Treatment of talar osteochondral lesions with autologous osteochondral grafts: indications and technical details

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Abstract
The authors discuss indications and technical details of autologous osteochondral grafts in treating talar osteochondral lesions, based on recent literature prognostic factors, highlighting the relationship between good clinical results and a technically correct surgical procedure.

Keywords: Talus/injuries; Bone transplantation/methods; Transplantation, autologous; Prognosis

Resumo
Os autores discutem as indicações e os detalhes técnicos do tratamento cirúrgico das lesões osteocondrais do tálus por meio da realização de enxertia autóloga osteocondral, baseados nos fatores prognósticos presentes na literatura recente, chamando atenção para os cuidados que devem ser tomados para a realização de um procedimento tecnicamente correto, que se relaciona com os melhores resultados possíveis observados na literatura.

Palavras-chave: Talus/lesões; Transplante ósseo/métodos; Transplante autólogo; Prognóstico
INTRODUCTION

Osteochondral lesions affect the chondral surface and the subchondral bone. The talus is a frequently affected bone, and many cases are secondary to a significant trauma, including ankle sprain, a high prevalence injury in young and active patients, affecting one in 10,000 people daily, in United States.

Chronic ankle instability causes overload of the chondral surface and may be responsible for up to 25% of patients with osteochondral lesions of talus. Ankle fractures also present a substantial risk for chondral injury, with rates reported to be as high as 73% (sixty-one of eighty-four acute ankle fractures).

A Cochrane review performed by Loveday et al. concluded that there was a lack of evidence to determine which operative treatment strategy is most beneficial in treating osteochondral lesions of the talus.

Treatment options include reparative procedures (bone marrow stimulation) and replacement procedures (autologous osteochondral grafts – AOTS, fresh cadaveric osteochondral grafts, chondrocytes transplantation) and biologic adjuvants (PRP and BMAC, for example). Typically, larger cystic lesions are treated with AOTS.

We describe the surgical technique of the AOTS technique, in which an osteochondral graft is harvested from the ipsilateral lateral femoral trochlea, and transplanted to the talus.

SURGICAL TECHNIQUE

The lesion is exposed by a longitudinal anterior lateral or medial incision.

In the lateral approach, the anterior and lateral talus trochlea is exposed. If the lesion continues under the lateral malleolous or if the lesion is not visible using plantar flexion, a fibular osteotomy can be used.

This osteotomy begins at the level of the ankle joint in the anterior fibular border, and progress obliquely to the fibular metaphysis, reaching the posterior fibular border around 5cm from the joint space level (Figure 1). The distal fragment is freed from its soft tissue attachments, keeping the lateral ligaments intact, and posteriorly or distally displaced, allowing the complete visualization of the lesion.

For the medial lesions, an inverted V or chevron medial malleolar osteotomy is done, starting at the medial metaphysis of the distal tibia, and progressing to the joint line. In order to make it safer, a Kirschner wire is inserted in the osteotomy area, reaching the joint line at the level of the lesion, with radioscopic control. After the osteotomy is performed using a thin and long oscillating saw that progresses touching the Kirschner wire, up to the joint line, creating a Chevron like medial malleolous osteotomy, or a step cut osteotomy, done in the frontal plane (Figure 2), that allow the exposition of the lesion area.

After preparing the lesion area, the measurement of the lesion size is done using the appropriate tool. The recipient trephine is used to create a cylindrical space where the graft is going to be introduced. The trephine needs to be inserted perpendicularly to the chondral surface, to allow the proper positioning of the graft.

After removing the graft from the lateral femoral trochlea, by a longitudinal lateral short incision, using the donor...
trephine, perpendicularly placed over the chondral surface, the graft is transferred to the prepared lesion site.

The surgeon marks with a pen the higher talar area, and the corresponding higher spot on the graft to try to match them. The graft is introduced in the talar recipe area.

If after the introduction of the graft the position is not perfect, it is possible to remove it using a 1.0 threaded Kirschner wire in the middle of the graft (Figure 3), and pull it out moving the Kirschner wire from side to side.

After the proper positioning of the graft the joint is inspected, and washed to remove bone debris.

The osteotomy is reduced and fixed, using interfragmentary screws or a posterolateral plate for the lateral malleolar osteotomy, and using two oblique and a transverse screw for the medial osteotomy (Figure 4).

After that the skin is closed in a conventional manner.

**DISCUSSION**

Talar osteochondral lesions are challenging problems for orthopedic surgeons. In the reparative techniques, including microfracture or microdrilling, results can deteriorate over time passes, while trend is some evidence that bone marrow stimulation techniques can be used repetitively, this way creates further problems, increasing lesion size, depth, and severity.

Factors that influence the results of bone reparative procedures are lesion size greater than 1.5cm², in part because the shear stress and compressive resistance of scar fibrous tissue is not the same as normal cartilage tissue. Uncontained lesions (without a wall of normal cartilage around the lesion area after debridement) affects prognosis also, because the cartilage walls help delimiting scar tissue formation after reparative procedures. Contained lesions normally affect the central talar dome region, and uncontained lesions, the shoulders. Patient age can be a prognostic factor but not always so, but some authors disagree with this statement. Cystic and deep lesions have a negative effect on prognosis, with poor results reaching 53% in this patient group.

Medial lesions on the non weight bearing surface have also been shown to have a poorer prognosis.

For these situations, the best procedure are replacement surgeries, and among them, the OATS procedure is well described in literature, with predictable outcomes.

The main indication of this procedure are large, recurring and deep (associated with subchondral cysts) osteochondral lesions (Figure 5).

To obtain the 90% plus satisfactory outcomes described in the literature, it is critical to follow optimal technique outlined. The proper positioning of the graft has great importance, due to overload of the graft or surrounding tissue caused by a graft higher placed comparing to the surrounding chondral surface, or under this level (Figure 6).

Donor area problems are not common, but authors found 36% of patients with complaints affecting the knee. Surgeons must be aware with the closing of patellar retinaculum, because problems in donor area are often related to a over tightened closure of lateral retinaculum. The symptoms are, in most of the times, temporary. The number and size of grafts, patient age or bone mass index does not interfere with symptoms in the knee (Figure 7).

Previous procedures, number of used grafts, need of malleolar osteotomies or the presence of degenerative arthritis do not impact significantly outcomes following AOTS.
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Figure 5. Large, recurred and deep osteochondral talar lesion pre and post autologous osteochondral grafts procedure.

Figure 6. Proper graft alignment.

Figure 7. Magnetic resonance image of a 5 year follow-up donor site in an asymptomatic patient.

Figure 8. Incongruency of medial maleolar osteotomy.
Perfect reduction of the osteotomy is important to prevent incongruences or soft tissue interposition impact, causing problems in this area.\(^{(2)}\) The T2 mapping of both medial and lateral osteotomy have been reported showing excellent restoration of cartilage congruency and functional outcome (Figure 8).

**COMMENTS**

The AOTS procedure in treating osteochondral lesions of the talus has excellent results in selected patients. Surgeons must be aware to the use of proper surgical technique to high patient level of satisfaction.

**REFERENCES**


