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TECHNIQUE

Treatment of Capitellar Osteochondritis Dissecans

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ABSTRACT

Osteochondritis dissecans (OCD) of the capitellum causes pain, motion deficits, and activity limitations. Evaluation requires a thorough history, physical examination, radiographs, and magnetic resonance imaging. Surgery is indicated for patients with stable lesions who fail nonoperative treatment or who have unstable lesions and particularly when mechanical symptoms are present. Treatment is based on the size and stability of the lesion. Surgical treatment options include drilling for stable intact lesions and chondroplasty with drilling for unstable lesions. Arthroscopic mosaicplasty is an option for large lesions that allow the radial head to engage within the capitellar lesion.

Keywords: elbow, arthroscopy, capitellum, osteochondritis dissecans

HISTORICAL PERSPECTIVE

Panner disease, first described in 1927, is an osteochondrosis of the capitellum which affects individuals younger than 10 years.[1] Radiographic features include fissuring, irregularity, and fragmentation of the capitellum, followed by reossification and resolution of symptoms. Panner disease is usually self-limited and must be differentiated from osteochondritis dissecans (OCD).

Valgus stress to the elbow results in compression of the radiocapitellar joint. Repetitive compressive forces may result in cartilage and bony damage; in skeletally immature athletes, this may manifest as capitellar OCD. Franz Konig is credited with the original description of OCD in 1888. It is now believed that the compression across the radiocapitellar joint occurs during a period of cartilage and bone vulnerability[2–5] and that the compressive forces may alter the subchondral blood supply of the capitellum. The ossific nucleus of the capitellum is supplied primarily by posterior vessels functioning as end arteries.[6,7]

PREOPERATIVE EVALUATION

Patients with capitellar OCD typically have a history of repetitive activity such as throwing. Gymnasts also incur repetitive forces to the lateral elbow and are at risk for capitellar OCD, especially when engaged in aggressive training at a young age. Symptoms include lateral elbow pain and stiffness. Mechanical symptoms of locking suggest the presence of intra-articular loose bodies. Physical examination commonly demonstrates a flexion contracture of 15 to 20 degrees. Crepitus and tenderness may be elicited over the radiocapitellar joint. Imaging begins with anteroposterior and lateral radiographs of the elbow. Comparison radiographs of the contralateral elbow assists the identification of subtle capitellar changes. Abnormalities of the radial head may also be present.[8,9] Plain radiographs often demonstrate fragmented subchondral bone with lucencies and irregular ossification of the capitellum (Fig. 1). Intra-articular loose bodies may also be seen on plain radiographs. Magnetic resonance imaging may further delineate the avascular segment and loose bodies (Fig. 2).

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SURGICAL INDICATIONS

Initial treatment consists of activity modification, avoidance of throwing or other related sports, nonsteroidal anti-inflammatory drugs, and bracing for acute symptoms. For lesions with intact articular cartilage, this is followed by physical therapy to regain strength and motion and then a progressive throwing program. Younger skeletally immature patients have a better prognosis for nonoperative treatment compared with older patients. For patients with Panner disease, most patients demonstrate excellent long-term results with nonoperative treatment. For patients with OCD, indications for surgery include failure of nonoperative treatment of stable lesions and more immediate surgery for unstable lesions with gross mechanical symptoms.

TREATMENT OPTIONS

The goals of surgery are to eliminate mechanical symptoms and stimulate a healing response. Current treatment options include removal of loose bodies, abrasion chondroplasty, drilling of lesions, microfracture, fixation of large fragments, and osteochondral autograft transfer.

FIGURE 1. Anteroposterior radiograph demonstrating lucency in capitellum.

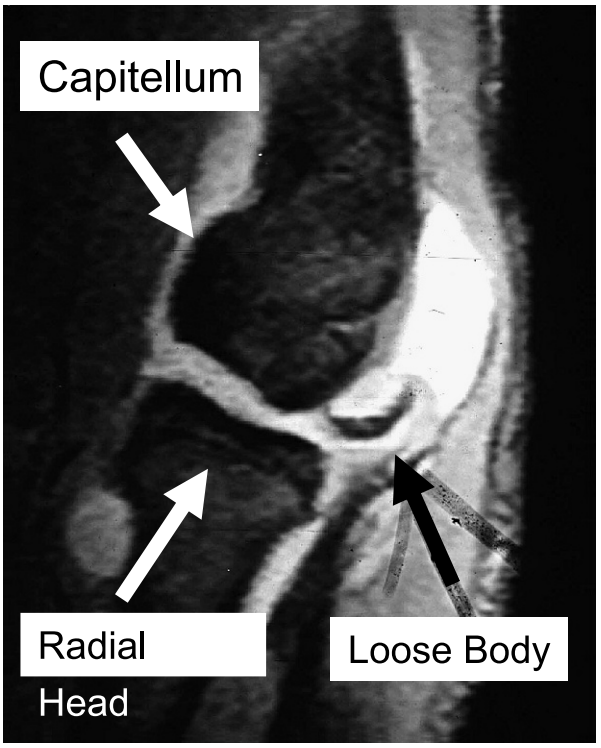

FIGURE 2. Magnetic resonance imaging demonstrating loose body and capitellar OCD lesion.

Fixation of fragments has not yielded superior results to debridement and drilling or microfracture and is likely related to the fragment's poor healing potential.

The OCD lesions of the elbow have been classified based on status and stability of the overlying cartilage.[10,11] According to Baumgarten et al[10], grade 1 lesions have smooth but soft articular cartilage. Grade 2 lesions have cartilage fibrillations or fissuring. Grade 3 lesions have exposed bone with a stable osteochondral fragment. Grade 4 lesions have a loose but nondisplaced fragment. Grade 5 lesions have a displaced fragment with resultant loose bodies. Surgical treatment recommendations for grade 1 lesions are drilling, and those for grade 2 lesions are removal of affected cartilage back to a stable rim and then drilling, microfracture, or abrasion chondroplasty. Grades 3 and 4 lesions should have removal of the osteochondral fragment and drilling, microfracture, or abrasion chondroplasty. Grade 5 lesions are treated with drilling, microfracture, or abrasion chondroplasty and removal of associated loose bodies.

Mosaicplasty is indicated for large capitellar lesions, grades 4 or 5, that allow the radial head to engage the lesion, as observed during arthroscopy. These lesions typically involve the lateral aspect of the capitellum and comprise greater than 50% of the capitellar surface area. These lesions also result in the loss of the lateral buttress to the radial head. Advanced stages of OCD that involve

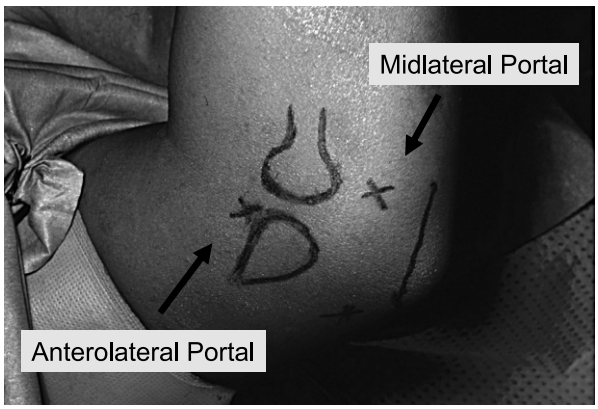

FIGURE 3. Lateral aspect of elbow with anterolateral and midlateral portals outlined.

degenerative changes of the radial head and deformity of the capitellum are relative contraindications to mosaicplasty.

TECHNIQUE

The patient is positioned according to surgeon preference with 3 options: supine, prone, and lateral decubitus. Our preference is the supine position if mosaicplasty is anticipated, with advantages of easy conversion to an open procedure and superior anesthesia access. Furthermore, supine position facilitates knee donor graft harvest. Prone position provides improved posterior compartment access and avoids the need for a suspension device. Gravity also displaces the neurovascular structures from the joint. Lateral position also provides improved posterior compartment access, gravity, and ease of conversion to arthrotomy and maintains ease for anesthesia. Arthroscopy equipments including 4- and 2.7-mm arthroscopes, shavers, and burs are required. Small-gauge, smooth 2-mm pins for drilling and commercial

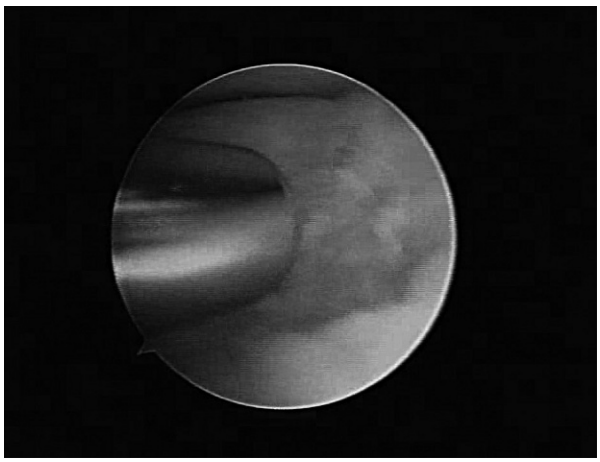

FIGURE 4. Capitellar lesion identified with loose cartilage debrided with shaver.

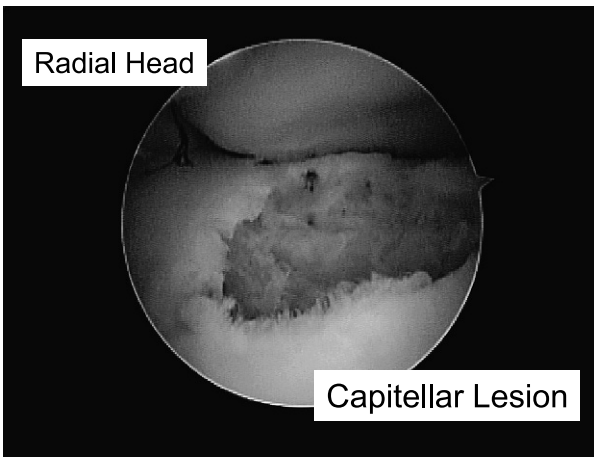

FIGURE 5. Capitellar lesion debrided to stable borders.

osteochondral graft transfer instrumentation (diameter of 4 and 6 mm) are necessary if mosaicplasty is anticipated.

After establishing standard portals, diagnostic arthroscopy is performed. All compartments are explored for loose bodies that, if identified, are removed. The midlateral portal is created through the soft spot centered in the triangle created by the lateral epicondyle, olecranon, and radial head (Fig. 3). This portal allows greater visualization and instrumentation for the capitellum. The OCD lesion is assessed and graded to guide treatment. A working portal is created adjacent and slightly lateral to the midlateral portal. The lesion is prepared by shaving loose fragments of cartilage down to subchondral bone and establishing healthy stable cartilage borders (Figs. 4 and 5). Drilling with 2-mm pins is then performed to introduce marrow elements and create a fibrocartilage healing response (Fig. 6). Figure 7A depicts the lesion after multiple drilling perforations, and Figure 7B demonstrates bleeding from the drill sites.

If mosaicplasty is elected, the lesion is also prepared by shaving loose fragments of cartilage to healthy stable borders. The size of the recipient site is determined with

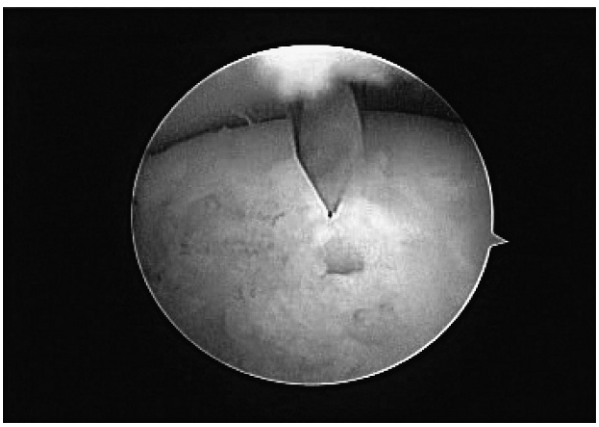

FIGURE 6. Drilling with smooth pin.

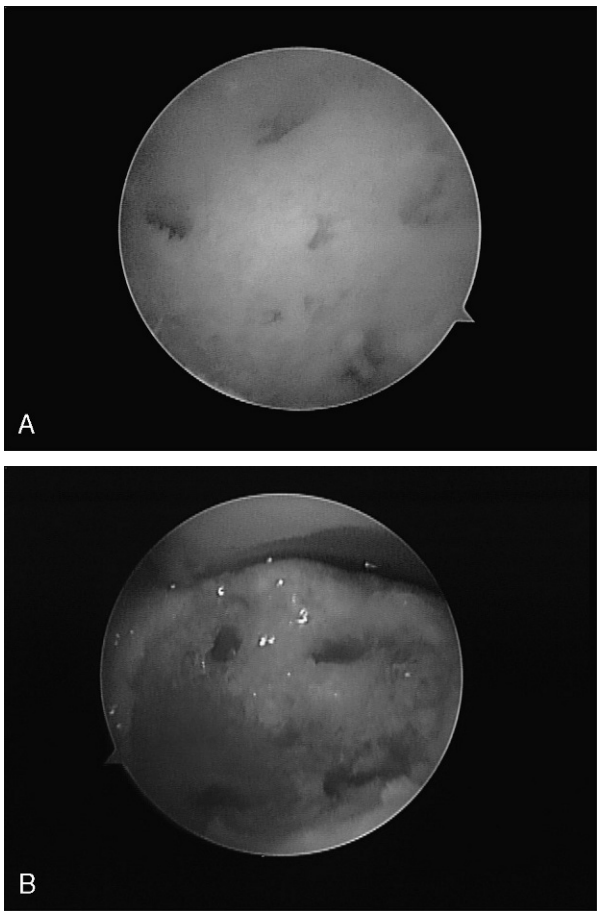

FIGURE 7. A, Completed drilling. B, Bleeding confirmed from the drill sites.

a calibrated probe or sizing guides and is typically either 4 or 6 mm. The elbow is then flexed to a range of 90 to 100 degrees, and a spinal needle is introduced for an exact perpendicular approach to the lesion. This is typically 3 to 4 cm distal from the midlateral portal and

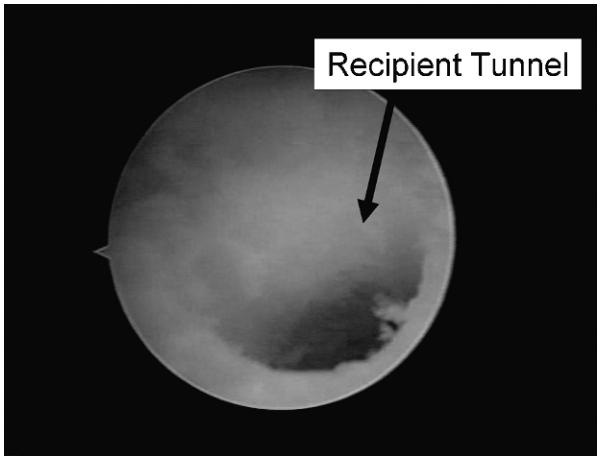

FIGURE 8. Recipient site for osteochondral autograft drilled.

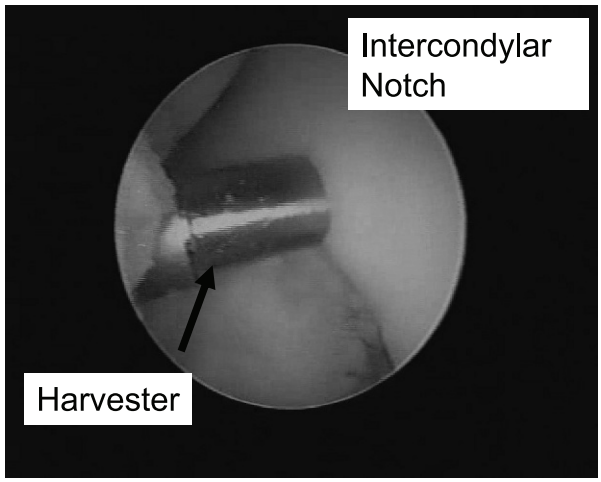

FIGURE 9. Harvest of donor osteochondral graft from knee intercondylar notch.

penetrates the anconeus. The recipient site is then drilled, creating the desired diameter tunnel for the osteochondral graft (Fig. 8).

The donor osteochondral graft is then harvested from the intercondylar notch of the knee arthroscopically (Fig. 9). The plug is then introduced into the recipient site and impacted flush with the surrounding cartilage. The process of osteochondral grafting is repeated until the lesion is adequately replaced (Fig. 10). If the entire lesion is not fully resurfaced, the remainder is treated with drilling.

RESULTS

Several long-term follow-up studies of patients with capitellar OCD indicate impairment of elbow function. Bauer et al[12] reported a 50% incidence of restricted motion, exertional pain, and radiographic degenerative disease at an average follow-up of 23 years. Similar findings have been observed in other long-term follow-up studies.[13,14]

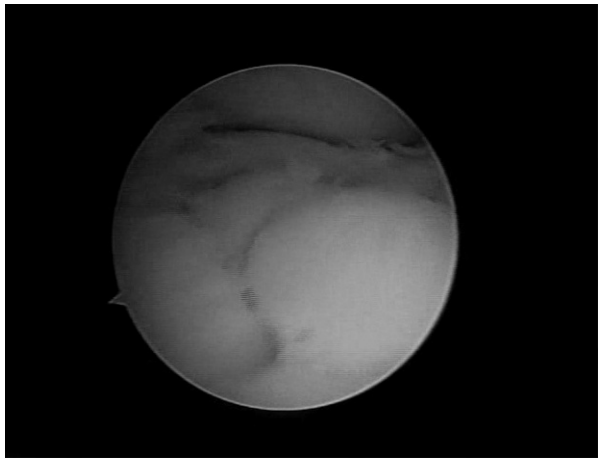

FIGURE 10. Completed mosaicplasty.

Ability to return to competitive sports has been variable in follow-up studies of shorter term. Tivnon et al[15] reported 10 patients with surgically treated OCD, and only 1 patient returned to his previous level of activity. Jackson et al[3] reviewed 10 cases of OCD in 7 high-level female gymnasts, and only 1 patient was able to return to competitive gymnastics. Maffulli et al[16] reported similar results in their review of 12 gymnasts.

Several other short-term studies have observed more favorable return to competitive athletics. McManama et al[17] reviewed 14 patients treated surgically for capitellar OCD and reported that 86% returned to competitive athletics at follow-up of 24 months. Baumgarten et al[10] reviewed 17 elbows treated arthroscopically for OCD of the capitellum; after a 2-year follow-up, 13 of the elbows were pain-free. Krijnen et al[18] reported on 5 cases of high-level female athletes who were treated with arthroscopic debridement, and all but one regained maximum motion. Similarly, in a review of 10 adolescent baseball players who underwent arthroscopic surgery for OCD of the capitellum, Byrd and Jones[19] reported excellent results, although only 4 of the 10 returned to playing baseball. Ruch et al[20] reported on 12 patients treated with arthroscopic debridement with follow-up of 3.2 years. Eleven of the 12 patients were highly satisfied. Bojanic et al[21] reported on arthroscopic debridement and microfracture technique to treat 3 adolescent gymnasts, with all 3 returning to competitive gymnastics. Brownlow et al[22] reported their results of arthroscopic debridement in 29 symptomatic patients. At an average of 77 months after operation, most patients had mild or no pain, and all but one had good or excellent outcomes. Only 4 of the 29 patients were unable to resume their preinjury level of sports activity.

No reports are available for all arthroscopic mosaicplasty treatment of capitellar OCD. We have performed 7 cases of arthroscopic mosaicplasty for elbow OCD with good-to-excellent patient satisfaction and reported a return to activity in 6 patients. There were no complications. The unsatisfied patient had arthritic changes involving the radial head and significant deformity of the capitellum that contributed to the poor result.

COMPLICATIONS

Potential complications related to arthroscopic treatment of capitellar OCD lesions include nerve injury, arthrofibrosis, and infection. When mosaicplasty is performed, care must be taken to avoid proud or nonperpendicular plug placement that would increase contact stress on the osteochondral graft. This requires accurate portal placement for visualization and exact perpendicular approach of instruments for donor harvest and preparation of recipient site.

POSTOPERATIVE MANAGEMENT

The elbow is splinted initially until the portals are healed. Physical therapy is then instituted to regain range of motion while avoiding strengthening that may compromise the healing response. Gentle resistance exercises are initiated at 3 months, with greater resistance at 4 months. For throwing athletes, a throwing program is started at 5 months. Full-effort throwing is achieved at 6 to 7 months.

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