

Osteochondral Autologous Transfer and Bulk Allograft for Biological Resurfacing of Large Osteochondral Lesions of the Talus

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Abstract: Osteochondral lesions of the talus that have previously undergone surgical management or involve the shoulder region of the talus require methods other than microfracture for treatment. For those lesions that have failed microfracture and do not involve the shoulder of the talus, osteochondral autologous transfer is our preferred treatment of choice. Perpendicular access to the lesion, often by osteotomy, is required for this technique. For those osteochondral lesions of the talus that involve the shoulder of the talus, structural allograft is indicated. This article describes our technique for osteochondral autologous transfer and structural allograft implantation.

Level of Evidence: Diagnostic Level 5. See Instructions for Authors for a complete description of levels of evidence.

Key Words: talus, cartilage transplantation, osteochondral, OLT, reconstruction, allograft

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LEARNING OBJECTIVES

After participating in this CME activity, Orthopedic Surgeons should be better able to:

1. Select patient-specific treatment approaches utilizing Osteochondral Autologous Transfer as well as structural allograft for osteochondral lesions of the talus that have previously failed surgical treatment.
2. Implement the steps described for Osteochondral Autologous Transfer utilized in the surgical treatment of osteochondral lesions of the talus.
3. Implement the steps described for structural allograft implantation utilized in the surgical treatment of osteochondral lesions of the talus.

HISTORICAL PERSPECTIVE

Osteochondral lesions of the talus (OLTs) refer to focal pathology of the talar articular cartilage and corresponding subchondral bone. Although initially thought to be secondary to spontaneous necrosis of bone,¹ it is currently felt that trauma is the most common cause of OLTs, with avascular necrosis, repetitive microtrauma, and congenital factors also leading to the development of these lesions.

Although smaller OLTs can be managed appropriately with debridement and microfracture, those larger than 15 mm in diameter^{2,3} have been shown to have poorer outcome when treated with this modality. In addition, those OLTs with a cystic component, or those that extend to the shoulder of the talus require alternative treatment strategies in attempts to reconstruct the native architecture of the talar dome.^{4,5}

For those lesions with a cystic component and an intact shoulder, osteochondral autologous transfer (OAT) can be performed.^{4,6–8} This procedure has been extensively used in the knee, with modifications made for its application in the ankle.⁹ Traditionally, autograft osteochondral plugs harvested from the ipsilateral knee have been favored; however, this harvest carries some degree of donor-site morbidity.^{10–12} Talar allograft, particularly fresh talar allograft may be used effectively in the ankle, with similar results, negligible concern for graft-versus-host/host-versus-graft disease, and no donor-site morbidity.

When the shoulder of the talus has been compromised, a structural allograft may be considered for reconstruction of the talar dome. Although structural allograft has been used extensively for management of large chondral defects or those defects following tumor resection in the knee, with graft

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FIGURE 1. Completion of left medial malleolar osteotomy with chisel. Posterior tibial tendon is protected with the small retractor on the left.

retention reported for upwards of 25 years,¹³ there are few studies with respect to structural allograft reconstruction of the talus.¹⁴⁻²¹

INDICATIONS

OAT is indicated for those OLTs with a large cystic component or in those cases where microfracture has failed. Lesions as small as 6 mm in diameter can be managed with this technique; however, a maximum lesion size has yet to be determined. OAT can be used as the index procedure or as a secondary procedure after failed microfracture. The lesion needs to be contained and should not involve the shoulder of the talus.

When the lesion extends to the shoulder of the talus, we prefer to use a fresh or fresh-frozen allograft. If healthy cartilage remains anterior and posterior to the shoulder lesion, reconstruction through a malleolar osteotomy so as to retain healthy cartilage and bone on 3 sides of the graft is appropriate. In those situations where the lesion extends anterior or posterior, hemitalus allograft using an anterior approach is our preferred method. Although we do not have an absolute volume criterion, anecdotally we have seen a trend for most favorable results with hemitalus allografts over large partial talar dome resurfacing procedures, perhaps due in part to not needing to perform a malleolar osteotomy.

This procedure can be used as the primary procedure in large defects that extend to the shoulder of the talus or as a

secondary procedure in those patients who have failed microfracture or OAT.

CONTRAINDICATIONS

For both OAT and structural allograft, contraindications include diffuse arthritis of the ankle, diffuse avascular necrosis of the talus, bipolar lesions of the tibia and talus, and active infection of the ankle or medical conditions that would prevent the undertaking of an elective procedure. Ankle instability or malalignment should be corrected before, or at the time of graft implantation.

For OAT, patellofemoral pain or arthritis of this joint is a relative contraindication, as graft harvest may further exacerbate these symptoms.

PREOPERATIVE PLANNING²²

When planning for both OAT and allograft talus implantation, plain radiographs are obtained to assess for overall alignment of the ankle. If needed, an alignment series is obtained should the need arise for supramalleolar osteotomy. Although magnetic resonance imaging provides valuable information about the extent of the cartilage defect and associated pathology, marrow edema may exaggerate the actual size of the bony defect. Therefore, computed tomography is the modality of choice for accurate measurement of the lesion's dimensions.²²

For those patients who meet the indications for structural allograft, insurance coverage for the procedure must be established. Once approved, the search for a suitable allograft is initiated. Our preference is for fresh allograft transplantation, although fresh-frozen allograft is an option as well. Variability exists among differing tissue banks in terms of the measurements required. Both anterior-to-posterior and medial-to-lateral dimensions are obtained based on the above-mentioned imaging modalities and relayed to the tissue bank, and laterality, left or right.

Once an appropriate donor is identified and the donor tissue is screened, the tissue bank will forward the allograft dimensions to the requesting surgeon. The donor talus is preferably within 3 mm of the host talus in both anterior-to-posterior and medial-to-lateral dimensions. If the allograft is accepted, once it arrives at the institution, the laterality is confirmed. In addition, verification that the allograft actually contains cartilage is a vital step, as removal of cartilage used to be common practice with some tissue banks. The allograft is stored in a refrigerator (or freezer for fresh frozen) intended for donor tissue.

In terms of special instrumentation, various sets exist for harvest and implantation of OAT plugs. Likewise, commercial mounting devices exist for securing and preparing the whole allograft tali. Additional instrumentation we have found helpful include a small microsagittal saw, small reciprocating saw, power rasp, calipers, low profile mini-fragment screws, and a small fragment set for fixation of malleolar osteotomies.

TECHNIQUE

OAT for OLT^{18,23}

Medial Approach

The incision is centered over the medial malleolus. While keeping periosteal stripping to a minimum, the posterior tibial tendon is identified and retracted posterior to protect the neurovascular bundle. Predrill the medial malleolus with the drill-tracts crossing the proposed osteotomy site. A Kirschner

wire is then placed in the plane of the osteotomy, although slightly more proximal on the tibia than the actual osteotomy so as not to impede the saw. The osteotomy should exit the lateral aspect of the lesion so as to allow full perpendicular access. Start the osteotomy with a saw, using cold saline to prevent thermal osteonecrosis. Liberal use of fluoroscopy ensures the correct saw trajectory. Complete the osteotomy with an osteotome (Fig. 1). Full displacement of the osteotomy can be achieved only if the posterior tibial tendon sheath has been fully released from the medial malleolus. Retract the malleolar fragment plantar for full exposure of the talus.

Initially we were concerned about violating the weight-bearing surface of the tibial plafond; however, with the use of a meticulous technique and anatomic reduction of the medial malleolus at completion of the procedure along with secure fixation, we have not been aware of a long-term negative influence on outcomes when entering the weight-bearing surface of the tibial plafond while performing medial malleolar osteotomy. Important to successful outcome of the procedure is adequate exposure of the lesion that allows proper saw blade positioning and screw fixation for larger structural grafts and perpendicular access to the lesion for OAT procedures. Entering the weight-bearing portion of the tibial plafond is required in all cases for which such reconstruction is indicated.

Lateral Approach

Center the incision over the fibula aiming toward the sinus tarsi. Whereas anterolateral lesions can be accessed by plantar flexion, more posterior lesions will require fibular osteotomy or plafondplasty. For fibular osteotomy, the inferior extensor retinaculum should be identified for utilization in the subsequent lateral ligamentous reconstruction. The osteotomy should be marked, with the distal portion at the level of the joint line. Although favored guidelines for the fibular osteotomy have not been established, we favor an oblique osteotomy that mimics the fracture pattern of a Weber B ankle fracture. In our experience, this osteotomy trajectory affords optimal exposure to the posterolateral talar dome.²⁴ Before creating the osteotomy, a one-third tubular plate should be provisionally fixed to the intact fibula so that these drill holes can be used for fixation at the completion of the case. Plate position should not impede subsequent lateral ligamentous reconstruction. The plate is then removed and the osteotomy is

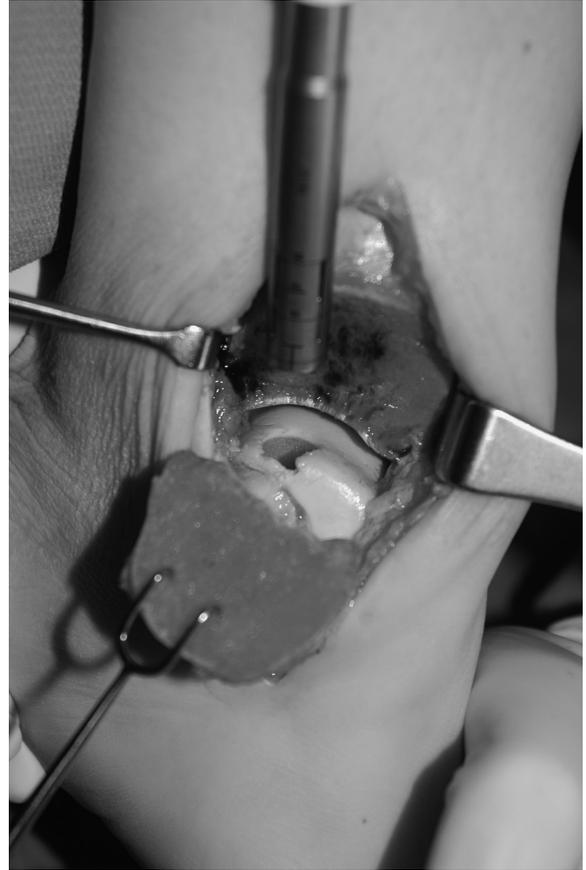


FIGURE 3. Preparation of the medial osteochondral lesions of the talus with the appropriate-sized trephine.

started with a saw and completed with an osteotome. Plantar and posterior retraction of the lateral malleolar fragment allows for access to the lateral lesion.

Centrolateral and anterolateral lesion can also be accessed by trapezoidal osteotomy of the lateral distal tibia (Fig. 2). This foregoes the need for fibular osteotomy and prominent fibular hardware. After anterolateral arthrotomy is performed, the

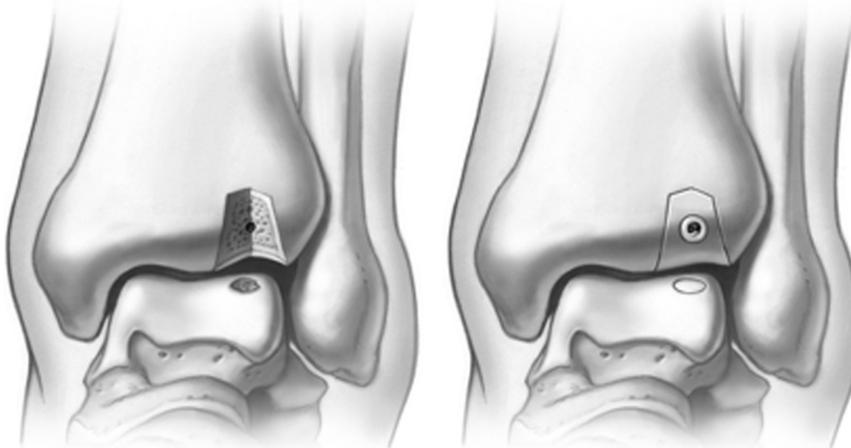


FIGURE 2. Anterolateral distal tibial osteotomy.¹¹ Illustrations copy right and reproduced with permission from John G. Kennedy, MD.



FIGURE 4. Lateral parapatellar arthrotomy with harvest from lateral femoral condyle of the knee.

anterolateral distal tibial osteotomy is marked and then pre-drilled for later fixation. The osteotomy is started with the saw and completed with the osteotome as previously described.

Lesion Preparation

The OLT is debrided to a stable rim of surrounding cartilage. The size of the defect and the orientation is determined with the sizing guide. The foot position can be changed so as to ensure perpendicular access. The appropriately sized recipient trephine is placed 10 to 12 mm into the talus (Fig. 3). If the subchondral bone is sclerotic, an appropriately sized ACL reamer can be used to remove the bone. If this technique is chosen, a guide pin is placed in the center of the lesion and cold saline is used to prevent thermal necrosis of the bone surrounding the defect while reaming.

Graft Harvest

A lateral parapatellar approach is made, followed by a lateral retinacular release with the knee extended. The osteochondral plug is typically harvested as superior and lateral as possible on the condyle so as not to interfere with the patellofemoral articulation. The sizing guide used during lesion preparation is used so as to determine the correct trajectory for the donor trephine. This trephine should be 1 mm larger than the recipient trephine to allow for interference fit of the graft. The trephine is placed perpendicular to the chondral surface. The orientation of the trephine cannot be changed once impaction has started. The trephine should be buried to a depth of 1 to 2 mm shorter than the socket that was created in the ankle defect. Ideally, a line-to-line harvest depth to recipient site would be performed; however, the risk is that the measurement is inaccurate, specifically that the donor cylinder is longer than the recipient site. If this proves to be the case, then as the graft is nearly fully seated but is not flush, further attempts at impaction may lead to shearing the cartilage from the bone. To eliminate this risk, we subtract 1 to 2 mm to the donor plug relative to the recipient site's depth (11 vs. 10 mm). The interference fit is typically excellent with ample surface area for plug incorporation; the gap in the depth of the recipient site is not exposed and because of interference fit in cylinder, synovial fluid has little chance of reaching this minimal defect. Once the desired depth is reached, rotate the trephine 90 degrees in alternating directions, then toggle the trephine and extract the graft from the knee (Fig. 4).



FIGURE 5. Trephine with graft (inside) placed over the recipient site for delivery of graft.

Implantation

Place the trephine over the recipient site (Fig. 5). Advance the graft with the tamp into the recipient site. The goal is to place the graft flush with the surrounding chondral surface (Fig. 6). If after the trephine has been removed the graft continues to remain still proud, the tamp or the corresponding sizing guide can be used to bury the graft further. In our experience, this technique, initially advancing the graft with the donor chisel (and its screw mechanism plunger) and then carefully setting

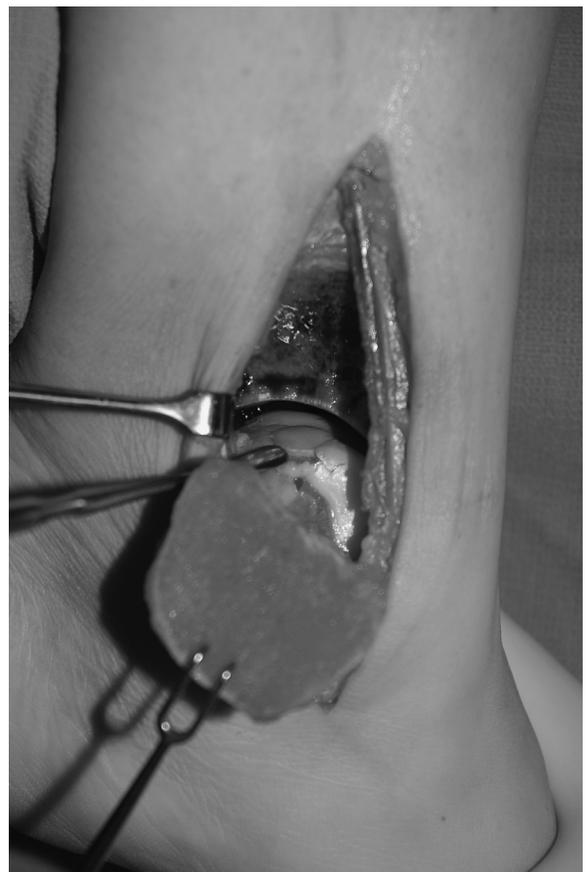


FIGURE 6. Final graft seated flush with the surrounding talus.



FIGURE 7. Fixation of medial malleolar osteotomy with two 4.0 mm partially threaded cancellous screws.

the final graft position with the smooth sizing guide in a recipient site that is slightly deeper than the length of the graft protects the graft's cartilage from damage. If the graft is countersunk, a Kirschner wire can be placed within the graft to manipulate it into the appropriate position.

Osteotomy Fixation

Partially threaded cancellous screws are used for fixation of the medial malleolus (Fig. 7). If additional fixation is required, longer screws engaging the lateral tibial cortex can be used. An additional screw from medial to lateral, parallel to the plafond, can also be used so as to prevent superior migration of the osteotomy. A plate may also be used for fixation of the osteotomy. If fibular osteotomy was performed, the one-third tubular plate that was predrilled can be applied followed by lateral ligamentous reconstruction. For lateral distal tibial osteotomy fixation, a single 4-0 mm screw with a washer should suffice, followed by lateral ligamentous reconstruction. Final position of all implants should be verified by fluoroscopy before closure.

POSTOPERATIVE MANAGEMENT

The patient is placed in a well-padded splint in the operating room and instructed not to bear weight. Knee range of motion exercise is encouraged once comfortable. Two weeks postoperatively, the patient transitions to a controlled ankle motion walking boot with continued weight-bearing restrictions. At this point, the patient is encouraged to start ankle range of

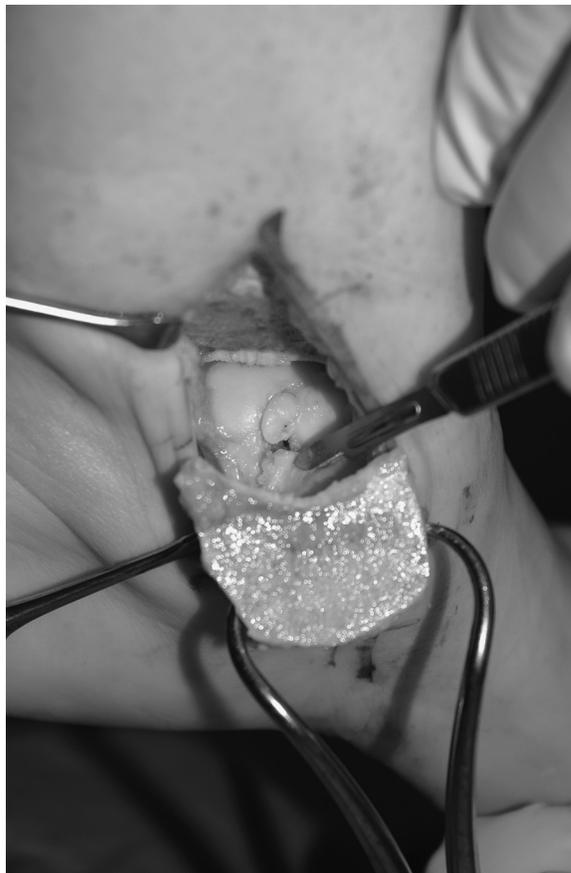


FIGURE 8. Left medial shoulder osteochondral lesions of the talus. This shoulder lesion has healthy cartilage both anterior and posterior to it.

motion exercises 3 to 5 times a day. Four weeks after surgery, patients are allowed partial weight-bearing and progress to full weight-bearing by 6 weeks postoperatively. Weight-bearing radiographs are obtained 6 weeks after surgery. If there are signs of osteotomy healing, physical therapy is commenced for the following 4 weeks. Sports-specific activities are considered at 10 weeks. Patients who have undergone knee harvest may have residual symptoms for up to 1 year after surgery.

Allograft Reconstruction of a Contained Medial Shoulder OLT^{18,22}

Approach

The surgeon verifies that the allograft is available for implantation and that it is of the correct size and laterality before induction of anesthetic. Lesions that involve the shoulder of the talus with healthy cartilage anterior and posterior to the lesion are accessed by medial or lateral malleolar osteotomy as described in the previous section.

Preparation of the Recipient Site

The diseased portion of the talus (Fig. 8) is resected with the reciprocating saw used for vertical cuts (Fig. 9) and the sagittal saw used for horizontal cuts. The power rasp, burr, and fine curettes can all be used for final preparation of the defect. A ruler (Fig. 10) and small caliper are used to record the dimensions of the lesion and are then recorded on glove



FIGURE 9. Reciprocating saw used to make vertical cuts during excision of the diseased portion of the talus.



FIGURE 10. Measurement of the defect with a ruler. A caliper is useful as well.

packaging or sterile gown-card. The measurements are double checked.

Allograft Preparation

The allograft is secured with bone-holding forceps (Fig. 11) or a commercially available mounting device for allograft preparation. The graft is positioned, as it is oriented in the native ankle to allow for the cuts made in the allograft to match those made in the host talus. The graft is marked using the measurements obtained from the defect in the native talus. Using both the microsagittal saw and the reciprocating saw, the allograft is cut so as to match the dimensions exactly. Err on the side of harvesting a graft that is too large. Ensure the cut surfaces are smooth utilizing a flat surface, such as a metallic ruler, and a rasp.

Allograft Implantation

Rarely does the graft perfectly match the recipient site. Every attempt is made to achieve the best match of the graft's articular surface with the surrounding native talus. If the clinical match is appropriate, the fluoroscopic match becomes less important. This is due to variability in the thickness of the 2 different chondral surfaces and their corresponding subchondral bone. Although no 2 tali are alike, the cartilage thickness, in our experience, is relatively consistently similar. One or 2 small diameter (1.5 or 2.0 mm) screws are placed in a lag manner through the graft (Fig. 12). One screw is placed from dorsal to plantar while the other can be placed from

medial to lateral. The screw heads are countersunk. Fixation is checked with fluoroscopy. If the clinical match is acceptable, the fluoroscopic appearance of the graft is less important. In addition the screw heads may not appear to be countersunk fluoroscopically due to the fact that they are countersunk relative to the cartilage surface, not the subchondral bone.



FIGURE 11. Allograft talus secured with bone-holding forceps. The donor graft has been retrieved from the remainder of the allograft.



FIGURE 12. Allograft secured to talus with a 2.0-mm screw.

Osteotomy Fixation

Fixation of the osteotomy is carried out in a similar manner as described in the previous section.

POSTOPERATIVE MANAGEMENT: ALLOGRAFT TALUS

Patients are admitted overnight for pain control. They are seen for a wound check and suture removal at 10 to 14 days postoperatively. If the wound and osteotomy are stable, they are transitioned to a controlled ankle motion boot and made to touchdown weight-bearing. Intermittent, gentle ankle motion is encouraged 3 to 4 times daily. Weight-bearing is progressed at 10 to 12 weeks. Radiographs are obtained at 6, 10, and 16 weeks.

Hemitalus Reconstruction of a Medial Shoulder Osteochondral Lesion of the Talus^{18,22}

Approach

As stated previously, the surgeon verifies that the allograft is available for implantation and that it is the correct size and laterality before induction of anesthetic. An anterior approach to the ankle is performed similar to that for ankle arthrodesis or arthroplasty. The superficial peroneal nerve is identified and retracted laterally, the retinaculum is divided over the extensor hallucis longus, the deep neurovascular bundle is identified and protected and an arthrotomy is then performed. In this case care must be taken to protect the underlying cartilage of the talus. The lesion is inspected, and if it appears appropriate to

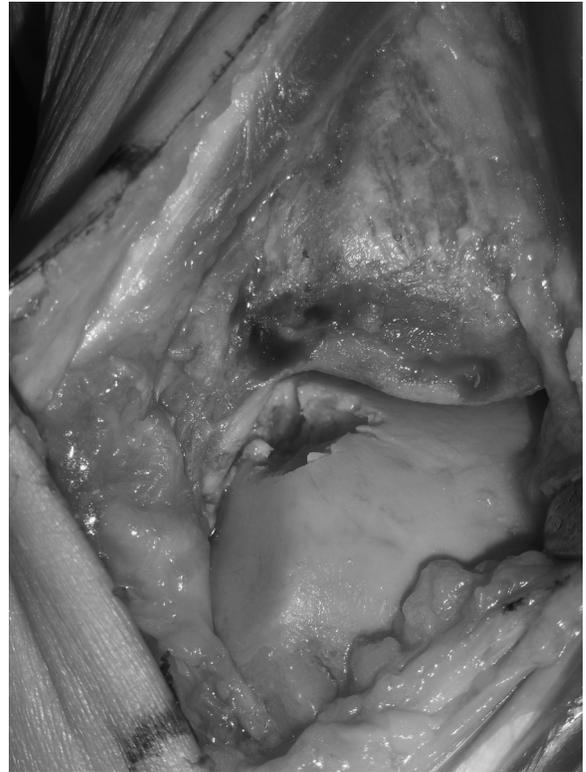


FIGURE 13. Left ankle anterior approach with large medial shoulder osteochondral lesions of the talus.

proceed with reconstruction (Fig. 13), the packaging for the donor talus is opened and the allograft is placed in warm saline on the back table.



FIGURE 14. Wire placed from anterior to posterior that serves as the intersection of horizontal and vertical cuts.



FIGURE 15. Reciprocating saw used to make a vertical cut in line with the reference wire.



FIGURE 16. Microsagittal saw used to make a horizontal cut in line with the reference wire.

Preparation of the Recipient Site

A pin-distractor is used to improve the exposure of the lesion. The lateral border of the lesion is determined and a K-wire is placed 1 mm lateral to this from anterior to posterior (Fig. 14). This pin serves as an axis to guide sagittal and coronal cuts as well as the apex of both cuts. Correct placement of this wire is verified with fluoroscopy. A reciprocating saw (Fig. 15) and a microsagittal saw (Fig. 16) is then used to make vertical and horizontal cuts, respectively, in the host talus. Saline irrigation is used to cool the saw blade during cutting to limit thermal necrosis. A malleable retractor is placed between the medial malleolus and talus during the horizontal cut to prevent damage to the malleolus. The resected surfaces of the host talus typically need to be smoothed. This is accomplished with a hand rasp and a power rasp. Dimensions are then obtained from the defect in the host talus using a ruler and a caliper (Fig. 17). These are recorded on glove packaging or a gown-card with a sterile pen (Fig. 18). These dimensions are double checked.

Allograft Preparation

The allograft is secured with bone-holding forceps or a commercially available mounting device (Fig. 18). The graft is positioned, as it is oriented in the native ankle to allow for the cuts made in the allograft to match those made in the host talus. The graft is marked using the measurements obtained from the defect in the native talus. Using the microsagittal saw and the reciprocating saw, the allograft is cut so as to match the dimensions exactly. Err on the side of harvesting a graft that is too large (Fig. 19). Use a rasp to ensure the cut surfaces are smooth.

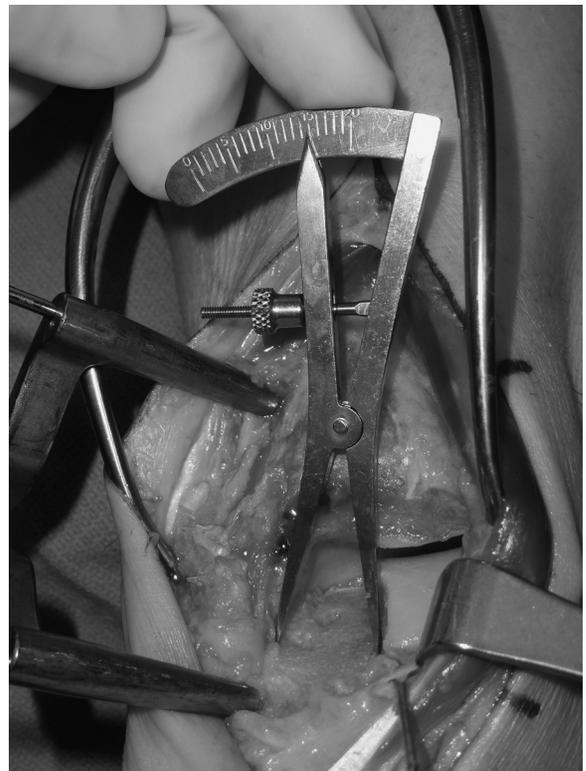


FIGURE 17. Caliper used to measure the defect.

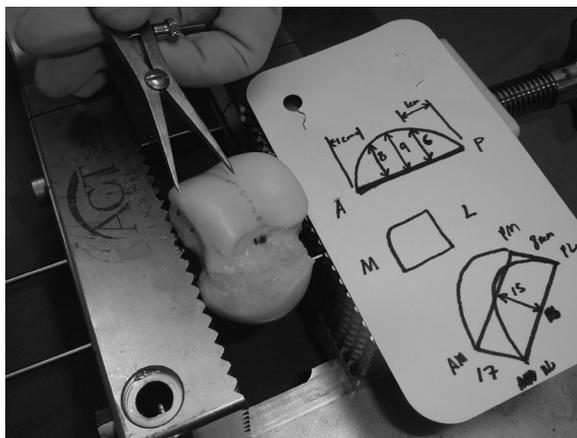


FIGURE 18. Allograft talus placed on mounting device. Dimensions from the defect were annotated with a sterile pen on a gown-card.

Allograft Implantation

The allograft is placed into the native ankle. Very rarely is it a perfect match on the first attempt. Often the recipient site needs to be deepened and the allograft needs to be thinned. Variability exists among human tali, therefore some inconsistencies may be present. Clinically, the graft may appear to fit perfectly; however, there may be incongruencies noted on the prepared surfaces or what appears to be a mismatch between the graft and the subchondral bone on fluoroscopic images (Figs. 20, 21). The graft is held in place with a large tenaculum. One or 2 small diameter screws (1.5 or 2.0 mm) are placed in lag manner through the graft anteriorly with the screw head countersunk (Fig. 22). Because of the congruity of the ankle joint, posterior fixation has not been found to be necessary. On fluoroscopy, the screw head may appear proud; however, this is likely a function of the talar dome not being smooth in a single plane. Postoperative management is as described above for allograft reconstruction.

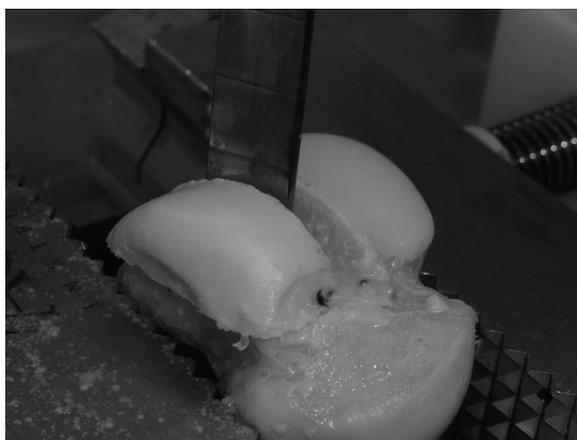


FIGURE 19. Graft has been cut with reciprocating and microsagittal saws. Note how the cuts were made outside of marks. Err on the side obtaining a graft that is too large, as extra bone can be removed if necessary.



FIGURE 20. Fluoroscopic view of implanted allograft. Small step-off noted on the talar dome, however clinically, the graft was flush with surrounding cartilage. This is due to variations in subchondral bone between the donor and native talus.

RESULTS

OAT

Several studies indicate that outcome from OAT are generally favorable.^{8,10,11,25} Scranton et al⁸ reported on 50 patients who had undergone OAT for cystic lesions with a mean follow-up of 36 months. They reported 90% good to excellent results based on the Karlsson-Peterson Ankle Score. Kim et al²⁵ reviewed 52 ankles that had undergone OAT followed by second-look arthroscopy. They found that age, sex, and duration of symptoms had no effect on clinical outcomes; however, BMI greater than 26 was associated with lower Tegner scores. From this cohort, 95% reported good to



FIGURE 21. Lateral fluoroscopic view of implanted allograft.

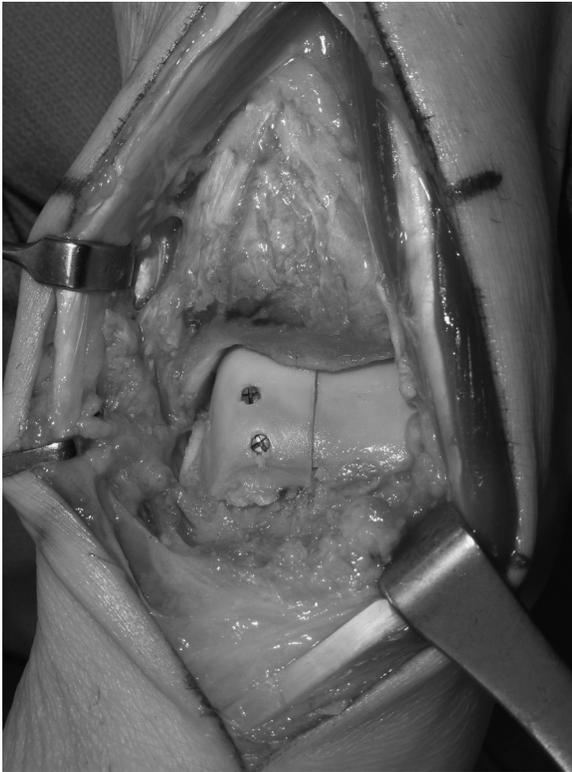


FIGURE 22. Graft fixation with 2 countersunk 2.0-mm screws.

excellent results. Hangody et al¹⁰ reported on 39 patients who had undergone talus mosaicplasty with a mean follow-up of 9.6 years. Hannover scores improved in this cohort from 63 to 91.

Structural Allograft

There is limited data on structural allograft for reconstruction of large OLTs. Adams¹⁷ reported mid-term results of 8 patients who had undergone fresh allograft transplantation with a mean follow-up of 4 years. There was a significant decrease in pain and improvement in Lower Extremity Functional Scale score from 37 points preoperatively to 65 points at final follow-up. The mean AOFAS score was 84. None of these patients developed arthrodesis; however, 4 required additional procedures. Görtz et al²⁶ discussed results of 12 patients who had undergone fresh allograft transplantation with a mean follow-up 38 months. One patient underwent subsequent fusion. Another patient had their allograft revised due to collapse. Of the 10 surviving grafts, only 50% reported good to excellent results based on the Olerud-Molander Ankle Score. Raikin¹⁵ also reported on mid-term results of 15 patients who had undergone fresh allograft reconstruction. Their patients mean AOFAS score was 83. Two patients had undergone subsequent ankle arthrodesis. All grafts displayed either partial collapse or some form of graft resorption. Gross et al¹⁴ reported on 9 patients who had undergone fresh allograft transplantation with a mean follow-up of 11 years. Three of these patients eventually went on to arthrodesis. The reported mean graft survival for this small series was 9 years. Haene et al¹⁹ reported results from 17 ankles that had undergone fresh allograft reconstruction with a mean follow-up of 4.1 years. Although 10 of these cases had what was deemed a good or excellent result, 4 of these 10 still were symptomatic. They

reported 5 of the 17 cases as failures and felt that the indications for this procedure should be “carefully evaluated and the patient should be properly educated” before proceeding with allograft implantation.

COMPLICATIONS

Complications specific to OAT include knee pain and those issues surrounding malleolar osteotomy and fixation. Knee pain after ipsilateral knee harvest is expected, however, it can be persistent and has been shown to occur in up to 50% of patients who undergo OAT.²⁷ Patients should be counseled on the possibility of postoperative knee pain and alternative strategies for reconstruction should be pursued in those patients with preexisting anterior knee pain or patellofemoral arthritis.

Symptomatic hardware associated with malleolar fixation is fairly common. The patient should be warned about this possibility and if symptoms are not tolerable, hardware removal may be undertaken once union of the osteotomy has occurred. Malleolar nonunion is a rare, albeit possible complication. In those cases where this has been identified, patients should undergo takedown of the nonunion site with revision fixation and bone grafting.

In those patients who undergo allograft implantation, similar complications with regards to malleolar fixation exist. Failure of graft incorporation, graft delamination, and graft resorption may occur. If the patient’s symptoms persist, revision allograft implantation, arthrodesis, or arthroplasty may be undertaken. In addition, the risks associated with disease transmission secondary to allograft use are theoretically present, however, with current screening techniques utilized by tissue banks, the incidence of pathogen transmission approaches zero.^{28,29}

Possible Concerns

The primary concerns for both OAT and allograft talus implantation revolve around failure of graft incorporation, graft resorption, and delamination of the chondral surface. With the use of allograft, additional risks include disease transmission and host rejection. When malleolar osteotomy is utilized for access, hardware irritation, malunion, and non-union may occur.

Future of the Technique

OAT remains a viable option for management of cystic lesions of the talus without shoulder involvement or those that have failed microfracture. Although there is little room for refinement of the implantation technique, perhaps alternative harvest sites within the knee or alternatives to decrease postoperative knee pain may arise.

Results from allograft talus implantation for reconstruction of OLTs involving the shoulder of the talus shows promise, although it should be understood by the patient that this is a salvage procedure to at least prolong, if not prevent subsequent arthrodesis or arthroplasty. Additional studies with long-term follow-up are needed.

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CME QUESTIONS

1. Which of the following situations might be most amenable to treatment with Osteochondral Autologous Transfer?
 - A. 16 mm cystic anteromedial osteochondral lesion with no shoulder involvement that has previously undergone microfracture
 - B. 10 mm cystic anterolateral lesion with shoulder involvement that has previously undergone microfracture
 - C. 8 mm posterolateral lesion, no cystic component, no shoulder involvement and no prior treatment
 - D. 7 mm posteromedial cystic lesion with no shoulder involvement and no prior treatment
2. Which of the following situations might be most amenable to treatment with Structural Allograft Implantation?
 - A. 16 mm cystic anterolateral osteochondral lesion with no shoulder involvement that has previously undergone microfracture
 - B. 17 mm cystic anteromedial lesion with shoulder involvement that has previously undergone microfracture
 - C. 7 mm posteromedial lesion with no shoulder involvement and no prior treatment
 - D. 9 mm posterolateral cystic lesion with no shoulder involvement and no prior treatment
3. Contraindications to Osteochondral Autologous Transfer as well as structural allograft include all of the following except:
 - A. Diffuse ankle arthritis
 - B. Diffuse avascular necrosis of the talus
 - C. Cystic lesions of the talus that have failed previous microfracture
 - D. Bipolar lesions of the tibia and talus
4. Placement of a cylindrical osteochondral autograft plug should be at what level in comparison to the surrounding talus?
 - A. 1-2 mm proud
 - B. Flush
 - C. 1-2 mm countersunk
 - D. Buried to the depth of the recipient socket
5. The imaging modality of choice for accurate determination of the dimensions of an osteochondral lesion of the talus is:
 - A. MRI
 - B. CT
 - C. Ultrasound
 - D. Bone Scan

**ANSWER SHEET FOR TECHNIQUES IN FOOT & ANKLE SURGERY
CME PROGRAM EXAM
March 2015**

Please answer the questions on page 39 by filling in the appropriate circles on the answer sheet below. Please mark the one best answer and fill in the circle until the letter is no longer visible. To process your exam, you must also provide the following information:

Name (please print): _____
 Street Address _____
 City/State/Zip _____
 Daytime Phone _____
 Specialty _____

- 1. A B C D E
- 2. A B C D E
- 3. A B C D E
- 4. A B C D E
- 5. A B C D E

Your completion of this activity includes evaluating it. Please respond to the following questions below.

Please rate these activities (1 — minimally, 5 — completely)

This activity was effective in meeting the educational objectives	<u>1 2 3 4 5</u>
This activity was appropriately evidence-based	0 0 0 0 0
This activity was relevant to my practice	0 0 0 0 0

Please rate your ability to achieve the following objectives, both before this activity and after it: 1 (minimally) to 5 (completely)

	Pre	Post
	<u>1 2 3 4 5</u>	<u>1 2 3 4 5</u>
Select patient-specific treatment approaches utilizing Osteochondral Autologous Transfer as well as structural allograft for osteochondral lesions of the talus that have previously failed surgical treatment.	0 0 0 0 0	0 0 0 0 0
Implement the steps described for Osteochondral Autologous Transfer utilized in the surgical treatment of osteochondral lesions of the talus.	0 0 0 0 0	0 0 0 0 0
Implement the steps described for structural allograft implantation utilized in the surgical treatment of osteochondral lesions of the talus.	0 0 0 0 0	0 0 0 0 0

How many of your patients are likely to be impacted by what you learned from this activity?

<20% 20-40% 40-60% 60-80% >80%

Do you expect that these activities will help you improve your skill or judgment within the next 6 months? (1 — definitely will not change, 5 — definitely will change)

	<u>1 2 3 4 5</u>
	0 0 0 0 0

How will you apply what you learned from these activities (mark all that apply):

- In diagnosing patients
- In monitoring patients
- In educating students and colleagues
- As part of a quality or performance improvement project
- For maintenance of board certification
- In making treatment decisions
- As a foundation to learn more
- In educating patients and their caregivers
- To confirm current practice
- For maintenance of licensure

Please list at least one strategy you learned from this activity that you will apply in practice:

How committed are you to applying these activities to your practice in the ways you indicated above? (1 — minimally, 5 — completely)

	<u>1 2 3 4 5</u>
	0 0 0 0 0

Did you perceive any bias for or against any commercial products or devices? **Yes** **No**

If yes, please explain: _____

How long did it take you to complete these activities? _____ hours _____ minutes

What are your biggest clinical challenges related to foot and ankle surgery?

[] Yes! I am interested in receiving future CME programs from Lippincott CME Institute! (Please place a check mark in the box)

Mail the completed Answer Sheet and a check or money order for the \$10 processing fee by March 31, 2016 to:

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