

BILATERAL OLECRANON EPIPHYSEAL FRACTURE NON-UNION IN A COMPETITIVE ATHLETE

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ABSTRACT

Olecranon epiphyseal stress fractures and epiphyseal non-unions have been described in throwing athletes, weight lifters and gymnasts. We present a case in which bilateral olecranon epiphyseal fractures were diagnosed in a competitive NCAA Division One wrestler who presented with chronic elbow pain. Given the rigors and physical demands of collegiate wrestling, we present a novel technique for open reduction internal fixation, grafting and supplementation with BMP for accelerated healing and return to competition.

INTRODUCTION

Stress fractures through the olecranon epiphyseal plate have been described in throwing athletes, weight lifters, gymnasts and have even been reported in a wrestler.¹⁻⁸ These injuries are thought to occur due to valgus extension overload across the ulnohumeral joint, repetitive abutment of the olecranon into the olecranon fossa, the deceleration phase of throwing and impaction of the medial olecranon onto the medial wall of the olecranon fossa.⁹

The olecranon ossific nucleus typically presents around the age of 8 and 11 years and fuses by the age of 15 and 17 years.¹⁰ It is during this time period that the elbow is susceptible to these injuries.

Repetitive overload and shear forces presumably cause abnormal stress across the growth plate, creating a Salter Harris Type One fracture. If the forces continue, a non-union occurs through the growth plate. Biopsy of these lesions show dense, poorly organized, cellular collagenous connective tissue separating two areas of reactive new-bone, consistent with a non-union. Furthermore, the epiphyseal plate is absent, indicating that this is not just failure of fusion of the epiphysis.^{6,11,12}

These injuries have been treated with a variety of methods. Conservative management combines elbow

immobilization, rest and subsequent rehabilitation. Rehabilitation focuses on eccentric strengthening of the elbow flexors, improving throwing mechanics, modification of technique in order to decrease the forces across the elbow joint and gradual return to training activities when all symptoms have resolved and radiographs demonstrate fracture healing. Conservative management may require several months of restricted activities. Electrical and ultrasound bone stimulators can be employed to promote healing. However, conservative measures have a high failure rate.¹³

Given the prolonged time period and uncertain outcome associated with conservative treatment, most athletes pursue operative intervention. Operative techniques include various forms of open reduction and internal fixation, bone grafting and post-operative immobilization followed by rehabilitation. The literature reports that most athletes are able to return to a pre-injury level within their sport after surgery and a period of recovery and rehabilitation.^{4,6,13,14}

While olecranon epiphyseal fracture occurrence and their treatment have been widely described in throwing athletes, we present an interesting case in a competitive collegiate wrestler.

CASE

A 19-year-old Division One NCAA competitive wrestler, with a history of a stress fracture in his left elbow, presented to clinic days after falling on his right elbow during competition. Radiographs demonstrated a displaced olecranon fragment with sclerotic appearing fracture lines consistent with an olecranon non-union. Further history revealed that the athlete's elbow had been painful for several months. The patient elected to have his non-union surgically stabilized with grafting. Surgery revealed an established non-union, which was stabilized with a 1/3 tubular plate and screws, supplemented with bone morphogenetic protein and allograft cancellous bone.

After his operation the patient revealed that his opposite, left elbow had substantial pain. Furthermore, this elbow was painful in his previous three wrestling seasons. Further history revealed that in each of the three previous seasons, his left elbow pain progressively worsened as the season progressed. Therefore, x-rays

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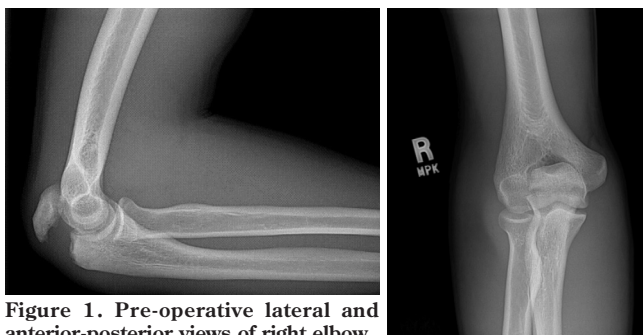


Figure 1. Pre-operative lateral and anterior-posterior views of right elbow.



Figure 2. Post-operative lateral and anterior-posterior views of right elbow.

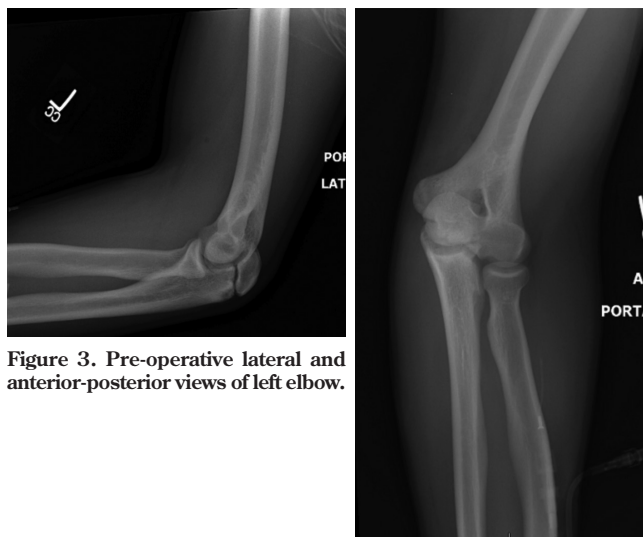


Figure 3. Pre-operative lateral and anterior-posterior views of left elbow.



Figure 4. Post-operative lateral and anterior-posterior views of left elbow.

were obtained which were remarkable for an olecranon epiphyseal non-union. The patient had an identical procedure performed two days after his first operation on his left elbow.

The patient was allowed functional range of motion in hinged braces post-operatively. At six weeks, radiographs showed healing of his previous bilateral non-unions. At that time his activity was appropriately progressed. The patient was able to return to full activity, including live wrestling. Eventually his hardware became symptomatic and was removed.

DISCUSSION

Most of the literature relevant to epiphyseal fractures of the olecranon discusses the possible fracture/non-union mechanism in overhead athletes. The injury is also noted in tennis players,¹² weight lifters⁵ and gymnasts.^{8,11,15} In most cases, the injury was unilateral. Maffulli et al. reported 2 cases of bilateral injuries in young gymnasts. These epiphyseal olecranon fractures likely occur through a similar mechanism as described in the overhead athlete. Maffulli et al. note that these injuries likely occur in gymnasts due to weight-bearing exercises,

over-use, rapid explosive maneuvers and repeated extension on a plastic growing skeleton creating repeated injury to the growth plates. Olecranon epiphyseal injuries may be analogous to stress fractures of the distal radius and Osgood-Schlatter apophysitis of the tibial tubercle.¹⁵

These lesions appear to be age dependent. When the olecranon epiphysis is not fully ossified, shear and tensile forces likely create the non-union. When the epiphysis is more mature and calcified, the same forces likely create a stress fracture. Regardless of whether the lesion appears as a stress fracture, or non-union, the biomechanical forces and subsequent pathology appear to be related.

The treatment of the patient in this report raises several points. The incidence of this injury in wrestlers appears less reported in the literature as compared to overhead athletes. Therefore, it should be considered in

high school-aged wrestlers with chronic elbow pain and needs to be evaluated in detail in wrestlers with bilateral elbow pain. Fracture fixation in olecranon epiphyseal fractures with allograft cancellous chips and bone morphogenic protein has not previously been described, but was successful in this patient. The use of a plate and screws is also a different method of fixation as compared to the tension band constructs described in the literature reviewing treatment for this injury. We decided to place a more robust construct given the potential demands that would be placed upon the fixation, in a historically non-compliant patient population. There are some notes of K-wire tension band and intramedullary screw fixation failures in the literature. While most elite athletes who suffer epiphyseal fractures and non-unions are able to return and compete at pre-injury levels, it is unknown how a competitive wrestler with bilateral injuries will compete in the future.

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