

## **POSITION STATEMENT**

### **The Use of Osteochondral Transplantation for the Treatment of Osteochondral Lesions of the Talus**

#### **Position Statement**

The American Orthopaedic Foot & Ankle Society (AOFAS) endorses the use of osteochondral autograft and allograft transplantation for the treatment of osteochondral lesion of the talus, especially large diameter lesions, cystic lesions, and those that have failed previous surgical treatment. AOFAS does not consider these procedures to be experimental in a patient population that has failed nonoperative management.

The American Orthopaedic Foot & Ankle Society is a medical specialty society whose 2,500 members are orthopaedic surgeons specializing in the operative and nonoperative treatment of injuries, disease, and other conditions of the foot and ankle. The AOFAS promotes quality patient care through education, research, and training of orthopaedic surgeons and other healthcare providers, and serves as a resource for government, industry, and the healthcare community on issues concerning the medical and surgical care of the foot and ankle.

#### **Background**

An osteochondral lesion of the talus (OLT) is a region of focal degeneration or injury to the talus bone that involves the cartilage of the joint surface as well as the “subchondral” bone just beneath the cartilage. OLTs are a common source of ankle pain and can cause substantial disability and lost productivity. While many OLTs are traumatic in origin, most cases are idiopathic.

Numerous surgical options are described for the treatment of painful OLTs that have not responded to nonoperative care. Smaller diameter lesions are most treated with “marrow stimulation” techniques.<sup>14</sup> These involve making multiple perforations in the subchondral bone to allow recruitment of mesenchymal stem cells which then differentiate and produce fibrocartilaginous repair tissue. The most commonly utilized form of marrow stimulation is microfracture, in which a small awl or drill is used to make several punctures in the subchondral bone. However, it must be noted that the cartilage produced by marrow stimulation is partly fibrous (“fibrocartilage”) and contains Type I collagen. This differs and is biomechanically inferior to native articular cartilage, which contains Type II collagen.

Another essential tool in treatment of OLTs is osteochondral transplantation. With this technique, the diseased cartilage and subchondral bone is replaced with one or more autograft or allograft plugs that contain both bone and cartilage. Alternatively, a single “block” of bone and cartilage may be used. Osteochondral transplantation is particularly useful for the treatment of large diameter OLTs, for those lesions associated with an underlying void, or cyst, in the subchondral bone (“cystic lesions”), and in revision settings where less invasive treatments have failed. Compared to smaller osteochondral lesions, larger lesions treated with marrow stimulation techniques have demonstrated poorer results. This outcome threshold is commonly used to define a “large” lesion, with surface area ranging from  $>100\text{mm}^2$  to  $>150\text{mm}^2$ , depending on the study<sup>3,4,17, 21, 22</sup>. In one study of OLT in young elite athletes Lee et al<sup>23</sup> found that this threshold may be even smaller, with lesions larger than  $84\text{mm}^2$  being associated with a lower likelihood of sustained return to play following microfracture.

## **Peer-reviewed Publications on Osteochondral Transplantation**

The use of osteochondral transplantation is well supported by the peer reviewed scientific literature.<sup>5-9,12,14-16</sup>

For instance, Lee et al. reported good-to-excellent results in 100% of patients treated with osteoarticular transplantation.<sup>12</sup> Paul et al. reported a very large series (131 patients) in which autologous osteochondral plugs were used to treat advanced OLTs.<sup>15</sup> These authors reported significant improvement in pain scores as well as a high percentage of return to sport. Nguyen et al reported a return previous level of sport of 87% in 38 athletes after autologous osteochondral transplantation demonstrating it is a viable option in the athletic population.<sup>24</sup>

Long-term follow-up studies have also shown good results.<sup>6,8,9,18, 20</sup> Imhoff and colleagues reported that clinical outcome scores and follow-up magnetic resonance (MR) imaging remained improved at an average of 84 months following osteochondral autograft transfer.<sup>9</sup> They reported a significant increase in the AOFAS score (50 to 78 points) as well as a significant improvement in the VAS pain score (7.8 to 1.5). Hangody and colleagues utilized autograft transplant from the knee for talar osteochondral lesions in 98 patients with 93% good to excellent results at long-term follow-up.<sup>8</sup> Valderrabano and colleagues reported on a series of patients who underwent knee-to-ankle autologous osteochondral transplantation. At an average follow-up of 72 months, they found significant improvement in AOFAS hindfoot scores (from 45.9 to 80.2) and good to excellent results in 91% of patients in terms of patient satisfaction.<sup>18</sup> In a multicenter study l'Escalopier and colleagues reported long term results at a mean of 8.5 years (range 5-20 years) after autologous osteochondral transplant in 56 patients, with significant and maintained improvement over time.<sup>20</sup>

Additional studies have shown similarly successful outcomes. Kreuz et al<sup>11</sup> reported results of osteochondral autografting for osteochondral lesions of the talus that have failed arthroscopic treatment in 35 patients with a mean follow-up of 49 months. The AOFAS hindfoot score significantly improved by 35.5 points. Kim et al<sup>10</sup> found no difference in the outcomes including VAS-pain (6.9 to 3.3), AOFAS score (67 to 83), and Tegner score (3 to 3.9) between primary osteochondral autograft transplantation and those with prior arthroscopic marrow stimulation. Good to excellent results were reported in 95% of patients. Yoon et al<sup>19</sup> demonstrated superior results in 22 patients who underwent osteochondral autologous transplantation (Good-excellent 81.8%) when compared with 22 patients who underwent repeat arthroscopy (Good-excellent 31.8%) in a level 3 study. The repeat arthroscopy group suffered from significant deterioration over a mean follow-up of 50 months despite having encouraged early results. Revision surgery was required in 63.6% of repeat arthroscopy patients versus 0% in osteochondral autologous transplantation patients. Shim et al<sup>22</sup> evaluated autologous osteochondral transplant versus marrow stimulation in the treatment of large cystic OLT. They found significantly better clinical results with osteochondral transplantation and noted that lesion surface area (>125mm<sup>2</sup>) but not volume was associated with failure in the marrow stimulation group. Ahmad and Jones<sup>2</sup> conducted a prospective randomized study in 40 patients that failed prior arthroscopy into either osteochondral autologous transplantation (20 patients) or osteochondral allograft transplantation (20 patients). Both groups demonstrated similar and significant improvement in VAS pain (7.9-->2 vs 7.8--> 2.7), FAAM score (54.4--> 85.5 vs 55.2-->80.7), and healing rate (90% vs 81.2%).

Osteochondral allograft transplantation has shown successful outcomes in many studies. Outcomes of bone marrow stimulation without biologic augmentation in large or cystic lesions are less favorable<sup>3</sup> and obtaining an adequate volume of autograft carries the risk of additional morbidity.<sup>13</sup> Raikin prospectively treated fifteen patients with symptomatic OLTs with a cystic component treated with allograft transplantation.<sup>16</sup> The average visual analogue scale improved from 8/10 to 3/10, while the AOFAS hindfoot outcome scores (range, 0-100) improved by 45 points.

El-Rashidy and colleagues reported similar results. In their series, osteochondral lesion treated with allograft transplants demonstrated statistically significant improvement in both visual analogue and AOFAS hindfoot outcome scores.<sup>5</sup> In addition, Hahn et al demonstrated significantly improved pain scores in 13 patients treated with osteochondral allograft transplantation with statistically significant improvement in postoperative pain scores.<sup>7</sup> Gaul et al, found 76% (13/17) of their patient were satisfied with their results after an osteochondral allograft and they demonstrated a survivorship of 81% at 10 years.<sup>25</sup> Finally, Adams et al prospectively followed 14 patients who underwent structural osteochondral allograft transplantation for shoulder OLTs for an average of 55 months.<sup>1</sup> Most patients failed previous surgical treatments. There was significant ( $P < .05$ ) improvement in the VAS pain, AOFAS scale, SF-36, SMFA, and the overall success rate of 86%. There were two failures secondary to cartilage delamination.

While the use of autograft has a trend for superior results for graft healing, donor site morbidity with chronic knee pain can be a cause of concern ranging from 0-26% of patients.<sup>2,15</sup> Additionally, osteochondral fresh allograft may be the only option in certain cases with extraordinary large lesions, when the lesions involve shoulder region of the talus, or if there is no good autologous donor site available.<sup>2,15</sup> Overall, both osteochondral autograft and allograft transplantation have a definitive role in the treatment of uncommon but disabling recurrent osteochondral lesions of the talus.

## **Conclusion**

Osteochondral lesions of the talus are common and often result in substantial pain and dysfunction. The American Orthopaedic Foot and Ankle Society supports the use of osteochondral autograft and allograft transplantation for the treatment of OLTs that have failed nonsurgical management, especially for large diameter lesions, cystic lesions, and lesions that have failed previous surgical treatment. To this end, the AOFAS considers osteochondral transplantation to be a treatment option with demonstrated improved outcomes maintained over long term follow up. This position is based on multiple reports from the peer-reviewed scientific literature.

## **Definitions**

*Allograft:* Bone or cartilage (or both) that comes from a cadaver.

*Autograft:* Bone or cartilage (or both) that comes from the patient's own body.

*Collagen:* A group of proteins that forms the main component of the connective tissues of the body, including cartilage.

*Cystic lesion:* An osteochondral lesion in which some of the subchondral bone is missing, forming a cavity or cyst. The cyst is a void and does not represent a tumor or malignancy.

*Microfracture:* The use of a small awl or drill is to make several punctures in the subchondral bone.

*Osteochondral lesion:* Focal degeneration or injury of the articular surface (joint surface) of the talus bone that involves both the subchondral bone and overlying cartilage.

*Subchondral bone:* In those bones that form a joint and have overlying cartilage, this is the layer of bone just beneath the cartilage.

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