Articular Regional Reconstruction (ARR) for Large Osteochondral Lesions of the Talus using Viable Osteochondral Allograft Combined with Autograft: Technique Description and Case Series

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Introduction/Purpose: Symptomatic osteochondral lesions of the talus (OLT) are challenging to treat, and large lesions (>10mm) with concomitant subchondral bony defects are particularly challenging. Standard treatments such as bone stimulation are limited and are often restricted to smaller lesions. Particulate and fragmented chondral allograft techniques face limitations with uncontained lesions. Structural allograft/autograft techniques often require removal of regions of native, uninjured bone and may encounter donor issues. Postoperatively, ensuring reliable osseous and cartilaginous healing responses can be difficult. Articular Regional Reconstruction (ARR) is a novel technique combining viable osteochondral allograft with morselized autograft bone to address large OLT lesions with bony defects, whether contained or uncontained. We describe a consecutive series of patients undergoing ARR here.

Methods: Patients indicated for the ARR procedure had preoperative MRI and CT imaging identifying large (>10mm), unstable osteochondral lesions with bony defects; 11 consecutive patients that had undergone ARR were identified. OLT lesions were initially inspected arthroscopically, and then converted to open debridement. Medial malleolar osteotomies were used for access when necessary. A stable bony base and viable cartilage rim was established, removing all damaged cartilage and nonstructural material from the OLT and bony defect. Talar body structure and morphology was restored using iliac crest or tibial morselized autograft bone placed in the bony defect. Viable osteochondral allograft (Cartiform) was shaped and then secured over the autograft using suture anchors placed at the lesion periphery. Patient Reported Outcome (PRO) measures included PROMIS-physical function (PROMIS-PF), PROMIS-pain interference (PROMIS-PI), and single assessment numeric evaluation (SANE). Three patients without PRO data were excluded, leaving eight patients with preoperative and postoperative PRO data for analysis.

Results: The ARR patients averaged 40 years old (range 28-60) with a mean follow up of 19 months (range 10-38). The lesion surface areas averaged 1.95 cm² (range 1.17-2.99 cm²) with a depth of 7.25mm (range 5-9mm). Four were uncontained corner lesions. Postoperative PROMIS-PF improved from 41 to 47 (p = 0.036), and PROMIS-PI improved from 60 to 53 (p = 0.093). Average SANE scores improved from 60 to 69 (p = 0.148). No complications occurred. No revision OLT surgeries were required, though three patients returned to the OR (Two for osteotomy screw removal, one for anterior impingement of opposite corner). During these 'second looks', the implanted cartilage layer was found intact. In a recent survey, all patients indicated they would undergo the procedure again.

Conclusion: Articular Regional Reconstruction (ARR) is a reproducible procedure with demonstrated potential for improvement in pain and physical function among patients with symptomatic, large osteochondral lesions of the talus with bony defects, whether 'contained' or 'uncontained'. It has particular utility as an alternative to bulk structural graft salvage procedures among patients who have failed prior procedures, as 5 of the 8 patients had undergone unsuccessful prior surgical intervention for their OLT by outside providers. Further studies on ARR of the talus are necessary to elucidate the prognosis of this procedure, establish indication boundaries, and strengthen long-term outcome data.
Figure 1: Preoperative MR imaging of ankle showing a large osteochondral lesion and bony defect of the lateral talar dome (A,B). Intraoperative image of debrided lesion, accessed through medial malleolar osteotomy (C). OLT lesion after autograft bone reconstruction of talar body bulk and placement of osteochondral allograft (D). Intraoperative images of reduced talus in plantarflexion and dorsiflexion (E,F).