CHAPTER

55

Debridement of Articular Cartilage in the Knee

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DEBRIDEMENT OF ARTICULAR CARTILAGE IN THE KNEE IN A NUTSHELL

History: Knee pain when ambulating stairs, rising from a low chair, and squatting or kneeling
Physical Examination: Crepitus with full active range of motion of the knee; palpable effusion with compression of the suprapatellar pouch; tenderness with palpation of the patellar facets
Imaging: Standard and weight-bearing radiographs
Indications: Continued pain that affects activities of daily living after failed conservative treatment
Surgical Technique: Initial diagnostic arthroscopy to inspect the entire articular surface of the knee, probing and looking for damaged articular cartilage; the extent of chondral damage and whether it involves the weight-bearing surface should be noted Arthrotome blade and basket forceps allow a controlled debridement without putting normal cartilage at risk An accessory portal can be established to help reach difficult areas of damaged cartilage After debridement, the lesion's size is measured with a calibrated probe, and the location is noted
Postoperative Management: Range-of-motion exercises are begun immediately after surgery; a noncrepitant strengthening program is started, followed by a progressive return to activities
Results: Encouraging; surgery had a beneficial effect in 32 of 36 patients after a 59-month follow-up Patients with traumatic chondrosis had a higher percentage of good or excellent results after surgery compared with atraumatic cases No significant correlation between the grade of chondral damage and improvement with surgery Arthroscopic debridement of the knee may improve function and decrease pain but is not a curative procedure

Debridement of damaged articular cartilage is a common arthroscopic procedure performed most often for chondrosis of the patellofemoral joint. Its use is not without controversy, because the biologic or biomechanical basis for its effectiveness has never been fully elucidated.[3-10,16,21,22,27,28] Debridement does not restore the articular surface to its normal, pristine state.[17,18,20] It is thus not surprising that the expected result is amelioration, not elimination, of symptoms. Nevertheless, its relatively low morbidity makes it a popular treatment for

joint symptoms that have not responded to conservative measures. In our experience, key factors in the successful use of chondral debridement are great care in patient selection and proper patient education regarding realistic postoperative expectations.

Case History

A 30-year-old woman was carrying a laundry basket downstairs when she missed a step and fell, landing directly on her right knee. She had immediate pain in the knee and a gradual onset of swelling over the next 12 hours. The patient presented to the office 6 months later complaining of anterior knee pain and intermittent swelling. Climbing or descending stairs, rising from a low chair, and squatting or kneeling exacerbated the pain. Prolonged sitting sometimes elicited pain as well. She denied any mechanical symptoms such as catching or locking but did note frequent crepitus. There was no history of any symptoms before the fall, and no pain in any other joints.

Physical Examination

The patient walked without a limp. The overall knee alignment appeared normal: her Q angle measured about 14 degrees (Fig. 55–1), and her tubercle-sulcus angle was about 5 degrees. Mild quadriceps atrophy was visualized on the injured extremity, with a circumferential measurement difference of 1 cm.

Seated on the examining table, the patient was able to fully extend her knee against gravity, although retropatellar crepitus could be felt during this maneuver. Aside from the crepitus, the patella seemed to track smoothly, with a small lateral deviation near full extension. Active flexion was to 130 degrees.

Compression of the suprapatellar pouch produced a small visible fluid wave (Fig. 55–2). Patellar glide was about 1 cm both medially and laterally. The patellar apprehension test was negative. Both the medial and lateral facets seemed tender (Fig. 55–3). There was no tenderness of the patellar tendon or the tibiofemoral joint lines. The Lachman test, varus and valgus stress

Figure 55–1 Position for examining knee alignment. (From Reider B: The Orthopaedic Physical Examination. Philadelphia, WB Saunders, 1999, p 211.)

Figure 55–2 Demonstration of a palpable fluid wave. (From Reider B: The Orthopaedic Physical Examination. Philadelphia, WB Saunders, 1999, p 227.)

Figure 55–3 Palpation of patellar facets. (From Reider B: The Orthopaedic Physical Examination. Philadelphia, WB Saunders, 1999, p 219.)

tests, posterior drawer test, and McMurray test were normal.

Imaging

Standard radiographs were obtained, including a standing anteroposterior view of both knees, standing posteroanterior view in flexion ("skier's view"), lateral view, and skyline view taken in 30 degrees of flexion. In this case, the radiographs were all normal. Weight-bearing radiographs allow assessment of joint space narrowing and other signs of tibiofemoral osteoarthritis. Occasionally, osteochondral fragments can be seen on anteroposterior and lateral radiographs. The axial radiograph is helpful in evaluating patellar alignment, if it is done in a standardized manner (Fig. 55–4), and for detecting patellar avulsion fragments and ectopic calcifications that may be associated with patellar instability. Patellar osteophytes can be appreciated on the lateral or axial projections. We do not routinely perform magnetic resonance imaging in cases of apparent patellofemoral pain, as it rarely adds to the evaluation. It is most helpful when the diagnosis is uncertain and another entity such as a meniscus tear is a possibility.

Indications and Contraindications

Surgery is not the primary treatment of patellofemoral pain. In most instances, the patient is given a simple home exercise program emphasizing light knee extension exercises in the nonpainful or noncrepitant arc of motion. In most cases, crepitus is felt near terminal extension, so exercise is recommended in a flexed arc, such as 105 to 40 degrees. Patients who are more severely disabled or who have failed a home exercise program are referred for supervised physical therapy. The goal is to devise a nonpainful strengthening program appropriate for each patient. Patellar taping may be used as an adjunct to exercise if it is effective in reducing the patient's pain. Biofeedback techniques can also be helpful if quadriceps muscle inhibition is present.

Nonsteroidal anti-inflammatory drugs are not routinely used but are prescribed for a specified course if an effusion or other signs of inflammation are present. Glucosamine may be beneficial, although its efficacy is still being evaluated. Some patients find that patellar knee sleeves are helpful when worn during activities. If the patient shows evidence of a flattened longitudinal arch and in-facing (squinting) patellas, a simple semirigid orthosis should be tried.

Finally, activity modification is recommended. Usually this consists of reduction or modification of athletic or daily living activities that exacerbate the patient's symptoms. These changes may be temporary, although some patients may need to permanently avoid squatting or kneeling.

In this case, the patient underwent a structured physical therapy program for 4 months consisting of quadriceps strengthening, patellar taping, and lower extremity flexibility training. She was given an oral nonsteroidal anti-inflammatory medicine to resolve her effusion. The patient had improved muscle tone in the knee but still complained of severe pain affecting her activities of daily living.

The primary indication for surgery in cases of patellofemoral pain is debilitating pain that is intractable to nonsurgical treatment. Patients whose pain is treatable by a reasonable level of activity modification should probably not be offered surgery. Once a decision has been made that surgery is indicated, the best procedure must be identified. The best candidates for patellar chondroplasty have (1) normal patellofemoral alignment,[12,14,15,26] (2) normal patellar mobility, (3) history of a direct injury to the patella, (4) normal radiographs, and (5) a discrete lesion of the articular surface surrounded by normal articular cartilage. Obviously, this last requirement can be definitively determined only at the time of the arthroscopic procedure.

Patients should have realistic expectations about the results of surgery. Specifically, we tell them that (1) the goal of surgery is to improve function and reduce pain; (2) most, but not all, patients will experience improvement, but the amount of improvement is unpredictable in any given patient; (3) it is unlikely that the knee will feel perfectly normal after surgery; and (4) certain activities, especially kneeling directly on the patella and deep squatting, will probably not be possible even after the surgery.

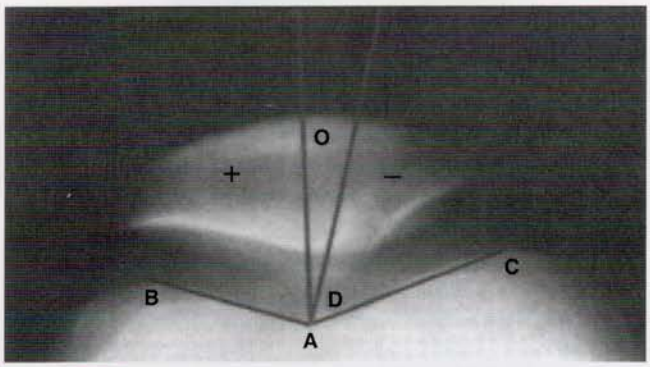

Figure 55–4 Skyline view. BAC represents the angle of the trochlear sulcus. AO is the bisector of this angle. AD is the line between the apex of the trochlear sulcus and the apex of the patella. The angle OAD is one measurement of patellar alignment. As the patella shifts laterally, this angle becomes positive.[19] (From Reider B: The Orthopaedic Physical Examination. Philadelphia, WB Saunders, 1999, p 371.)

Surgical Technique

Positioning

The patient is positioned supine on the operating table. A tourniquet is applied to the proximal thigh, and a lateral post is situated to help visualize the medial compartment of the knee. The tourniquet is not normally

used for the procedure but is put in place as a precaution.

Diagnostic Arthroscopy

A superolateral portal is made for placement of the outflow cannula. We prefer the superolateral portal to the superomedial portal to avoid possible inhibition of the vastus medialis obliquus postoperatively. Standard anteromedial and anterolateral portals are used for insertion of the surgical instruments and the arthroscope. A diagnostic arthroscopy is begun, starting in the suprapatellar pouch and the medial and lateral gutters to look for any loose chondral fragments. When evaluating the patella, it is important to make sure that the entire articular surface is systematically inspected. A flexion contracture of the knee or a large, tethered fat pad can obstruct visualization of the patella from the joint line portals. If difficulty is experienced while attempting to visualize the patella, the arthroscope should be shifted to the superolateral portal.

Specific Surgical Steps

The patella is probed, looking for softening and determining the extent of fibrillations and fissuring. We do not recommend debriding areas that are softened but have a normal, intact surface. In this case, the inferomedial portion of the patella showed grade III chondral damage with fibrillation measuring 1 by 1.5 cm. In addition to the patella, the femoral trochlea should be examined from the proximal border distally to the roof of the intercondylar notch (Figs. 55–5 and 55–6). Lesions of the femoral trochlea carry a worse prognosis than do lesions of the patella.

After the patellofemoral joint has been inspected, the knee is gradually flexed while assessing the medial and lateral femoral condyles. The size and location of chondral lesions should be noted. Especially important to note are whether the principal weight-bearing surface is involved and at what degree of flexion a condylar lesion makes contact with the tibia. Obviously, a large lesion that involves the weight-bearing surface and makes contact near extension is more of a problem than a small lesion to the side of the weight-bearing surface that makes contact in 90 degrees of flexion. In this case, the medial femoral condyle had grade III changes measuring 1.5 by 2 cm on the weight-bearing surface with the knee in full extension (Figs. 55–7 and 55–8). Completion of the diagnostic arthroscopy includes visualizing and probing the cruciate ligaments and menisci for tears and assessing the medial and lateral gutters for loose bodies.

Our general guideline for debridement of the knee is to be conservatively aggressive. This means selecting

Figure 55–5 Femoral trochlea viewed from the superolateral portal.

Figure 55–6 Grade III chondral changes to the femoral trochlea.

Figure 55–7 Grade III chondral changes to the medial femoral condyle.

Figure 55–8 Medial femoral condyle with knee in full extension.

Figure 55–9 Establishing a superomedial accessory portal with an 18-gauge needle.

patients who have truly failed conservative treatment and choosing instrumentation that is capable of debriding degenerated cartilage without putting normal cartilage at risk. The arthroscopic instruments used most often for debridement and chondroplasty of the knee are basket forceps and a gently scalloped arthrotome blade. The arthrotome blade is first used to remove fibrillated, degenerated cartilage. Little pressure on the arthrotome and a moderate amount of suction are required for this portion of the procedure. The basket forceps are then used to resect firmer, undermined flaps of cartilage that may lie along the edges of the lesion. The lesion is carefully probed to identify which areas are still significantly soft and fibrillated and require further resection. The mouth of the blade should always face the degenerated cartilage to avoid injury to normal, healthy cartilage. If necessary, an accessory portal should be created to approach inaccessible lesions without damaging normal articular cartilage. The medial facet of the patella can often be a difficult area to adequately debride from either the anterior or superolateral portal. An 18-gauge needle is helpful to localize the best placement of an accessory portal for debridement of the medial patella (Fig. 55–9).

As a chondral lesion is debrided, greater pressure is often required to resect the more sessile fragments (Fig. 55–10). The goal is to create smooth contours with stable surrounding borders (Fig. 55–11). When debridement appears to be complete, the area of resection is carefully examined and probed to verify that no further debridement is required and that all edges are stable. The arthroscope should be moved from the anterior portal to the superolateral portal to view any resection performed to the patellofemoral joint. This allows a different vantage point and often reveals residual areas of fibrillation. If subchondral bone is exposed during debridement, it is lightly curetted to encourage the ingrowth of fibrocartilage. Using a calibrated probe, the length and breadth

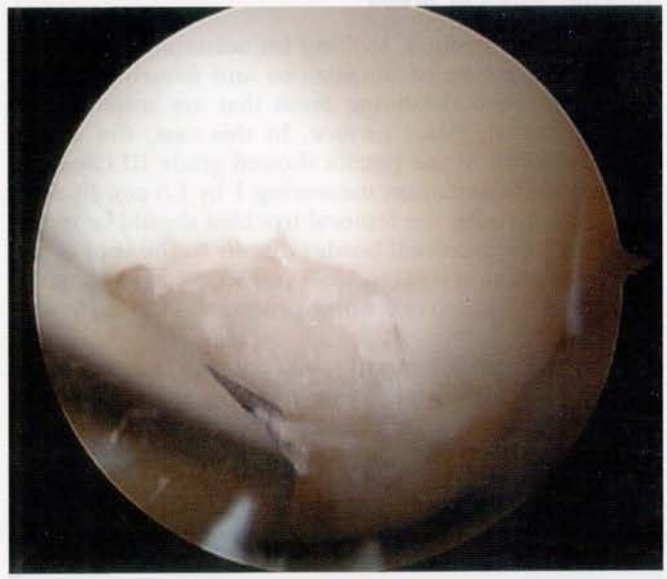

Figure 55–10 Arthrotome blade debridement of sessile fragments.

of the lesion, as well as its location and depth, are recorded. The location of patellofemoral lesions can be helpful in customizing the postoperative exercise regimen. Distal patellar lesions and proximal trochlear lesions make contact near extension, whereas proximal patellar and distal trochlear lesions make contact in greater degrees of flexion. We usually instruct the physical therapist to avoid quadriceps exercises in the arc of motion in which the lesion is likely to make contact. The knee is copiously irrigated to remove any remaining loose fragments from debridement. The portal sites are closed with single nylon sutures, and the knee is sterilely dressed and bandaged with a compressive wrap.

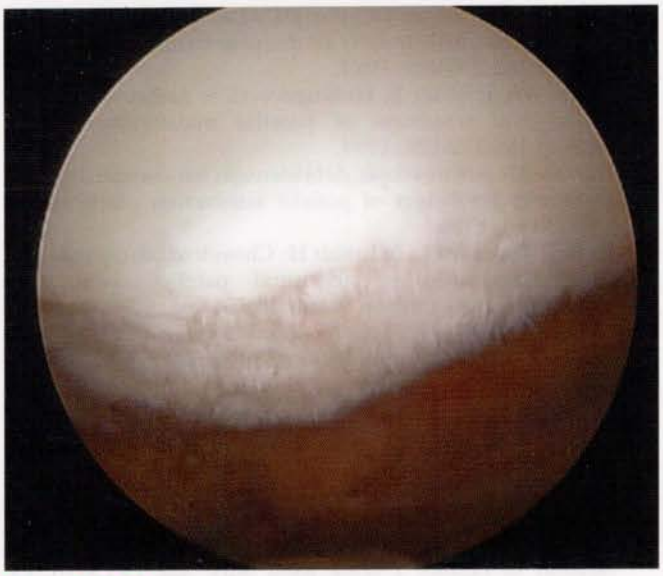

Figure 55–11 Patella after debridement with stable borders.

Postoperative Management

Range-of-motion exercises are initiated immediately after surgery. Progression to full weight bearing as tolerated is usually possible within the first couple of postoperative days. The patient is encouraged to ice and elevate the surgical extremity to decrease swelling. A rehabilitation program is started after the first follow-up office visit. The patient is instructed on noncrepitant range-of-motion strengthening exercises for chondral lesions involving the patellofemoral joint. Closed chain quadriceps exercises are initiated, followed by a progressive return to sporting activities as tolerated. The need for activity modification, particularly the avoidance of kneeling and squatting, is stressed to the patient.

Results

We reviewed 36 patients who underwent arthroscopic patellar debridement for patellofemoral pain with isolated chondromalacia patellae noted during arthroscopy.[24,25] Nineteen patients had traumatic events to the patellofemoral joint that initiated their symptoms. The patients had continued pain after a minimum of 4 months of physical therapy (noncrepitant arc quadriceps muscle strengthening, stretching, electrical stimulation, and ultrasound). No patient had a history of patellar instability or malalignment. All patients had Outerbridge grade II[1] or worse chondromalacia at the time of debridement; 61% had grade III lesions (53% traumatic, 47% atraumatic). The lesions were debrided according to the guidelines described earlier. Follow-up and evaluation consisted of the Fulkerson-Shea patellofemoral joint evaluation score, subjective outcome rating, activity level, questionnaire, and independent physical examination. Average follow-up was 59 months. All but four patients subjectively reported that surgery had had a beneficial effect. There was significant improvement in the patellofemoral joint evaluation score from the preoperative level to the maximal and final postoperative level. Patients with traumatic chondrosis had a higher percentage of good or excellent results compared with atraumatic cases (57.9% vs. 41.1%). Patients with milder grades of chondral damage had higher patellofemoral joint evaluation scores. Patients with traumatic chondrosis had a significantly greater improvement in their pain scores than did those without a history of trauma. All but one patient in the traumatic group had an average improvement of 14.2 points on a 35-point patellofemoral pain scale. There was no significant correlation between the grade of chondral damage and the improvement after surgery in the two groups. Fifty-three percent of the traumatic group and 59% of the atraumatic group had improved stair-climbing ability. Surgery decreased symptoms of crepitation in 58% of the traumatic group and 53% of the atraumatic group. Twenty-seven of 29 patients were active in sports at final follow-up; 14 of these patients were at a lower activity level, however. There was a direct correlation between the patients' final symptoms and the amount of articular tenderness present on physical examination. Overall, patients had an 89% rate of subjective improvement with patellar debridement.

Friedman et al.[11] reviewed arthroscopic debridement of 110 patients with grade IV articular changes. Patients who had the most improvement from debridement were younger than 40 years and had treatment isolated to the patellofemoral joint. Baumgaertner et al.[2] reviewed arthroscopic debridement of 49 knees with a 33-month follow-up. Patients with a longer duration of symptoms, advanced arthritis on preoperative radiographs, and malalignment had poorer results. Debridement of the knee had a beneficial effect on the patients' function with regard to walking endurance and the need for assistive walking devices. Symptoms of swelling and giving way improved postoperatively. Rand[23] reported that normal preoperative radiographs did not correlate with arthroscopic findings of grade III and IV changes. All patients who were worse at final follow-up had radiographic evidence of osteoarthritis. Harwin[13] retrospectively reviewed 204 knees that underwent arthroscopic debridement. Standing radiographs were taken to evaluate limb alignment. Harwin concluded from statistical analysis that patients with less deviated axes did better than those with greater knee malalignment. Bert and Maschka[5] reported a 5-year follow-up comparing arthroscopic debridement alone and debridement with abrasion arthroplasty. Results showed that 66% of patients had good or excellent results with debridement alone, compared with 51% of those also undergoing abrasion arthroplasty. Half the patients who had abrasion arthroplasty showed joint space widening, but there was no correlation with symptomatic improvement. They concluded that arthroscopic joint debridement should be considered in selected patients when conservative measures have failed.

Complications

There were no postoperative complications in our series, although patients who undergo arthroscopic chondroplasty are presumably at risk for the usual complications associated with arthroscopy of the knee, such as infection, thromboembolic disease, hematoma, and arthrofibrosis.

Conclusion

Arthroscopic chondroplasty of the patellofemoral joint can improve pain and function in a properly selected group of patients. Patients must understand that the procedure does not restore a normal articular surface and rarely leads to complete resolution of all symptoms. The duration of improvement has yet to be determined with long-term prospective studies.

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