September 2014 Case Study

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Chief Complaint: elbow pain

HPI:
A 17-year-old male, high-level, year-round baseball pitcher, with a history of an ulnar nerve transposition procedure 9 months prior to presentation for ulnar neuritis/subluxation, was referred to sports medicine for new onset elbow pain. He had made a full return to throwing at his pre-surgical baseline 4 months prior. He was feeling fine and had participated in full pitching outings without symptoms until three days prior to presentation when on his fourth pitch of the game he felt a sudden “pop” in his elbow with associated pain. He recalls mild pain on the pitch prior, however following the fourth pitch he was unable to continue and removed himself from the game.

He reported immediate onset of significant swelling and loss of range of motion. Pain was located posteriorly along the course of the triceps tendon onto its insertion on the olecranon. He denied locking or catching. No paresthesias. He had been applying ice and using ibuprofen for pain relief for the past few days.

Past medical history, social history, and family history were unremarkable with the exception of the ulnar nerve transposition as discussed above.

Physical Exam:
VITALS: Pulse 73, BP 115/61, ht 174.5 cm, wt 67.9 kilos.
GENERAL: Well appearing male, athletic build
PSYCH: Pleasant mood and affect.
NEURO: Normal sensation to light touch throughout upper extremities.
VASCULAR: No upper extremity edema. 2+ radial pulses.
SKIN: Negative.
LYMPHATIC: No regional lymphadenopathy.

RIGHT ELBOW EXAM:
Inspection: obvious soft tissue swelling, predominantly around the posterior aspect of the joint over the distal triceps and down onto the proximal ulna. There was no isolated bursa noted, but rather diffuse swelling.

Palpation: Point tenderness noted right at the triceps insertion on the ulna. The ulnar groove was mildly tender.

Range of motion: Limited to 165 degrees of extension and approximately 80 degrees of flexion on the right; full pronation and supination. Pain reported with forced flexion and extension. Left elbow had full pain-free range of motion.
Strength: intact in flexion, extension, pronation, and supination. Pain noted on extension.
Special tests:
Active flexion and extension did not result in subluxation of the ulnar nerve. Valgus stress test and milking maneuver reproduced pain in the right elbow but he had no laxity and his pain was localized to the distal triceps attachment. Positive Tinel's over the ulnar nerve.

Imaging:
We reviewed the MRI study from July of 2013 (images 1a and 1b below, taken prior to his surgery). At that time, there was evidence of stress injury, however given his period of rest associated with surgical correction of the ulnar nerve subluxations, the surgical team felt he had adequate time for resolution of any stress to the olecranon. He also made a successful return to throwing without symptoms, negating any need for follow up imaging in the spring of 2014. At our initial visit on 5/22/2014, we obtained plain films as shown with interpretation below in images 2a and 2b.

Differential Diagnosis:
- Ulnar collateral ligament tear/sprain
- Triceps strain/tear
- Olecranon bursitis
- Olecranon fracture/avulsion injury
- Supracondylar humeral fracture
- Osteochondritis dissecans (OCD) of capitellum
- Ulnar neuritis/entrapment (cubital tunnel syndrome)
- Epicondylitis (Tennis Elbow, Golfer’s Elbow)
- Septic arthritis
- Gout

Imaging:

7/29/2013: MRI RIGHT ELBOW (Images 1a & 1b):
Edema of the olecranon, extending into the proximal metadiaphysis of the ulna, without evidence of fracture. This finding is consistent with stress injury. Thickening of the ulnar collateral ligament, without evidence of tear, consistent with tendinopathy due to prior sprains.
5/22/2014: XR ELBOW (Images 2a & 2b):
There is a linear lucency extending across a supracondylar region of the humerus and also overlying the olecranon process on the AP and both oblique views appear this however cannot be localized on the lateral view. No cortical disruption is appreciated. Joint spaces are maintained. No joint effusion is seen. Linear lucency described is suspicious for a fracture. Anatomic location of this however is uncertain.

5/24/2014: MRI RIGHT ELBOW (Images 3a & 3b):
There is low T1 and high T2 signal within the olecranon, with a 2 cm horizontal fracture in the medial cortex that does not extend through the lateral cortex. Joint effusion is present and new. There is persistent thickening of the ulnar collateral ligament, with edema in the common flexor tendon origin. Additionally, there is swelling and edema involving the ulnar nerve.

IMPRESSION:
1. Interval worsening of stress injury, now with olecranon fracture and joint effusion, as described above.
2. Thickening of the ulnar collateral ligament, which is otherwise intact.
3. Persistent edema in the common flexor tendon origin.
4. Swelling and edema of the ulnar nerve, which may be related to prior surgery or recent injury.

Final Diagnosis: Olecranon stress fracture

Follow Up/Outcome:
With MRI confirming an incomplete stress fracture through the olecranon without displacement, the patient underwent 4 weeks of complete rest in a sling prior to follow up films (images 4a and 4b). Following his 4 week checkup, he was released to begin cardiovascular conditioning. He continued to utilize the sling when out of the house for protection and as a reminder. A vitamin D level was also checked and found to be low at 25ng/ml (nml 30-100) and he was started on supplementation at 1000iu daily. He was told to follow up in 2 months.

6/25/2014: XR ELBOW COMPLETE (Images 4a & 4b):
Compared to the prior study of 5/22/2014, joint effusion has resolved. There is now slight periosteal reaction noted about the olecranon. New bone formation about the proximal ulna.

At his 2 month follow up he showed continued healing on x-ray (images 5a and 5b) and a normal physical exam. His activity level was again liberalized to include more rigorous cardiovascular fitness, however he was told to avoid upper extremity weight lifting or weight bearing activities (push-ups, pull ups, etc). The plan is to follow with plain films every two months until complete radiographic resolution. He will then begin intensive physical therapy with a throwing mechanics analysis, followed by a gradual return to throwing program similar to that described by Reinold and colleagues.⁹
Increased healing of nondisplaced proximal ulnar fracture.

Discussion:
Olecranon stress fractures (OSFs) are not a new phenomenon in overhead throwing sports. Their interconnectedness with stress placed over the ulnar collateral ligament (UCL) due to valgus extension overload (VEO) has been theorized over the years with a recent contribution coming from Furushima and colleagues. They provided the first classification system for OSFs, and reported a frequency of 5.4% among 1,430 patients with baseball related elbow injuries presenting to their clinic over a 4 year period. Having first been mentioned in the literature by Waris and colleagues back in 1946 (described in javelin throwers), OSFs are now being diagnosed more often as modern athletes push physiologic limits both acutely and through overuse.

From a pediatric standpoint, the classification/type of OSF is important as it has a correlation to the age of the athlete (Image 6). The differences are secondary to age and rate of closure of the primary ossification center for the olecranon, which can vary slightly between athletes. The mean age for the “physeal” type, which is found predominantly in skeletally immature athletes, is 14.1 years (A in Image 6). The “classic” type is the most common in adults as it occurs once full maturation of the physis has occurred at a mean age of 18.6 years (B in Image 6). This was previously called an “oblique fracture” as described by Suzuki and colleagues. The type of OSF found in our case is a “transitional” type with a mean age of 16.9 years (C in Image 6). This type of injury represents a mix of the “physeal” and “classic” types and will occur in an athlete who has undergone incomplete closure of the olecranon physis. The final two types are the “sclerotic” type (D in Image 6), with a mean age of 18.0 years, and the “distal” type (E in Image 6), with a mean age of 19.6 years.

Image 6: Classification, frequency, and mean age of patients with OCFs (N=200).

There is a high incidence of medial elbow disorders in association with OSFs, lending a “chicken or egg” debate as to the role VEO or UCL laxity plays in stressing the olecranon.
of comorbid medial elbow injury ranged from 71.3% to 94.7% depending on OSF type (sclerotic being the most common). The radiographic typing and eventual staging (not discussed here) of OSFs is important for appropriate decision making in management. If surgical management is to be pursued (as is the case with concomitant medial elbow disorders; UCL injury, avulsion injury), a CT scan should be obtained to assure perpendicular fixation during the operative procedure. Determination of surgical candidates is made on a case by case basis and should be sought through the consultation of an orthopedic surgeon experienced in management of elbow injuries in throwing athletes.

In the primary care setting, deciding when elbow pain in a throwing athlete is more than “just tendonitis” is important. Clearly in the immature thrower, the medial epicondyle and UCL should be carefully considered, as concomitant injuries to these structures are common, as discussed above. The evaluation for an OSF, starting with plain radiographs, should be pursued when point tenderness overlying the olecranon is found on exam or when elbow pain fails to improve with more conservative management (ice, NSAIDs, rest, etc). MRI is useful in further classifying and staging injuries, and CT is useful in surgical planning, however these diagnostic measures are not necessary as a part of an initial investigation.

The decision to return athletes to play following elbow injuries rests on a number of facets. First, the athlete should follow a progressive return-to-throw program. Secondly, they must be pain free throughout the entirety of their throwing motion, especially during the acceleration phase. Lastly, they should be limited in the pitch count as appropriate for their age and stage of development. With appropriate rehabilitation and a gradual return to sport, the recurrence rate will be lowered. A home exercise plan as prescribed from a physical therapist will further decrease this risk. Education of athletes is important to stress the importance of recognizing symptoms early in the event of recurrence, removing themselves from competition, and seeking further evaluation in a timely fashion.

References: