. Lateral lesions are more commonly associated with a traumatic injury and are described as shallow with a greater tendency to become displaced.

BIOMECHANICS

In the normal anatomic relationship between the distal ends of the tibia and fibula, a certain amount of motion is allowed in all three planes. When the ankle joint is loaded in

dorsiflexion, the articular geometry contributes to translational stability and to a lesser degree, rotational stability. The ligaments surrounding the ankle take over a more dominant role in the unloaded ankle, particularly when the ankle is in plantar flexion.

PATHOGENESIS

The etiology of an OLT can be divided into nontraumatic and traumatic defects. Most authors believe that a traumatic etiology has an integral role in the pathogenesis of a vast majority of OLTs. It is hypothesized that they represent the chronic phase of a talar dome compression fracture. A single event of macrotrauma or repetitive microtrauma may initiate progression of the lesion in an individual already predisposed to talar dome ischemia. Endocrine or metabolic abnormalities, vasculopathies, and avascular necrosis are potential etiologic factors in nontraumatic OLTs, but there is no clear consensus regarding these elements.

Subchondral cysts with overlying chondromalacia, osteochondral fragments and loose bodies all represent various stages in the progression of osteochondral lesions of the talus. The development of a symptomatic OLT depends on various factors. The primary mechanism is damage and insufficient repair of the subchondral bone plate. The associated pain is believed to be a result of stimulation of the highly innervated subchondral bone underneath the cartilage defect. The precise natural history of an OLT is unclear but osteoarthritis of the ankle has been shown to be an uncommon final outcome.

CLINICAL PRESENTATION

The diagnosis of an OLT is rarely made immediately after an acute ankle injury. In most cases it is associated with chronic ankle pain that develops after a traumatic incident, commonly an inversion injury to the lateral ligamentous complex. Patients presenting with an OLT often describe prolonged pain, recurrent ankle swelling, weakness and subjective instability. The pain is commonly described as deep in the ankle. Patients may also report mechanical symptoms including catching, clicking, and locking. A high index of suspicion for an OLT must be maintained when evaluating patients with chronic ankle pain.

EXAM

The physical examination often reveals swelling and tenderness at the level of the ankle mortise anteriorly or posteriorly. Ligamentous insufficiency or laxity may be present and should always be evaluated. The exam, however, is often benign and the history is usually the best way to assess for the possibility of an OLT.

STAGES

Berndt and Harty described the first staging system based on plain radiographic evaluation that is still widely utilized. According to their classification system they described four stages based on subchondral impaction, detachment and displacement of the fragment. As a result of relatively recent progress in advanced diagnostic imaging, it is now possible to describe the lesions in more detail. As a result, several other classifications have been added to the classification of Berndt and Harty. Ferkel and Sgaglione described a four-stage system of classifying the lesions based on CT finding. This classification system corresponds to stages described in the original classification by Berndt and Harty but also considers subchondral cyst formation, fragmentation and the overall extent of osteonecrosis. MRI is most commonly used modality to stage osteochondral lesions of the talus. Anderson et al described an MRI classification system also based on the Berndt and Harty classification system. Furthermore, Mintz and associates described an MRI grading system based on Cheng and Ferkel's arthroscopic grading system. Several additional arthroscopic grading systems have also been described.

IMAGING STAGES

Advanced imaging modalities have significantly increased our ability to accurately diagnose OLTs. MRI is the preferred imaging study for detection and staging of a suspected OLT. MRI provides improved three-dimensional localization and sizing of the lesion. It also aids in the assessment of stability and determination of the presence of a cystic component. CT is predominately utilized as an adjunct for a more comprehensive evaluation and preoperative planning of known lesions.

TREATMENT

Surgical intervention is indicated for acute displaced osteochondral lesions and for those refractory to conservative care. The approach and objectives of surgery are variable and dictated by the type of lesion that is present. Goals may range from removal of a loose fragment to securing a larger fragment anatomically. Alternatively the primary objective may be creating an environment for fibrocartilaginous proliferation or resurfacing with hyaline cartilage.

The primary traditional approach includes open ankle arthrotomy. Numerous exposure methods have been described including several variations of medial malleolar osteotomies, distal tibial osteotomies along with combined anterior and posterior arthrotomies. Open approaches require significant tissue trauma and as a result may be associated with postoperative stiffness, prolonged rehabilitation time and poor cosmetic appearance. Additionally, nonunion or malunion of the malleoli is a risk with approaches involving a malleolar osteotomy. Inadequate visualization of the talar dome lesion, particularly the posterior aspect, remains a primary limitation of many open approaches.

Ankle arthroscopy has established itself as a useful tool in both the diagnosis and treatment of osteochondral lesions of the talus. Compared to an extensive open approach, arthroscopy has proven to provide superior visualization of the talar dome along with improved access to the lesion. As a result of recent advances, arthroscopic management of osteochondral lesions of the talus is now the preferred technique whenever possible.

A wide variety of procedures that vary in complexity have been described for the treatment of OLTs. Treatment strategies generally are categorized as primary repair, reparative techniques, or restorative techniques. Marrow-inducing reparative treatments include abrasion arthroplasty, microfracture, and drilling techniques. Restorative techniques primarily include autologous chondrocyte implantation (ACI), osteochondral autologous transfer system (OATS and mosaicplasty), and osteochondral allograft. Future directions in restorative techniques for OLTs include matrix/membrane ACI (MACI), collagen-covered ACI, arthroscopic allograft/autograft with platelet-rich plasma (PRP) implantation, stem cell–mediated cartilage implants, and scaffolds.

When selecting the appropriate treatment option there are several important variables to consider. It is imperative to delineate, primarily from advanced imaging, the type, stability

and displacement of the lesion. Chronicity, size, location, containment are other important factors to consider. Reparative treatments generally are indicated for contained lesions less than 1.5 cm2 in size. These techniques are relatively inexpensive, with low morbidity, and a high success rate. Restorative techniques are considered for larger uncontained lesions that are not amenable to the reparative techniques previously depicted.

CONCLUSION

Osteochondral lesions of the talus represent a problematic clinical entity to orthopaedic surgeons. The options for surgical treatment have increased substantially over the last decade and continue to evolve as we gain a greater understanding of this challenging pathology. Selection of the most appropriate surgical strategy for osteochondral lesions of the talus remains complex and controversial.

Written by Erik Freeland, DO
Reviewed by Thomas Dowd, MD
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