Articular Cartilage Injury: Filling Potholes

JOHN A. BERGFELD, MD

From Hippocrates to Hunter and at present, articular cartilage injury presents significant problems. Articular cartilage injury is the Achilles’ heel of the athlete. What can be done about this? First, the etiology of the pothole needs to be defined. Osteoarthritis, traumatic injuries, and osteochondritis dissecans are the big three.

Better diagnostic and imaging techniques are now available to evaluate these potholes. The defect can be seen in the articular cartilage, and computed tomography can be used to measure the size of the defect.

TREATMENT METHODS

The pothole can be treated several ways—do nothing, debridement, microfracture, osteoarticular transplant, and autologous cultured cells implant. These are the five most common treatments.

- Do nothing. Many articular cartilage injuries are not treated, as seen when patients present later in life who have had an injury with no treatment.
- Debridement plays a role when fragments are too small to repair and when the defect is not exposed to high forces of joint motion (ie, the defect is small enough that it can support the joint forces on the shoulders of the defect). These defects usually are 3-5 mm. These lesions often are seen with acute injuries in athletes.
- Specific procedures are microfracture, mosaic osteoarticular transplant, or autologous cultured cells implant. Other procedures beyond the scope of this article are transplanting a mixture of bone and cartilage, so-called “paste chondroplasty,” and allograft. Controversy exists as to whether microfracture, osteoarticular transplant, or autologous cultured cells implant is the best procedure and at what stage they should be performed.

The classic abrasion arthroplasty has, by and large, been replaced by microfracture. The advantage of microfracture is that it is a simple procedure and the bony architecture is maintained. The disadvantages are the production of fibrocartilage, not true hyaline cartilage, and a prolonged rehabilitation period. Early results show that it works (Figure 1). In properly selected patients, we report 75% good results.1

Advantages of osteoarticular transplant include the transplantation of true hyaline cartilage, restoration of joint...
architecture, and only one surgery, possibly an arthroscopic procedure, depending on the location of the lesion. Figure 2 demonstrates little difference between the transplant and surrounding normal cartilage. Viability of the transplanted plugs is 95%, and no pathologic alterations are noted on magnetic resonance imaging at 12 months. At 2-4 weeks, the plugs can be seen. At 6 months, healing is noted. At 1 year, cartilage appears normal, resulting in a successful procedure. Biopsy at 2-12 months shows living chondrocytes and osteocytes.

One disadvantage of osteoarticular transplant is that this technique requires attention to detail, may need to be open, and is destructive to the donor portion of the joint. However, 84%-90% good results are being reported. Advantages of autologous cultured cells implant include its ability to cover a large defect and little donor-site morbidity. Disadvantages include the production of “hyaline-like” cartilage, the need for two operations, and a higher cost. Good results have been reported in 70%-80% of patients.

The ideal patient for these procedures is aged <45 years, has an isolated injury, no osteoarthritis, and no malalignment.

**TREATMENT RECOMMENDATIONS**

For acute lesions <5 mm², debride to a stable shoulder >5 mm up to 2 cm microfracture. For chronic lesions <5 mm², debride and microfracture. For lesions between 5mm² and 2 cm², debride and microfracture; however, some surgeons might perform osteoarticular transplant as the first procedure. For failed microfracture, osteoarticular transplant is recommended. Autologous cultured cells implant should be considered for lesions >2 cm².

For osteochondritis dissecans, all viable pieces should be put back in place and fixed with multiple fixation devices. If an acute injury to the cartilage occurs with the bone attached, fixation should be attempted and the fragment should not be discarded.

**REFERENCES**

1. Warren RF. A prospective outcome analysis of patients treated with microfracture abrasion for chondral lesions of the knee: a preliminary review. Presented at ACL Study Group; May 29-June 4, 2004; Sardinia, Italy.


---

**Figure 2:** Osteoarticular “mosaic” transplant at 2 weeks (A), 6 months (B), and 12 months (C) postoperatively.