CHAPTER **37**

OSTEOCHONDRAL GRAFTS IN THE FOOT AND ANKLE

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Evolving techniques for osteochondral defects have been introduced over the past several years for talar lesions, including autografts and allografts in single plugs or mosaic patterns. Similar techniques have been utilized as well for chondral defects in the metatarsal heads. The degenerative changes seen in hallux valgus and limitus cases can present with lesions that can also be staged into the traditional types I-IV. They also can occasionally present with cystic changes within the talar dome or metatarsal heads. A magnetic resonance image may be useful to visualize these cystic changes and recognize the deep marrow edema within the bone involved.

Most of our traditional techniques include subchondral drilling, abrasion arthroplasty, or microfracture. Penetration of drill holes through the subchondral bone plate will stimulate mesenchymal cells within the bone marrow to form fibrocartilage. This form of repair is functional, but definitely does not result in the durability and strength of normal hyaline cartilage. A good analogy is to compare normal skin to a healed scar. The scar tissue is functional, but never as supple and healthy as the normal skin. Studies have shown short-term success with fibrocartilage repair, but these joints usually return with pain and degenerative damage to the same areas within 2-4 years, especially in weight-bearing joints of the body. Once the repair fibrocartilage fails, they continue to undergo degeneration rapidly and progress to end-stage arthrosis within a short amount of time.

Surgeons have recently used other forms of cartilage repair that attempt to replace these osteochondral defects with hyaline cartilage options in the form of both allografts and autografts. Autografts have been described by several authors with good medium- to long-term results. Hangody et al has reported a 7 year follow-up on osteochondral autografts from the knee to the ankle joint. These have shown promise in providing the hyaline repair many have been seeking for these difficult lesions.

The available sites of donor tissue have initially been taken from the knee, mainly in the notch region or lateral femoral condyle. Donor cartilage can only come from "nonessential, nonweight-bearing" areas of a joint space. Although there is adequate surface area there, the biomechanic characteristics of this knee plug are not ideal for the loading properties of the ankle and the foot. The thickness of the cartilage is also thicker than normal thickness in the ankle and joints of the foot. Therefore, it would be helpful to have donor sites from the same joint in question. We are now taking osteochondral grafts from the medial and lateral talar surfaces and also the spring ligament area. Successful outcomes have been reported in the literature with osteochondral autografts from the medial and lateral talar surfaces. The spring ligament site, which is from the plantar-medial navicular has become popular due to the radius of curvature seen on many diseased joint surfaces, and it is helpful to try and match this when possible. In the majority of cases, the donor sites are not backfilled and we have not seen any hemarthrosis to speak of. In communication with multiple members from the Podiatry Institute, there have been over 50 spring ligament grafts taken without the incidence of talonavicular joint pain.

Frozen allografts were utilized in the past, but their popularity has dwindled as fresh grafts have become more common. Fresh talar allografts have also gained popularity recently with success seen in the orthopedic and podiatric reports. These grafts can be performed for both uniploar (single sided) and bipolar (double-sided) repair. Brage and Bugbee have reported good success with a variety of these repairs in the ankle. These ankle grafts are carefully screened by the companies and then released for implantation within weeks of procurement. The current recommendation is to implant the fresh cartilage within 3-4 weeks of procurement. The percentage of viable cartilage cells still present is extremely high in this time frame.

When cartilage grafting is used in the repair of the joint disease, it is also extremely important to discuss other mechanic contributions to the overall correction. It is often important to carefully assess biomechanic contributions to the deformity. It is imperative to create a better environment to the joint in question, and in the forefoot, this will often require osteotomies. The inclusion of cartilage grafting techniques does not change the overall approach to joint preservation. Consider metatarsal decompressional osteotomies in joint preservation cases with hallux valgus or hallus limitus. This can be performed

behind the graft site and still be made within the metaphyseal portion of the bone, which will provide a much healthier environment for the joint in the long term.

Recent excitement has been seen with synthetic grafts showing evidence of hyaline cartilage repair. The formation of hyaline cartilage into the graft site has been well-documented in both the in vitro and in vivo models and has been confirmed by histopathologic biopsies and tissue staining. It is important to place the synthetic grafts adjacent to healthy bone and cartilage tissue. Once in place, there is essentially a creeping substitution type of incorporation as both the bone and the cartilage heal from the periphery inward. Depending on the size of the defect, this process has been shown to take 1 to 2 years. The central portions of the graft are the last to heal and fully revascularize. Once complete however, this provides the surgeon with an almost perfect cartilage repair in a synthetic form. The applications of this technology to our current practices will be limitless.

In summary, surgeons continue to treat osteochondral defects on a daily basis. These newer techniques have given us the opportunity to achieve hyaline cartilage repair to these difficult problems. This improved repair will provide longevity to the joint and greater patient satisfaction when joint salvage options are explored.