

ARTICULAR CARTILAGE PROCEDURES

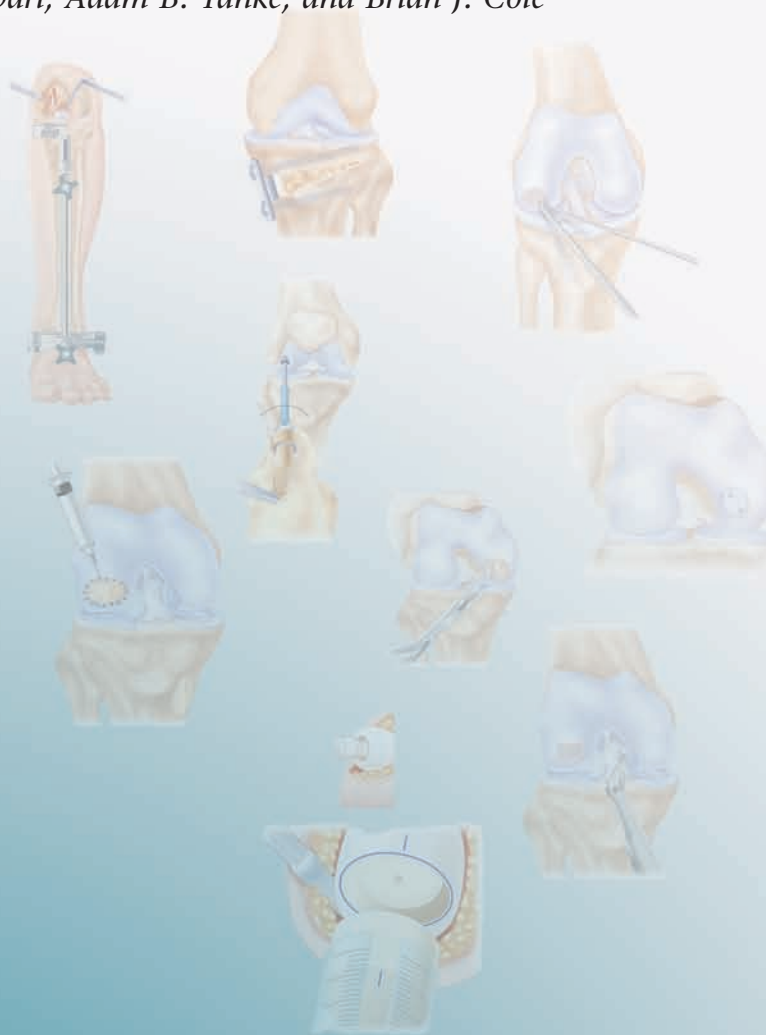
SECTION II





Chondroplasty and Microfracture

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PEARLS

- *It is important to discuss postoperative weight-bearing and range-of-motion restrictions with every patient who has a suspected cartilage lesion.*

PITFALLS

- *Regarding chondroplasty, the longer a patient has symptoms (i.e., >6 months), the less likely he or she will benefit from chondroplasty.*
- *Advanced degenerative arthritis without mechanical symptoms is not likely to respond to any cartilage repair or restoration procedure, and therefore chondroplasty alone is relatively contraindicated for these patients.*
- *Microfracture is contraindicated for patients who are unable or unwilling to abide by the protected weight-bearing requirements or range-of-motion restrictions.*
- *Pain at rest, ligamentous instability, and previous arthroscopic débridement within 5 years are relative contraindications to chondroplasty alone.*

Indications

- Arthroscopic débridement and lavage are indicated for the management of mechanical symptoms in arthritic knees.
 - Chondroplasty is intended as a palliative procedure to remove mechanical sources of pain and dysfunction (unstable cartilage, loose bodies, and meniscal flaps). Additional benefits may be derived from lavage of local inflammatory mediators.
 - Patients must understand that, when arthrosis is the primary symptom generator, results are less predictable.
- Microfracture
 - Microfracture is indicated as first-line treatment for focal Outerbridge grade III and IV lesions under 3–4 cm² in an otherwise nonarthritic knee in a symptomatic, active, and relatively young patient willing to respect the postoperative rehabilitation requirements.
 - For older and low-demand patients, microfracture may be useful even in lesions larger than 3–4 cm².

Examination/Imaging

SYMPTOMS

- Patients with focal chondral defects generally have symptoms localized to the lesion location.
- Symptoms that worsen with weight-bearing activities likely are produced by damage that resides in the femoral condyle.
- Pain when arising from a sitting position following prolonged knee flexion and with stair climbing suggests a lesion in the patellofemoral joint.
- Patients may complain of activity-related swelling.

PHYSICAL EXAMINATION

- The area of maximal tenderness, range of motion, effusion, and the presence of true mechanical symptoms (catching, locking, etc.) should be documented.

RADIOGRAPHS

- Standing anteroposterior (AP), lateral, Merchant's, and weight-bearing 45° flexion posteroanterior views should be obtained (Fig. 1). The last view is especially useful to diagnose joint subtle space narrowing, which may not be apparent on the AP view alone.

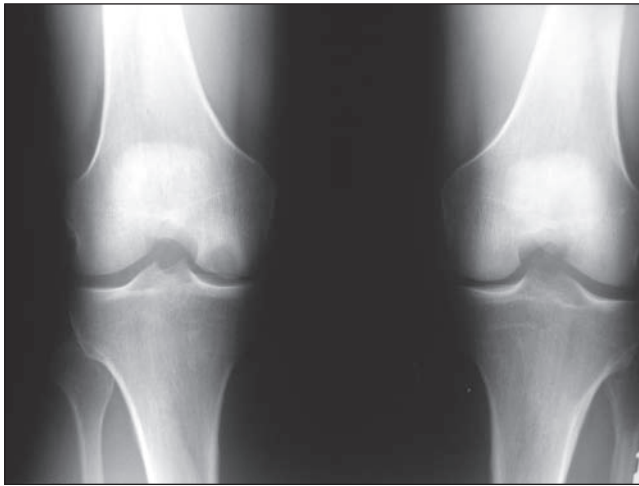


FIGURE 1

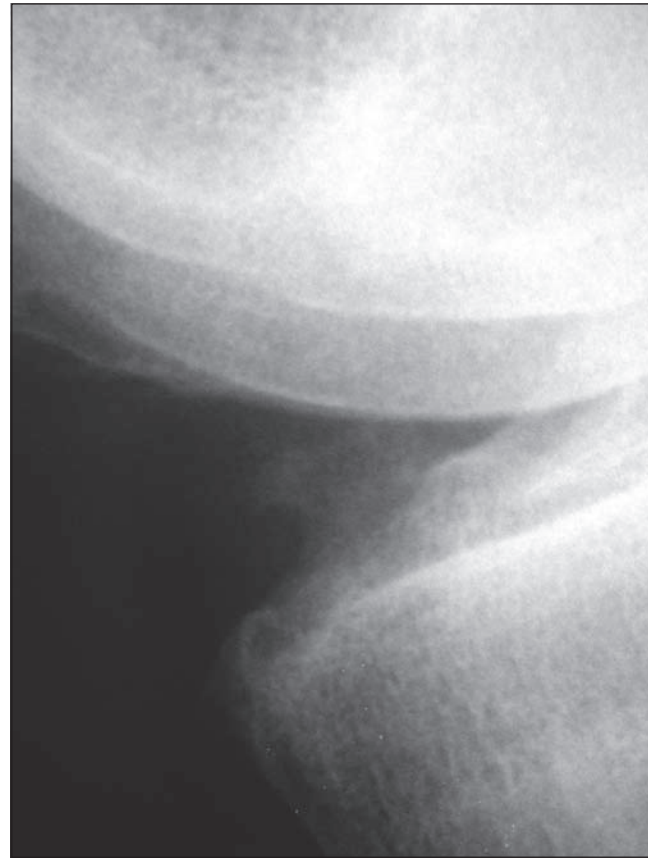


FIGURE 2

Treatment Options

- Nonoperative treatment options
 - Oral anti-inflammatories
 - Nutraceuticals
 - Cortisone injections
 - Viscosupplementation
 - Activity modification
 - Unloader braces
 - Assistive devices (canes, walkers)

- Radiographic interpretation should assess for loose bodies, osteophyte formation, and focal chondral lesions that may be present in the weight-bearing portions of the joint (Fig. 2).
- Long cassette view standing films should be obtained with any degree of clinical malalignment.

MAGNETIC RESONANCE IMAGING

- Magnetic resonance imaging (MRI) is most useful in nonarthritic knees with a suspected focal lesion to examine its size, depth, and whether it would be amenable to microfracture.

Positioning

- Positioning can be either supine using a lateral post or in a leg holder with the knee flexed to 90°.
- A tourniquet is applied but generally not used. Bleeding is generally controlled by avoiding trauma to the fat pad, safely keeping the systolic blood pressure low, and using epinephrine in the irrigation solution.

PEARLS

- If a lateral post is used, it should be placed at the lateral aspect of the middle of the thigh. Placing it too proximal on the leg may hinder the surgeon's ability to place the leg in valgus. Conversely, placing it too distal will interfere with the surgeon's ability to maneuver the arthroscope and instruments around the knee.
- If a leg holder is placed, the tourniquet is placed within the holder, and the patient's body is moved distally on the bed so that the holder is at the proximal third of the thigh. This position also allows the surgeon to hyperflex the knee to about 110°. The opposite leg is placed in a well-padded leg holder. The table is re-flexed in order to reduce tension on the femoral nerve and reverse excessive lumbar lordosis.

Portals/Exposure

- Standard arthroscopic anteromedial and anterolateral portals are established using a #11 blade. A straight hemostat is used to enlarge the capsular incision. A superomedial or superolateral outflow portal is optional. We tend to avoid them to minimize quadriceps shutdown.
- If microfracture is performed and the standard portals do not allow adequate access to the lesion, an accessory portal can be established using an 18-gauge spinal needle for optimal localization.

Procedure

STEP 1: DIAGNOSTIC ARTHROSCOPY

- Examination under anesthesia is performed prior to initiating the operative procedure. Range of motion, ligamentous stability, and the presence of an effusion should be documented.
- After establishing the standard portals, the arthroscope is introduced through the anterolateral portal. The patellofemoral compartment, the medial and lateral gutters, the notch, and the medial and lateral compartments should be thoroughly inspected. Examining the gutters is very important if loose bodies are suspected (Fig. 3). The scope should then be advanced to the posteromedial and lateral compartments to look for loose bodies there as well.
- A probe is used to palpate and size all lesions seen (Fig. 4).

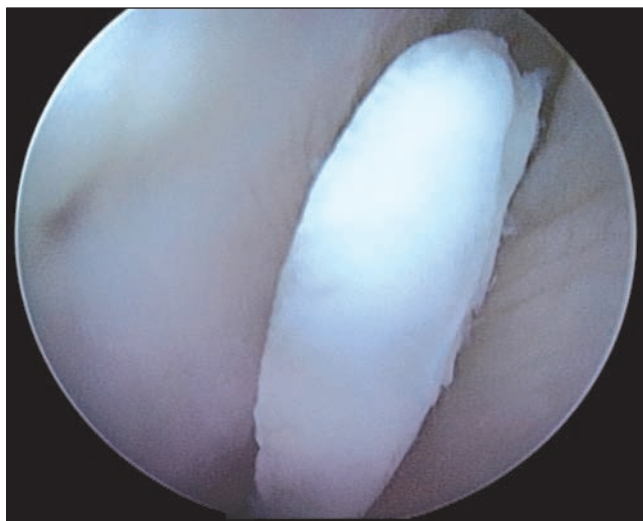


FIGURE 3

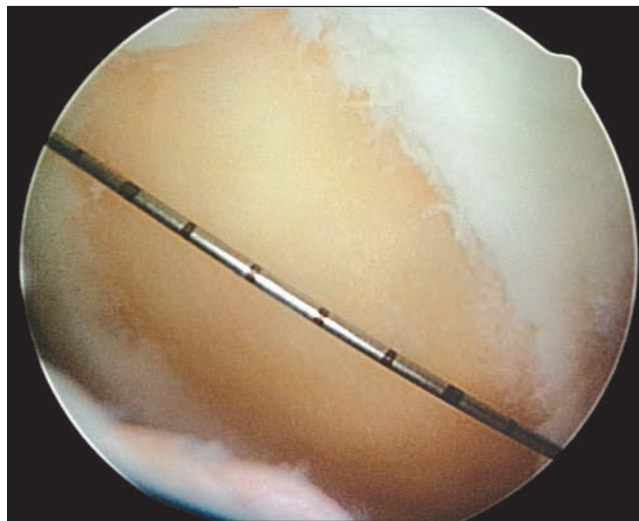


FIGURE 4

PEARLS

- Avoid aggressive débridement of an asymptomatic compartment.
- The surgeon must make sure the patient has realistic expectations regarding the amount of relief he or she can expect after surgery.
- Counsel patients that, if meniscal pathology is the primary pain generator, then the prognosis is better than when frank degenerative changes are responsible for the patient's symptoms.

STEP 2: ARTHROSCOPIC CHONDROPLASTY

- A 4.5-mm shaver is used to débride unstable cartilage flaps and meniscal tears (Fig. 5). If necessary, a basket can also be used (Fig. 6). A smooth transition with vertical walls between the abnormal and normal cartilage should be achieved.
- Loose bodies are removed. If necessary, accessory posteromedial or lateral portals are created (Fig. 7).

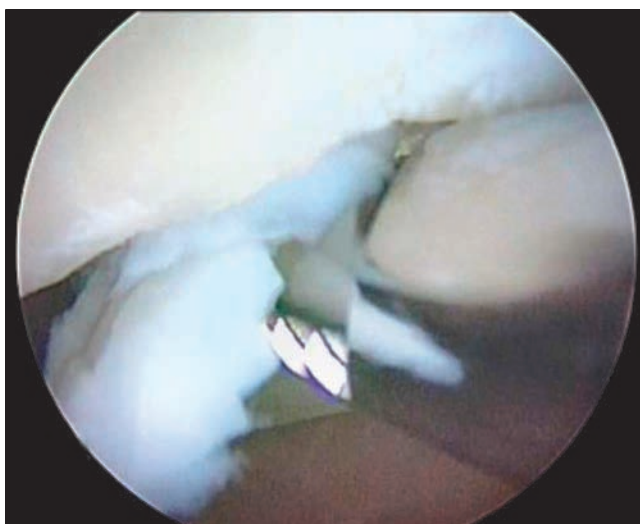


FIGURE 5

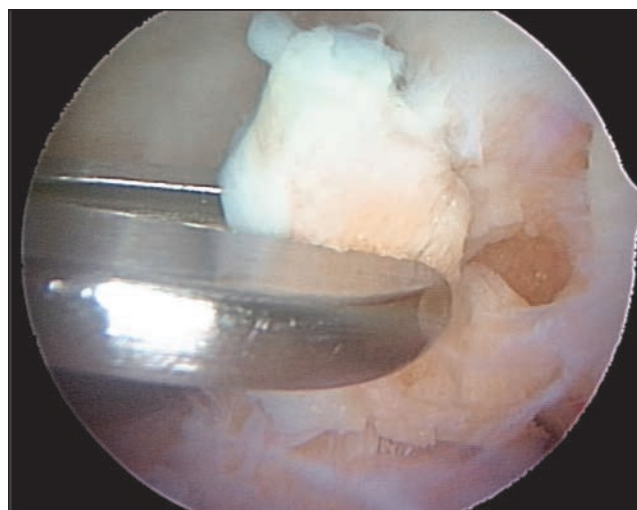


FIGURE 6

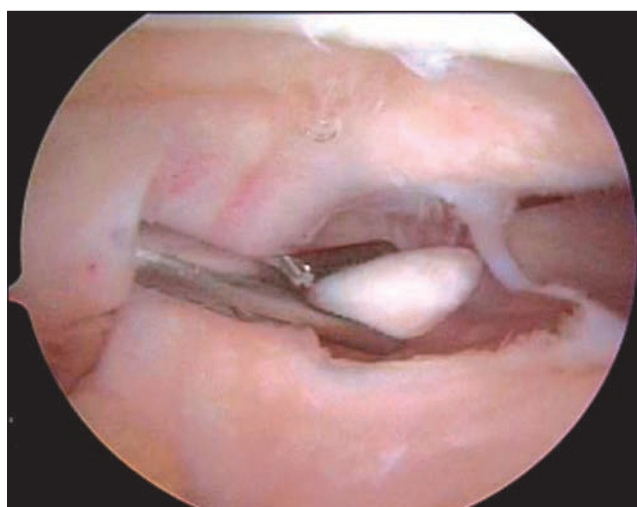


FIGURE 7

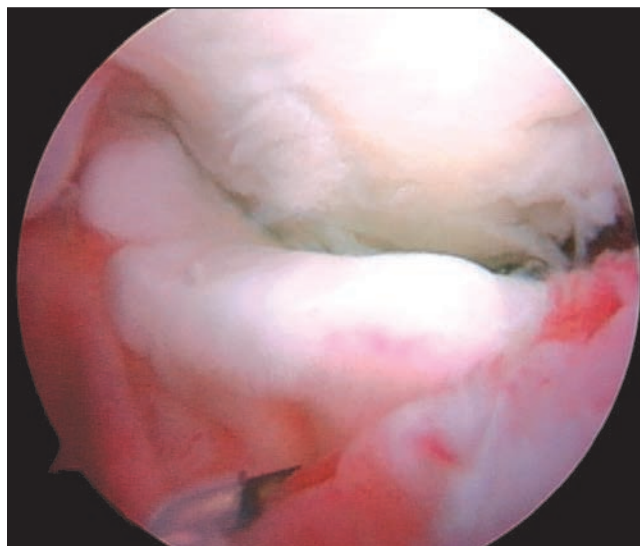


FIGURE 8

- If an osteophyte is suspected to be interfering with knee motion, it can be taken down carefully with a burr. Anvil osteophytes surrounding the anterior cruciate ligament tibial footprint can block full knee extension and should be mechanically reduced accordingly (Fig. 8). Similarly, a notchplasty may help patients to achieve greater degrees of extension. Release of the suprapatellar pouch and anterior interval between the patellar tendon and anterior tibia can also improve motion and patellofemoral mechanics.
- The arthroscope should be switched to the anteromedial portal to perform the débridement from the opposite side.

STEP 3: MICROFRACTURE—PREPARATION OF THE LESION

- If a small focal or localized chondral defect is encountered with normal surrounding cartilage, it is suitable for microfracture.
- An arthroscopic 4.5-mm shaver is used first to remove the frayed and unstable cartilage rim surrounding the lesion (Fig. 9).
- A curette is used to create vertical walls around the defect. Care must be taken not to allow the curette to slip, thereby damaging normal cartilage. Running a shaver with no teeth (i.e., bone cutter) in one direction can be very helpful in further establishing a vertical wall at the transition of the defect and surrounding normal cartilage.

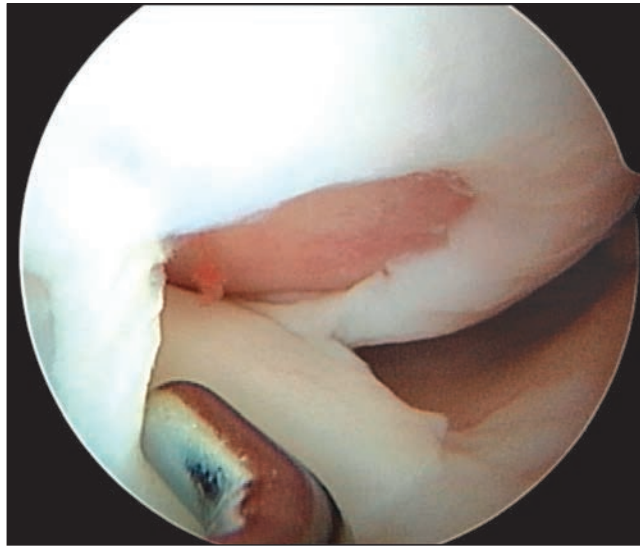


FIGURE 9

- Next, the calcified cartilage layer is débrided using a curette (Fig. 10). Removal of the calcified cartilage has been shown to improve the amount and quality of fibrocartilage fill.

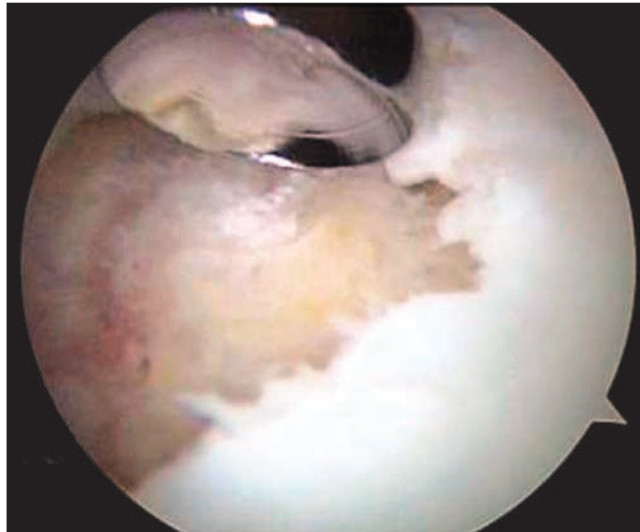


FIGURE 10

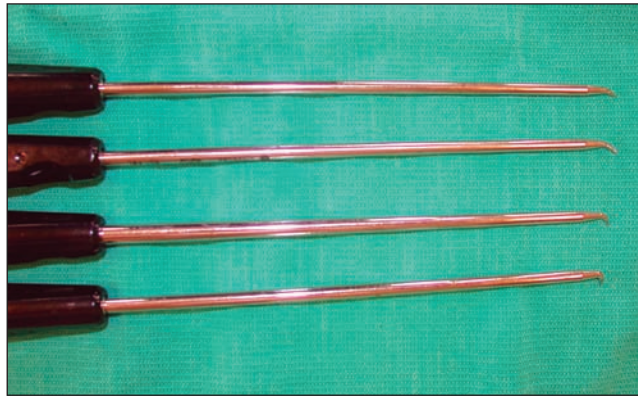


FIGURE 11

PEARLS

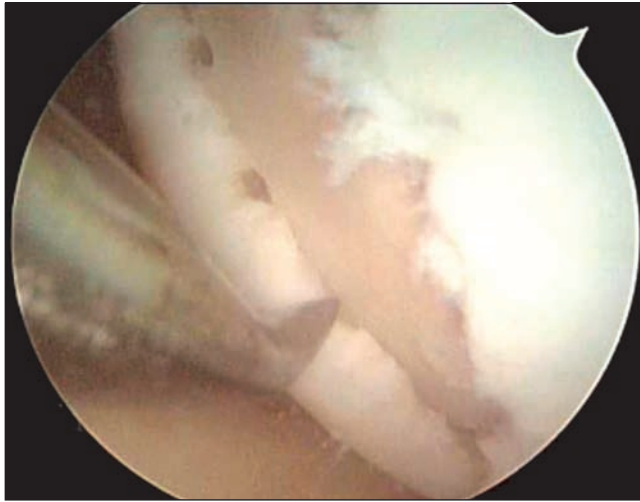
- *Care must be taken to avoid communication of adjacent holes to protect the overall integrity of the subchondral bone.*
- *Switching portals for instrumentation is critical to address all aspects of the defect equally.*

STEP 4: MICROFRACTURE

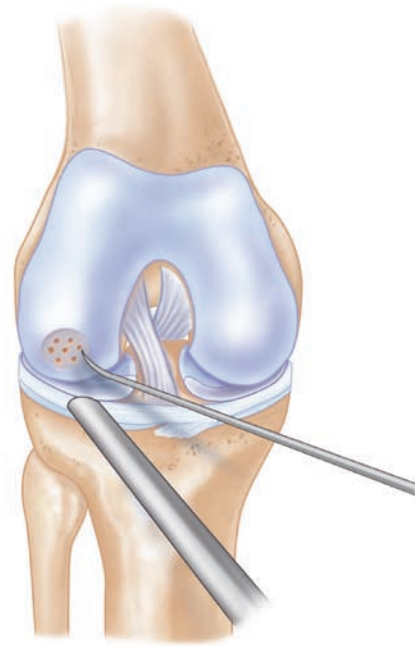
- Surgical awls (Linvatec Corp, Largo, FL) of different angles (Fig. 11) are gently tapped to create multiple small holes in the bed of the defect. The awl angle should be chosen so that it makes a right angle with the bone. Changing the flexion angle of the knee can be useful.
- The holes are initially made at the periphery of the lesion (Fig. 12A and 12B) and then advanced to the center. Holes should be separated by 3 mm (Fig. 13).
- A shaver is used to remove any loose debris in the knee.
- The arthroscopic pump is turned down to allow blood and fat droplets to flow out of the holes (Fig. 14).

STEP 5: CLOSURE

- The portal sites are closed in a standard fashion, and sterile dressings are applied. In microfracture cases, no drains are used to prevent evacuation of the blood clot over the lesion.
- Microfracture patients are placed in a knee brace locked in extension.
- Local anesthetic is injected in the portals before starting the case, and the joint is injected with a long-acting local anesthetic at the conclusion of the procedure.



A



B

FIGURE 12

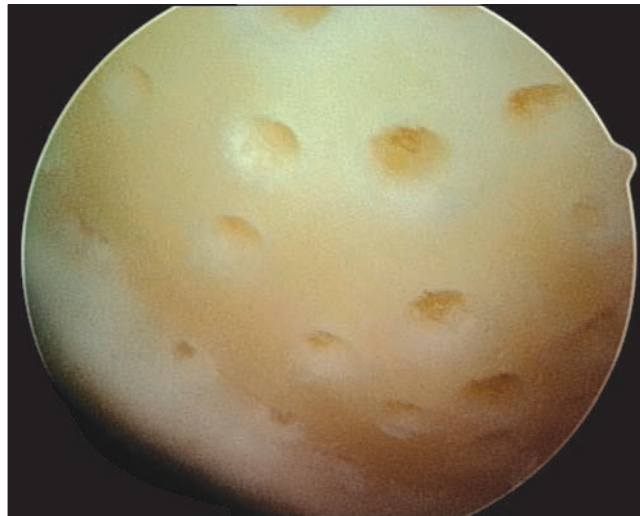


FIGURE 13

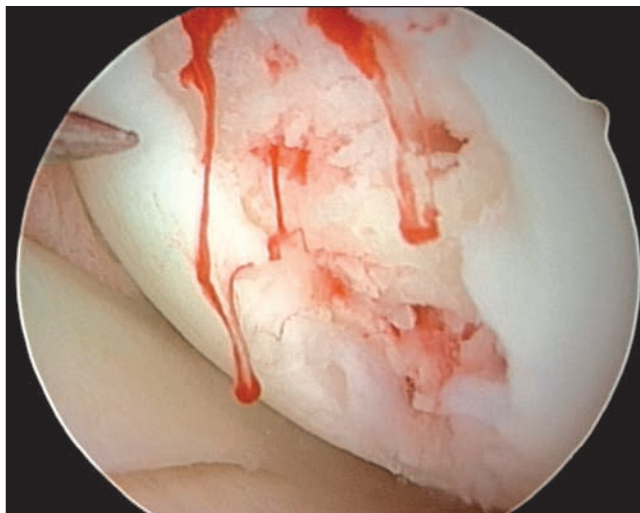


FIGURE 14

Postoperative Care and Expected Outcomes

- Arthroscopic lavage and débridement
 - Patients are allowed weight bearing as tolerated. They are encouraged to use a stationary bike as soon as tolerated and to work on their range of motion. Strengthening exercises include quadriceps sets and heel slides.
 - Some patients may need physical therapy to help restore their range of motion and strength.
 - Overall, the débridement procedure can provide improvement in pain and mechanical symptoms in about 50%–70% of patients with the appropriate symptoms. This relief can last from a few months to a few years.
- Microfracture in the medial or lateral compartment
 - Patients are allowed touch-down weight bearing (20%–30%) for the first 6–8 weeks.
 - The brace is discarded once good quadriceps control is regained.
 - A continuous passive motion (CPM) machine is used for 6–8 hours a day for the first 8 weeks without extension or flexion restrictions. Therapeutic exercises include quad and hamstring isometrics and passive stretching.
 - At 8 weeks, the patients are allowed to start weight bearing as tolerated. Progressive active strengthening is also initiated.
- Microfracture in the patellofemoral compartment
 - Patients are allowed full weight bearing with the brace locked from 0° to 40° of flexion.
 - A CPM is also started immediately for 6–8 hours per day. The starting angle is from 0° to 40°. Passive stretching is performed in physical therapy.
 - The brace is discarded at about 6 weeks.
 - At 8 weeks, the patients are progressed to full weight bearing and range of motion and begin closed-chain exercises.
 - Patients are allowed to return to full activities no sooner than 12 weeks as long as they are pain-free through their full range of motion without the induction of swelling.

Evidence

Blevins FT, Steadman JR, Rodrigo JJ, Silliman J. Treatment of articular cartilage defects in athletes: an analysis of functional outcome and lesion appearance. *Orthopedics*. 1998;21:761-7.

In this review of the results of microfracture treatment of 140 athletes, the average follow-up was 4 years. Fifty-four patients had second-look arthroscopies demonstrating no change in the degree of arthritis in 35%.

Fond J, Rodin D, Ahmad S, Nirschl RP. Arthroscopic debridement for the treatment of osteoarthritis of the knee: 2- and 5-year results. *Arthroscopy*. 2002;18:829-34.

The authors evaluated 36 patients (average age 64.8) who were treated with arthroscopic débridement at 2- and 5- intervals. At the 2-year follow-up, 88% of the patients were satisfied with their surgery. At the 5-year follow-up, the number fell to 69%. The patients with a preoperative flexion contracture of less than 10° and HSS score over 22 responded the best to this treatment.

Gill TJ, MacGillivray JD. The technique of microfracture for the treatment of articular cartilage defects in the knee. *Oper Tech Orthop*. 2001;11:105-7.

The authors reviewed their microfracture results in 19 patients at a mean follow-up of 3 years. Seventy-four percent of the patients reported minimal or no pain, and 63% of patients were rated as good or excellent. Postoperative MRIs showed only 2% of patients having 67%–100% fill of their defect.

Jackson RW, Dieterichs C. The results of arthroscopic lavage and debridement of osteoarthritic knees based on the severity of degeneration: a 4- to 6-year symptomatic follow-up. *Arthroscopy*. 2003;19:13-20.

A retrospective study was performed to evaluate 121 cases of arthroscopic lavage for review at 4- to 6-year follow-up. Overall, 87% of the advanced arthritic patients were improved at follow-up.

McGinley BJ, Cushner FD, Scott WN. Debridement arthroscopy: 10 year follow-up. *Clin Orthop*. 1999;367:190-4.

A subjective telephone interview of patients was done at least 10 years after arthroscopic débridement. Seventy-seven patients (91 knees) were contacted. Overall, 67% continued to live with their native knees. Patient satisfaction averaged 8.6 on a scale of 1–10.

Miller BS, Steadman JR, Briggs KK, Rodrigo JJ, Rodkey WG. Patient satisfaction and outcome after microfracture of the degenerative knee. *J Knee Surg*. 2004;17:13-7.

Eighty-one patients (average age 49) were treated with microfracture for degenerative lesions in the knee. The average follow-up was 2.6 years. All subjective parameters (pain, swelling, activities of daily living, etc.) were improved. Lysholm scores improved from 54 to 83 and Tegner scores improved from 3 to 4.5.

Steadman JR, Briggs KK, Rodrigo JJ, Kocher MS, Gill TJ, Rodkey WG. Outcomes of microfracture for traumatic chondral defects of the knee: average 11-year follow-up. *Arthroscopy*. 2003;19:477-84.

A case series of 71 knees treated with microfracture was followed for an average of 11 years. Significant improvements were seen in both Lysholm scores (59 preoperatively to 89 postoperatively) and Tegner scores (3 preoperatively to 6 postoperatively). Eighty percent of the patients rated themselves as "improved."

Timoney JM, Kneisl JS, Barrack RL, Alexander AH. Arthroscopy Update #6. Arthroscopy in the osteoarthritic knee: long-term follow-up. *Orthop Rev*. 1990;19:371-3, 376-9.

Retrospective review was performed on 111 patients who underwent arthroscopic débridement of the knee for degenerative arthritis. The mean age at follow-up was 58 years. The mean follow-up was 50 months. Surgery offered measurable relief for 63% of patients, and 74% of patients thought the procedure was beneficial.

