Technical Note

Technique for Arthroscopic Debridement and Microfracture of Unstable, Contained Osteochondritis Dissecans Lesions of the Capitellum

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Abstract: Osteochondritis dissecans of the capitellum is an overuse injury that occurs primarily in adolescent athletes that causes pain and motion loss and can lead to chronic dysfunction. When diagnosed in its early stages, most lesions can be treated conservatively and without long-term consequences. Many osteochondritis dissecans lesions, however, continue to cause progressive symptoms despite nonoperative measures or are too advanced at the time of initial clinical presentation to be effectively treated without surgical intervention. The authors describe a safe and reproducible technique for the arthroscopic treatment of unstable, contained capitellar lesions.

Introduction (With Video Illustration)

Osteochondritis dissecans (OCD) of the capitellum occurs most commonly due to overuse injury in adolescent athletes involved in sports such as baseball, weightlifting, racquet sports, cheerleading, and gymnastics.[1,2] OCD lesions are more prevalent in male than female patients and almost always affect the dominant arm. Bilateral elbow involvement can be seen in 5% to 20% of patients.[1] Athletes will typically complain of pain, decreased range of motion, and, if the disease is more advanced, mechanical symptoms such as clicking, popping, catching, or locking.

Although information related to the natural history of OCD lesions is limited, it is widely accepted that early intervention is key to preventing long-term disability. Mihara et al.[3] observed that 83% of early elbow lesions, characterized by radiolucency and flattening of the capitellum, went on to heal with complete cessation of the offending activity. Unfortunately, many patients present initially with more advanced lesions that may require more invasive treatment. In the same study, Mihara et al.[3] found that only 11% of advanced lesions treated nonoperatively were completely healed at the time of final follow-up. These advanced lesions are characterized by separation or complete displacement of the cartilage cap from the subchondral bone, often leading to the formation of loose bodies within the elbow. Takahara et al.[4] found that 50% of their nonoperatively treated patients with advanced lesions had continued symptoms that interfered with activities of daily living after an average follow up of 12.6 years. In their 23-year follow up study, Bauer et al.[5] showed similar findings with approximately 50% of their nonoperatively managed patients reporting continued pain with activity and persistently impaired motion.

OCD lesions of the capitellum can be classified as either stable or unstable and as either contained or uncontained. Stable lesions typically are amenable to conservative treatment, whereas unstable lesions require surgery.[6] Stability of the lesion is determined based on whether the cartilage cap has been violated, leading to separation and possible detachment of cartilage from the subchondral bone. Containment is determined based on whether the lesion is remains completely surrounded by an intact cartilage perimeter. Contained lesions are usually amenable to debridement, microfracture, or fragment fixation, whereas uncontained lesions may require reconstruction of the

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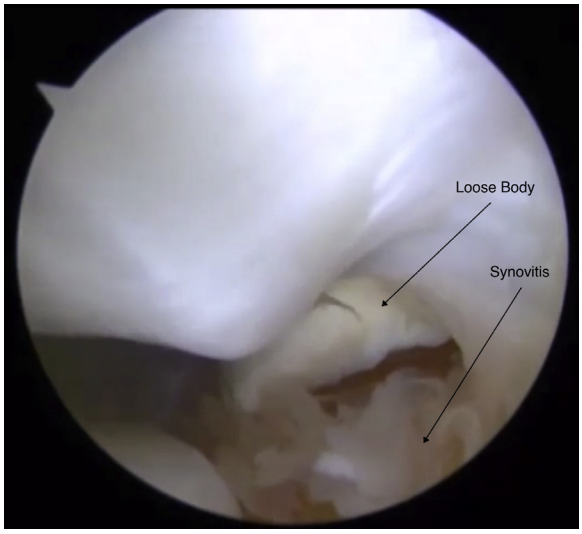

Fig 1. Viewing the posterolateral gutter of a right elbow in the prone position from the posterolateral portal, loose bodies and synovitis will commonly be present and obstruct the view of the radiocapitellar joint.

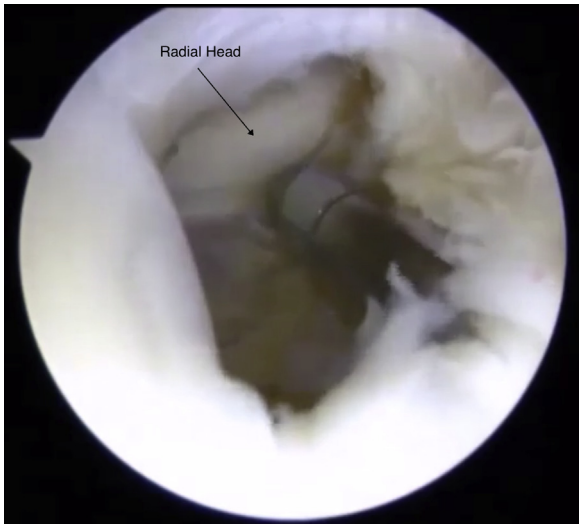

Fig 3. Viewing the radiocapitellar joint of this right elbow in a prone position from the direct lateral portal, an osteochondritis dissecans lesion is observed at the central portion of the capitellum.

cartilage wall via grafting. Contained lesions, regardless of treatment, have better outcomes overall when compared with uncontained lesions.[7]

For those patients with contained lesions that require operative intervention, the authors describe our preferred technique for arthroscopic debridement and microfracture of unstable, contained capitellar OCD lesions (Video 1). This technique affords the surgeon a safe and effective means to visualize, adequately access, and treat such capitellar lesions while minimizing the risk of iatrogenic injuries and complications.

Surgical Technique

Following the induction of general anesthesia, the patient is positioned prone on the operating table with appropriate padding of bony prominences. The operative arm is placed into a nonsterile arm holder or draped over a post. A nonsterile tourniquet is applied, and the operative arm is then prepped and draped in standard fashion. After exsanguination and elevation of the tourniquet to 250 mm Hg, landmarks are carefully marked to aid in portal placement. In addition, the ulnar nerve is always palpated to confirm its location within the ulnar groove and to ensure that it

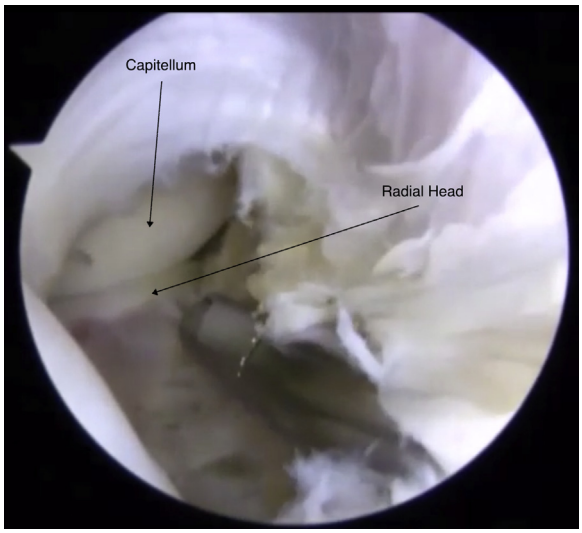

Fig 2. After the loose body has been removed, an arthroscopic shaver is used to debride the synovitis to obtain an unobstructed view of the posterolateral gutter and radiocapitellar joint for this right elbow in the prone position.

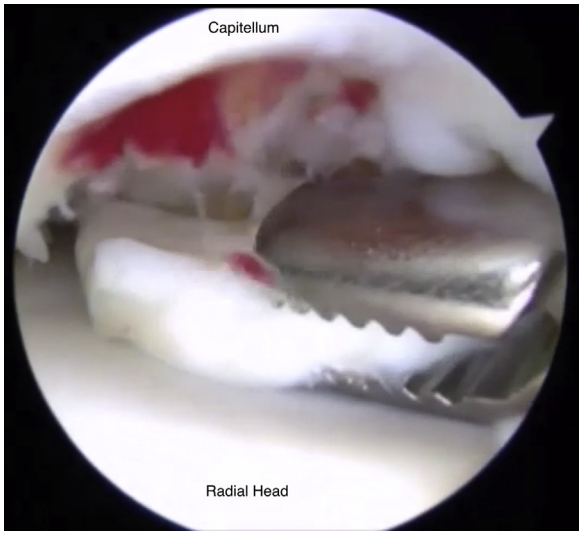

Fig 4. An arthroscopic grasper is used to rotate and assess the retained chondral lesion.

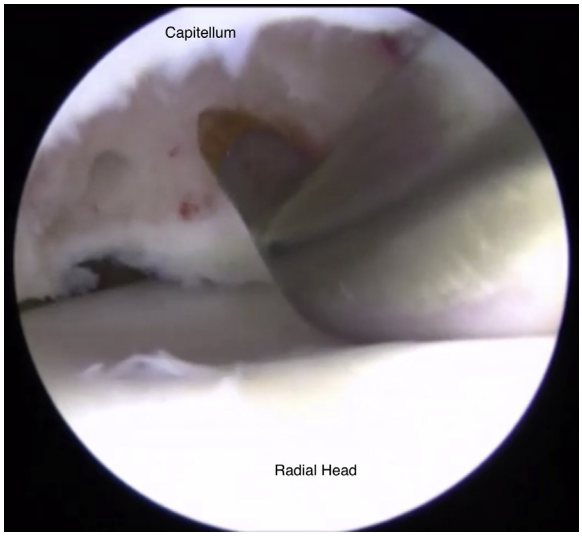

Fig 5. After debridement of the osteochondritis dissecans defect, a pick is used to penetrate the subchondral bone to allow the release of multipotent marrow cells into the lesion.

is not subluxated or subluxatable. Approximately 30 mL of normal saline is then injected into the elbow joint using an 18-gauge needle so as to distend the capsule making anterior compartment capsular penetration using blunt trocars more reliable. Diagnostic arthroscopy is then performed, beginning with establishment of a proximal anteromedial portal. The anterior compartment of the elbow joint is carefully assessed with attention paid to the radiocapitellar joint. The radius is then rotated to visualize the articular cartilage of the radial head. Loose bodies and other concurrent pathology within the anterior compartment can be addressed after establishing a proximal anterolateral portal using an inside-out technique. Once assessment and treatment of the anterior compartment is complete, the arthroscope is then introduced into the posterior elbow compartment through a posterior central portal.

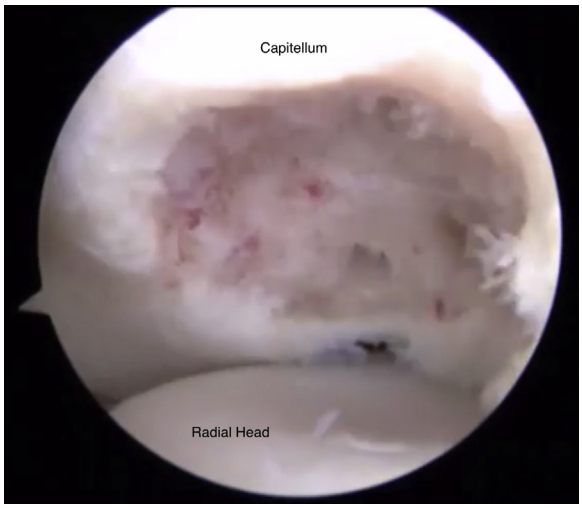

Fig 6. View of the osteochondritis dissecans lesion from the direct lateral portal for a right elbow in the prone position, after completing the debridement and microfracture.

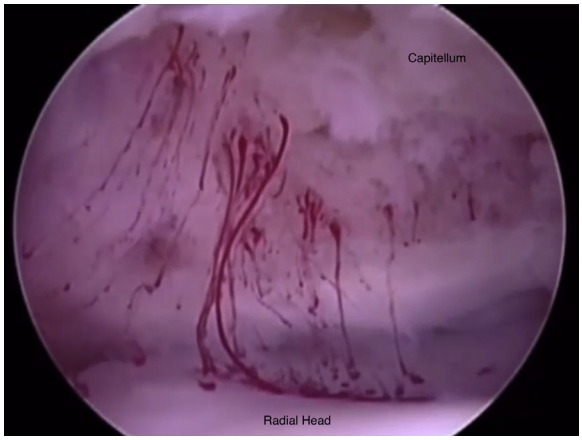

Fig 7. View of the osteochondritis dissecans lesion from the direct lateral portal after the tourniquet is released. Note bleeding emanating from the microfractured bony surface.

After completing diagnostic arthroscopy of the anterior and posterior compartments of the elbow, attention is then focused on obtaining visualization of and access to the capitellar OCD lesion. To begin this process, posterolateral and direct lateral (soft spot) portals are established in standard fashion. Localization of proposed portals using a spinal needle helps to ensure that these portals are placed in positions that will offer the most utility. Synovitis and loose bodies that can limit, or even prevent, the surgeon from visualizing the capitellar lesion and radiocapitellar joint from the posterolateral joint are often encountered in the affected elbows of such patients (Fig 1). For such situations, the posterolateral gutter is arthroscopically debrided as necessary using the posterolateral portal for viewing and the direct lateral portal for instrumentation. Appropriately sized arthroscopic shavers and graspers (Smith & Nephew, Andover, MA; Arthrex, Naples, FL) are used to perform this debridement (Fig 2). Once the posterolateral gutter has been adequately debrided, the arthroscope can then be moved to the direct lateral portal site location, which provides a more comprehensive view of the radiocapitellar joint including the OCD lesion (Fig 3).

From the direct lateral portal site, arthroscopic inspection of the OCD lesion is carried out to determine its size and location on the capitellum and to confirm

Table 1. Technique Advantages and Disadvantages

Advantages	Disadvantages
Safe and efficient way to view and treat contained capitellar OCD lesions, thus decreasing risk of iatrogenic injury and operative time	Technically demanding, requiring expert knowledge of elbow anatomy and advanced elbow arthroscopy skills
Small poke-hole incisions minimize wound complications	

OCD, osteochondritis dissecans.

that the lesion still possesses an adequate lateral capitellar buttress. Likewise, assessment for any retained bony or cartilaginous fragments within the OCD lesion's bony bed is accomplished. Such fragments are assessed to evaluate their size, stability, and potential viability. Working instruments can be advanced into the joint either percutaneously by using a spinal needle or by establishing an accessory posterolateral portal site.

Debridement is considered the treatment of choice when lesions occupy less than 50% of the capitellar surface, do not extend to the lateral capitellar rim, and do not contain fragments that are amenable to fixation (i.e. lack viable, subchondral bone for healing). To determine viability of any hinged fragments, a percutaneously placed spinal needle or an arthroscopic grasper (Arthrex) can be used to gently tilt the fragment to inspect it and to help visualize its undersurface for any subchondral bone that may be attached to this retained fragment (Fig 4). Once any nonviable fragments have been removed, a 4-mm arthroscopic shaver (Smith & Nephew) is used to carefully and thoroughly debride the bed of the OCD lesion and create a stable margin of articular cartilage on along the border of the lesion circumferentially. Also, due to the very limited space within the posterolateral gutter of the elbow joint, careful technique should be used to help minimize the risk for iatrogenic injury to adjacent articular cartilage, capsule and ligaments. Following arthroscopic debridement, a chondral pick (Arthrex) can be used to penetrate the subchondral bed in multiple locations (Fig 5 and 6). This subchondral picking introduces additional multipotent marrow cells that may improve the chances for reduction of lesion size through the production of fibrocartilage. Following microfracture, lowering of the tourniquet pressure allows for bleeding bone within the capitellar defect to be visualized (Fig 7).

Table 2. Technique Pearls and Pitfalls

Pearls	Pitfalls
The radiocapitellar joint is small; use caution when introducing instruments to avoid iatrogenic chondral damage.	Improper portal placement can make viewing and instrumentation difficult, given the small working area.
Debride lesion until stable cartilage walls completely surround lesion; otherwise, there is risk of recurrence and loose body formation.	Failure to debride posterolateral gutter and remove synovitis, if present, may make visualization difficult.

Discussion

Arthroscopic surgery has become the preferred method of treatment for contained capitellar OCD lesions. Compared with open surgery, arthroscopy offers the ability to directly visualize and access all the pathology within the elbow joint and has the additional advantage of not requiring larger incisions needed for open surgery. Minimal limitations are recommended after arthroscopic debridement, and patients are allowed to engage in normal activities of daily living immediately post-operatively (Table 1). Arthroscopic debridement with microfracture has yielded good-to-excellent results with significant improvements in motion, pain reduction, and high levels of patient satisfaction in studies.[8,9] Brownlow at al.[10] followed 29 patients who underwent debridement and microfracture and found that approximately 81% were able to return to previous levels of play. Rahusen at al.[11] found similar positive results with 80% of their 15 patients being able to return to their pre-injury levels of sporting activity.

Arthroscopic debridement of capitellar OCD lesions is challenging. The small amount of posterolateral elbow gutter intra-articular working space along with significant constraints that the radiocapitellar joint itself imposes limits visualization and restricts access to OCD lesions. However, thorough understanding of arthroscopic elbow anatomy and proper technique allows for effective and reproducible arthroscopic management capitellar OCD lesions (Table 2). The described technique provides for excellent viewing of and access to the capitellum while minimizing the risk of inadvertent iatrogenic injury to adjacent articular cartilage and other anatomic structures.

References

1. Iagulli N, Field L, Savoie F. Arthroscopic and open management of osteochondritis dissecans of the elbow. In: Cole B, Sekiya J, eds. *Surgical techniques of the shoulder, elbow, and knee in sports medicine*. Philadelphia: Saunders Elsevier, 2013;413.
2. Gonzalez-Lomas G, Ahmad C, Wanich T, et al. Osteochondritis dissecans of the elbow. In: Field L, Savoie F, eds. *AANA advanced arthroscopy: the elbow and wrist*. Philadelphia: Saunders Elsevier, 2010;40.
3. Mihara K, Tsutsui H, Nishinaka N, Yamaguchi K. Nonoperative treatment for osteochondritis dissecans of the capitellum. *Am J Sports Med* 2009;37:298-304.

4. Takahara M, Ogino T, Sasaki I, et al. Long-term outcome of osteochondritis dissecans of the humeral capitellum. *Clin Orthop Rel Res* 1999;363:108-115.
5. Bauer M, Jonsson K, Josefsson P, et al. Osteochondritis dissecans of the elbow. *Clin Orthop Rel Res* 1992;(284):156-160.
6. Takahara M, Mura N, Sasaki J, Harada M, Ogino T. Classification, treatment, and outcome of osteochondritis dissecans of the humeral capitellum. *J Bone Joint Surg Am* 2007;89:1205-1214.
7. Shi LL1, Bae DS, Kocher MS, Micheli LJ, Waters PM. Contained versus uncontained lesions in juvenile elbow osteochondritis dissecans. *J Pediatr Orthop* 2012;32:221-225.
8. Micheli L, Luke A, Mintzer C, et al. Elbow arthroscopy in the pediatric and adolescent population. *Arthroscopy* 2001;17:694-699.
9. Jones K, Wiesel B, Sankar W, et al. Arthroscopic management of osteochondritis dissecans of the capitellum: Mid-term results in adolescent athletes. *J Pediatr Orthop* 2010;30:8-13.
10. Brownlow H, O'Connor-Read L, Perko M. Arthroscopic treatment of osteochondritis dissecans of the capitellum. *Knee Surg Sports Traumatol Arthrosc* 2005;14:198-202.
11. Rahusen F, Brinkman J, Eygendaal D. Results of arthroscopic debridement for osteochondritis dissecans of the elbow. *Br J Sports Med* 2006;40:966-969.