

Bilateral Osteochondritis Dissecans of the Elbow in a Female Pitcher

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We report a case of a 17-year-old female pitcher with bilateral elbow osteochondritis dissecans.

Osteochondritis of the elbow is a well-known disorder affecting pitchers and other individuals who sustain repetitive microtrauma to the elbow. Elbow osteochondritis has been described infrequently in female athletes. The incidence and reporting patterns of this disease are likely to increase as more female athletes participate in organized sports.

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Osteochondritis dissecans of the elbow is typically seen in adolescent athletes who sustain repetitive microtrauma to the extremity. A case report of a 17-year-old female softball pitcher is presented. Current basic science research, clinical findings, and diagnostic and treatment options are reviewed. Finally, prognostic factors and preventive measures are presented to aid the family physician in determining the appropriate treatment and predicting the long-term outcome for patients with osteochondritis dissecans.

CASE REPORTS

A 17-year-old right-handed female athlete was active in several high school sports including volleyball, basketball, and softball, in which she was a softball pitcher. She complained of intermittent right elbow pain and swelling, which she has had for the past several years. Approximately 3 months before presentation, she noted pain and swelling with new symptoms of grinding, locking, and decreased range of motion. She denied a history of acute trauma. She continued to participate in sports with no loss of playing or practice time.

Her past medical history was negative for any other joint or endocrine disorders. Family history was negative for any bone or joint problems. Examination of her right elbow revealed no obvious

swelling. There was slight tenderness to palpation anteriorly over the antecubital fossa. There was no joint line tenderness to palpation. Active range of motion was 0° to 130° with audible grinding. There was a 5° loss of extension and a 20° loss of flexion compared with the opposite asymptomatic elbow. There was no evidence of valgus or posterolateral instability. She was able to demonstrate full active pronation and supination. The only other significant finding was pain on active wrist extension against resistance, which reproduced her elbow pain. Neurovascular examination was within normal limits.

Roentgenograms of the right elbow revealed a large loose body with a defect in the distal capitellar articular surface. A zone of increased density was notable at the base of the crater-like defect. Flattening of the capitellum was demonstrable on the lateral view. Olecranon spurs were visible on both the anterior-posterior and lateral views (Figures 1 and 2).

The diagnosis of osteochondritis dissecans (OCD) of the capitellum was established. Because of the presence of mechanical symptoms, limited range of motion, and loose body formation, surgery was indicated.

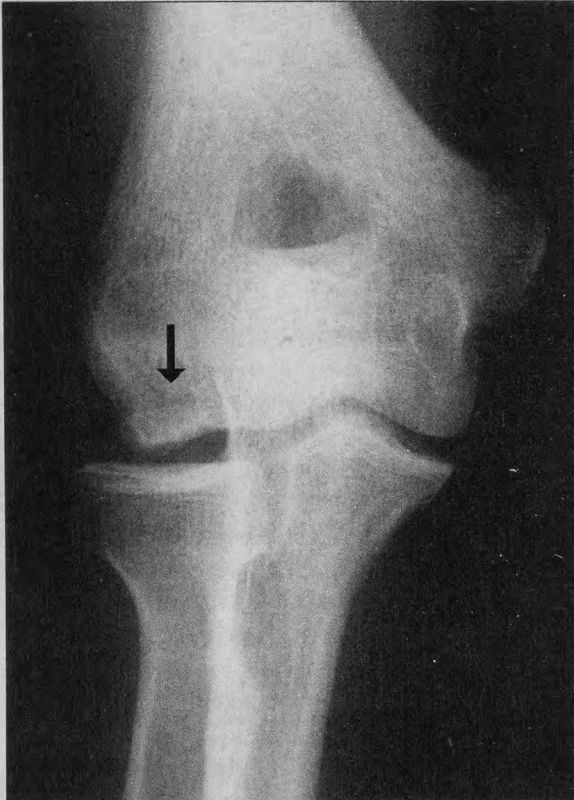
Intraoperative findings revealed multiple osteocartilaginous loose bodies. Crater-like defects were also present in the capitellum and medial trochlea. Diffuse synovitis and olecranon osteophytes were present. The operative procedure included removal of loose bodies, debridement of the capitellar and trochlear defects, and partial synovectomy. On follow-up, she resumed full activities, including pitching and catching without pain, and she had no other

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FIGURE 1

Anterior-posterior view radiograph of the right elbow demonstrating osteochondritis dissecans in a 17-year-old female softball pitcher. The arrow delineates an oval-shaped loose body in the lateral elbow joint near the capitellum.



functional limitation.

The patient returned 14 months after her initial presentation. She was now participating in intercollegiate basketball. She stated that her right elbow was "as good as new." She had a new complaint of left elbow pain. There was no history of acute trauma. She complained of catching, grinding, and limited range of motion. She felt that these symptoms were identical to those that were present in the right elbow in the past.

On examination, no obvious swelling or tenderness was present. Active range of motion was 0° to 140°. She demonstrated full active pronation and supination. Neurovascular examination was within normal limits. Roentgenograms revealed a loose body with a crater-like defect in the distal capitellum. The patient wished to have surgery performed but deferred the procedure until the conclusion of the basketball season.

DISCUSSION

Initially, the term osteochondritis dissecans was used to define a pathological process involving inflammation of the bone and joint with desiccation of the osteochondral fracture. More precise histological analysis has shed new light on the pathological process that takes place in osteochondritis. In 1953 Green and Banks¹ described microscopic finding of aseptic necrosis of the subchondral bone. There were no inflammatory cells present. Thus the term osteochondritis is really a misnomer.

The progression of macroscopic changes in OCD has been well documented. Initially, subchondral bone undergoes necrosis. Cartilage maintains its nourishment from the synovial fluid, but necrotic bone is resorbed and the cartilage loses its mechanical support. This places it at high risk for fracture and displacement from its base. With repetitive trauma, softening, degeneration, and eventual fragmentation of the joint surface occurs. If protected, necrotic bone is resorbed and the osteochondral fragment may heal.

FIGURE 2

Lateral view radiograph of right elbow of the same patient in Figure 1. The arrow delineates an oval-shaped loose body between the distal humerus and radial head.



Etiology

Several theories on the etiology of OCD have emerged.^{1,2} One theory suggests an ischemic insult to a localized area of subchondral bone. Histopathological architecture is similar to that found in infarction. Hyperemia and edema are common findings. Late stages of OCD follow one of two routes. Repair is more likely to take place if the articular surface remains intact. Restoration of normal architecture is often the end result. If the articular surface is fractured, the necrotic osteochondral segment may become detached and form a loose body. This is the likely cause of OCD in the our patient.

Repetitive trauma has been suggested as the cause of OCD of the elbow. Albright described side-arm pitching mechanics that contribute to elbow joint disorders.³ Tullos and King also analyzed the mechanics of pitching.⁴ They felt that the forces across the radiocapitellar joint played a part in the development of OCD of the capitellum. During the acceleration phase of pitching, the shoulder and arm move forward, the forearm and hand are left behind, and the elbow assumes a position of extreme valgus. The elbow flexor mass, medial collateral ligament, and the medial joint capsule become lax secondary to repetitive valgus stress, leading to abnormally elevated compressive forces across the lateral joint space. Medial epicondyle avulsion fractures can occur in skeletally immature patients. Osteochondral fractures and OCD are common sequelae of chronic repetitive microtrauma to the lateral joint space.^{5,6} This combination of findings is commonly known as "little league elbow." The patient described in our report had radiographic and surgical findings consistent with OCD but no clinical evidence of elbow joint instability or abnormalities involving her medial elbow joint.

Heredity may play a role in the development of osteochondritis. There have been several reports of OCD occurring in several generations of the same family.^{7,8,9} The family history in our patient was negative.

Incidence

Osteochondritis dissecans usually occurs during the second decade of life, during the growth spurt.^{9,12} The right dominant elbow is most commonly affected. Bilateral involvement has been described infrequent-

ly. Repetitive trauma is identified as the cause of OCD in over 50% of reported cases.¹³ Involvement of multiple joints has been described.^{1,8,14}

Primarily, OCD involves the knee, but elbow involvement occurs in about 6% of all cases.¹⁰ The evaluation of 1000 elbow radiographs in an adult population revealed an incidence of 0.4%.¹⁵ Nearly all (98%) cases of OCD reported in the literature have been in males. The largest series to date describes 10 cases of OCD in 7 female gymnasts.¹⁶

The presence of OCD lesions in both elbows in our patient perhaps reflects the recent trend of girls' and women's involvement in what were at one time male-dominated sports. There are no other factors in the history, examination, or operative findings that would suggest a cause other than that commonly described in throwing athletes.

Clinical Features of Osteochondritis Dissecans

History. The typical patient is an adolescent or young adult complaining of elbow pain and swelling. Usually he or she is active in sports or activities involving repetitive explosive upper extremity motion. Often pain is present, which is aggravated by activity and relieved with rest. The patient may complain of a grinding or catching sensation with limited range of motion.

Physical Examination. An effusion is usually present. Cubitus valgus is a common finding in pitchers. Palpation of the lateral joint line can be painful. Pronation and supination are limited. Crepitus with active and passive range of motion is usually present in patients with radiographic evidence of a loose body. In many asymptomatic pitchers a 5° to 15° flexion contracture is common. With acute symptoms, there may be loss of flexion and extension.

Diagnostic Tests. Roentgenograms should include anterior-posterior (AP) and lateral views of the elbow. Findings on the AP view include an irregular area of decreased density in the subchondral bone of the capitellum. This lesion is usually surrounded by a well-circumscribed zone of increased density. Cystic changes in the capitellum are often present. If the osteochondral lesion has been shed from its base, a loose body is usually apparent. On the lateral view, flattening of the capitellum is visible. The ipsilateral radial head may be larger when compared with the opposite unaffected side. Early epi-

physeal closure is a common finding when comparison views are obtained. In young adults with chronic symptoms, osteophyte formation and joint space narrowing are not uncommon.

It is important to evaluate the integrity of the articular surface and the displacement of the osteochondral fracture. Arthrography may be used to assess integrity of the articular surface. Dye will collect in the articular surface defect, and surround the defect if it is completely detached. Computed tomography is useful during treatment to identify areas of healing and areas where a fracture line persists. Magnetic resonance imaging is useful in delineating flattening of the capitellum or irregularities in the radial head. Short T1 inversion recovery (STIR) images often demonstrate subchondral necrosis and fluid extravasation into the subchondral defect.¹⁷

Differential Diagnosis. Panner's disease is defined as osteochondrosis of the capitellum. This disease involves the ossification centers in skeletally immature patients. Degeneration and necrosis is followed by regeneration and recalcification. It occurs primarily in boys aged 7 to 12 during active ossification of capitellar epiphysis. Patients complain of pain and limitation of elbow extension. Swelling and lateral joint line tenderness is present. The entire capitellar ossification center is fragmented with sclerosis and alternating rarefaction. The capitellar outline may be irregular and smaller than the opposite unaffected side. With time, the epiphysis heals with a normal radiographic appearance. The condition is self-limited; rest is the only prescribed treatment. Ischemic bone diseases, endocrinopathies, collagen vascular diseases, and multiple epiphyseal dysplasia are just a few disease processes that should be included in the differential diagnosis.

■ TREATMENT AND PROGNOSIS

Treatment is based on clinical and radiological findings. Pappas describes findings and treatment based on age and clinical findings.¹⁸ In younger patients the articular surface is usually intact. Sometimes a partially detached nondisplaced lesion is present. With protection, healing of the fragment occurs in the majority of cases. Treatment should include rest and possibly immobilization. After a 3- to 4-week period of immobilization range-of-motion exercises are initiated. The elbow is protected from trauma until radiographic evidence of healing is noted.

In adolescents, healing is not as predictable. Evaluation of the integrity of the articular surface is important. The fragment may be partially or completely detached from its base. Nonoperative modalities include activity modification and short-term splinting, followed by a program designed to improve range of motion with forearm flexor and extensor muscle stretching. Mechanical symptoms of catching and grinding with limited range of motion suggest a loose body. If confirmed radiographically, operative intervention is indicated.^{11,16,18,19} Operative options include: loose body removal, attempt at reattachment of the loose body, and drilling or curetting the crater base with loose body removal and abrasion chondroplasty.

The treatment of an articular surface defect is controversial. Bauer and colleagues evaluated a long-term follow-up study of elbow OCD.¹⁹ Thirty-one patients were followed an average of 23 years. Seventeen of 23 (74%) patients who presented with OCD as an adult had degenerative joint disease on long-term follow-up. When OCD presented in childhood, the prognosis was better. Degenerative joint disease appeared in 25% on long-term follow-up.

Basic science literature allows us to evaluate articular cartilage defects and healing in the animal model. Cartilage response to injury depends on several factors. The depth of the lesion determines the healing response.^{20,21} Partial thickness defects demonstrate no significant change in dimensions with time, and essentially no evidence of early or late repair. Shapiro and associates²² have recently documented the healing response to full-thickness defects in the rabbit model. Articular surface defects to a depth that included both cartilage and bone appeared initially to fill in with hyaline cartilage and bone, but between 12 and 48 weeks, progressive erosion and destruction of the newly formed cartilage took place. These findings allow us to predict that attempts at articular surface healing in full-thickness defects are short-lived. This supports Bauer's clinical findings of osteoarthritis in the long-term follow-up of surgically treated elbow osteochondritis.¹⁹

■ SUMMARY

Exposure to repetitive microtrauma is a well-known cause of elbow OCD in throwing athletes. Treatment of the nondisplaced osteochondritic lesion is initially nonoperative; immobilization or rest followed by

range of motion exercises is recommended. A completely detached but nondisplaced lesion should be treated nonoperatively.

Initial restriction of activity is important for healing. In patients with refractory symptoms, drilling may encourage healing of the lesion back to its base. The primary indication for surgical intervention is loose body removal in patients with mechanical symptoms.

Long-term follow-up suggests a relatively poor prognosis in patients with OCD presenting after childhood. Osteoarthritis is a common finding on follow-up in this group of patients. Preventive measures include evaluation and correction of abnormal throwing mechanics in pitchers. Patient and parental education play an important role in treatment of the young athlete. In athletic patients with OCD and evidence of degenerative joint disease, it may be prudent to suggest changing to a sport that decreases the risk of further articular cartilage damage. It is important that the patient and parent are made aware of the late sequelae of osteochondritis. They need to play an active role in the decision whether or not to continue the sport or activity that is responsible for repetitive microtrauma to the elbow. Halting the progression of articular cartilage destruction and subsequent degenerative joint disease should be the overall goal of the physician, coach, parent, and patient.

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