If left untreated, chondral defects of the talus may lead to degenerative arthritis of the ankle. To avoid this complication and restore ankle function, a two-stage reconstruction of the articular surface using autologous chondrocyte transplantation can be performed.

In the initial arthroscopic phase, which is aimed towards healthy cartilage, biopsies are obtained from a nonweight-bearing area of the knee for chondrocyte isolation and cultivation. Chondral biopsy procurement produces an iatrogenic injury to the knee. To retrieve chondral biopsy arthroscopically without donor-site morbidity, the anteromedial rim of the talar domus can be isolated through full dorsal flexion of the ankle and can be used as a donor site. The second phase of this procedure includes arthroscopy and chondrocyte transplantation.

Indications for autologous chondrocyte transplantation include acute or chronic chondral or osteochondral lesions that involve the medial or lateral part of the talus. More specifically, based on the classification of Ritzler and Van Dijk,¹ the procedure is indicated for the anteromedial, medial intermedial ventral, and medial intermedial dorsal portion of the talus and the anterolateral and lateral intermedial dorsal portion of the articular surface.

Contraindications include age >45 years, septic or aseptic inflammatory process of the ankle, ankle instability or laxity, cartilage damage of the distal tibia, and generalized arthrosis.

Preoperative assessment includes clinical and radiographic evaluation. Preoperative physical examination is essential to exclude a possible mediolateral or anteroposterior (AP) ankle instability or a 30° limitation of plantar ankle flexion. Radiographic evaluation includes plain AP and lateral radiographs of the ankle, magnetic resonance imaging (MRI).
with fat suppressed T1-weighted gradient echo, and computed tomography. Computed tomography is necessary to evaluate subchondral cysts of the talus and to investigate their size and relation to the joint.

Between 1997 and 2000, 10 patients with osteochondritis dissecans were treated using autologous chondrocyte transplantation of the talus.

**SURGICAL TECHNIQUE**

The initial phase of the procedure is arthroscopy of the ankle. Following standard preparation, the arthroscope is inserted through the anterolateral portal, which is opened under direct visualization. In full dorsal flexion, the uncovered anterior rim of the talar domus is identified and 2-3 biopsies of 2×3-mm fragments of healthy cartilage are obtained, which are sent for chondrocyte extraction and cultivation (Figure 1).

Lavage of the ankle is performed, and an intra-articular suction drain is placed for 24 hours. Mobilization and weight bearing are allowed after drain removal.

When the cultivated chondrocytes are ready for transplantation, the second phase of the procedure is performed. An anteromedial or anterolateral approach is used based on the position of the talar defect. To facilitate the inspection and perform the operation to the anteromedial or anterolateral part of the talus, maximal plantar ankle flexion is necessary. If an anteromedial or anterolateral lesion extends posteriorly and occupies the central part of the talus, an oblique osteotomy of the medial or lateral malleolus is necessary to gain access to the defect site. The height of osteotomy, as well as the angle of obliquity, is decided according to the space required for the operation. Preoperative MRI is helpful in planning the line of the osteotomy. The osteotomy must provide enough space to allow successful suturing of the periosteum on the opposite border of the defect (Figures 2 and 3).

Prior to conduction of the osteotomy, to achieve a more accurate reposition and better anatomical fixation of the medial or lateral malleolus, a 3.2-mm hole is drilled, preparing the site to receive a 4.5-mm malleolar screw. If exposure of

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*Figure 2: Osteotomy line drawn through the medial malleolus, aiming towards the lateral border of the medial talar lesion.*

*Figure 3: Osteotomy line drawn through the lateral malleolus, aiming towards the medial border of the lateral talar lesion.*

*Figure 4: Defect site preparation of the medial talar dome after medial malleolus osteotomy.*

*Figure 5: The periosteal flap is sutured over the prepared defect site and sealed with fibrin glue.*
the talus is insufficient, a slight incision can be made to the talar ligaments to increase the mobility of the malleoli.

The talar articular defect is debrided up to physiological cartilage and osseous tissue. The size of the defect is measured after debridement. After elevating the extensor communis brevis muscle origin and tibialis anterior tendon, a periosteal flap is extracted with a scalpel from the anterior surface of the distal tibia, according to the defect size.

After removal of the peristeum a 10×10-mm window is opened at the same site and autologous cancellous bone is gained to restore the osseous part of the defect in large osteochondral defects. The cortical window is pushed back and pressed to fit in its original position.

After filling the osseous defect with cancellous bone, the periosteal flap is sutured on the cartilage rim of the defect site with 5-0 PDS single sutures. The leakage tendency of the sutured periosteal flap is tested by injecting 2 mL of NaCl into the prepared site. The cartilage rim of the defect is sutured on the periosteal flap after debridement. After postoperative week 8, physiotherapy is intensified with additional exercises and ankle mobilization.

The wound is closed in layers and the talar ligaments are repaired and closed with nonabsorbable sutures. A suction drain is left in the joint for 48 hours (Figures 4 and 5).

The patient is encouraged to ambulate with crutches without weight bearing on postoperative day 2. Continuous active and passive motion of the ankle is allowed after drain removal on postoperative day 2. Six weeks postoperatively, the patient is allowed to practice partial weight bearing with increasing tendency to full weight bearing 8 weeks postoperatively. Physiotherapy of the lower extremity includes muscle strengthening exercises. After postoperative week 8, physiotherapy is intensified with additional exercises and ankle mobilization.

RESULTS

All patients were satisfied with the postoperative result regarding pain during full weight bearing on the ankle. Average lesion size was 20×16.2 mm. The average depth of the lesion was 7 mm. Three patients experienced a postoperative restriction of dorsal ankle flexion due to ventral intracapsular adhesions and required arthroscopic adhesiolysis. Ankle motion was restored through an immediate intensive physiotherapy protocol.

Magnetic resonance imaging of all patients showed full coverage of the defect. The arthroscopic view of the transplantation site of the three patients receiving arthroscopic adhesiolysis also showed full coverage of the defect.

DISCUSSION

Managing osteochondral defects is a challenging and difficult task, especially when it concerns the reconstruction of articular joint surfaces with difficult intra-articular approaches, such as the ankle. This difficulty creates disadvantages such as a lack of vital operative space in the medial and lateral ankle. This can be overcome through a medial or a lateral malleolar osteotomy in conjunction with ipsilateral ligament release. Anatomic reduction and stable fixation of the osteotomy avoids morbidity related to loss of position of the medial or lateral malleolus fragment (Figure 6).

Careful preoperative planning is necessary to achieve sufficient space for chondrocyte transplantation. It is essential that large defects of the articular surface be restored with cartilage-like tissue. Through this described method, the anterior cartilaginous rim of the talus is used as a chondrocyte donor site and iatrogenic damage of healthy articular knee cartilage is avoided. This technique, however, needs to be further investigated and developed to minimize morbidity and possible complications.

REFERENCES