



E-ISSN: 2707-8353  
P-ISSN: 2707-8345  
IJCRO 2022; 4(2): 101-104  
Received: 15-05-2022  
Accepted: 20-06-2022

**Steven R Dayton**  
Northwestern University  
Feinberg School of Medicine -  
420 E Superior St, Chicago, IL  
60611

**Hunter S Angileri**  
Northwestern University  
Feinberg School of Medicine -  
420 E Superior St, Chicago, IL  
60611, USA

**Richard W Nicolay**  
MD, Northwestern Memorial  
Hospital – Department of  
Orthopedic Surgery, 676 North  
Saint Clair Street, Suite 1350,  
Chicago, Illinois, 60661, USA

**Michael A Terry**  
MD, Northwestern Memorial  
Hospital – Department of  
Orthopedic Surgery, 676 North  
Saint Clair Street, Suite 1350,  
Chicago, Illinois, 60661, USA

**Vehniah K Tjong**  
MD, Northwestern Memorial  
Hospital – Department of  
Orthopedic Surgery, 676 North  
Saint Clair Street, Suite 1350,  
Chicago, Illinois, 60661, USA

**Corresponding Author:**  
**Hunter S Angileri**  
Northwestern University  
Feinberg School of Medicine -  
420 E Superior St, Chicago, IL  
60611, USA

## Nonunion fracture of the sublime tubercle in a collegiate baseball pitcher: A case report

**Steven R Dayton, Hunter S Angileri, Richard W Nicolay, Michael A Terry and Vehniah K Tjong**

DOI: <https://doi.org/10.22271/27078345.2022.v4.i2b.132>

### Abstract

**Introduction:** Elbow pathology including fractures to the coronoid process are common in overhead throwing athletes such as baseball pitchers. Only four cases have been reported of sublime tubercle avulsion fractures in the literature. This case study investigates a novel treatment for such injuries.

**Case Presentation:** A 21-year-old collegiate baseball pitcher presented with medial elbow pain. Radiographic evaluation showed a nonunion fracture of the sublime tubercle of the coronoid process as well as medial epicondylitis and a partial ulnar collateral ligament (UCL) tear. The senior author performed platelet rich plasma injections into the origin of the flexor-pronator mass and UCL insertion. After an 8-week rehabilitation program, he was able to return to sport with no complications or drop in performance.

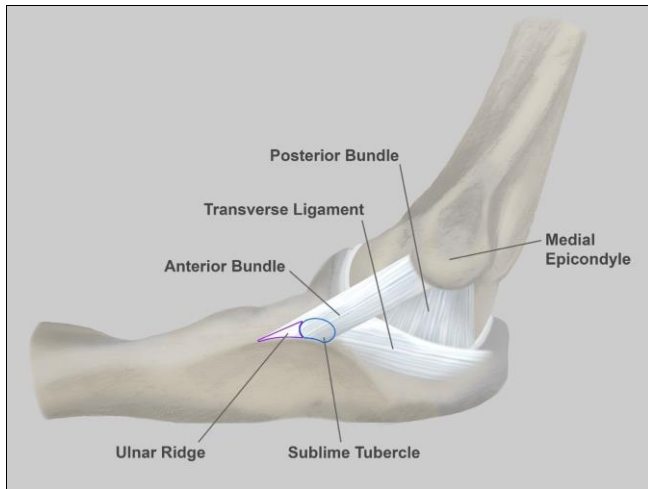
**Conclusion:** Platelet-rich plasma injection may be a viable treatment option for management of patients with delayed union fractures to the sublime tubercle, medial epicondylitis and partial UCL tear.

**Keywords:** Nonunion fracture, baseball pitcher, rehabilitation program

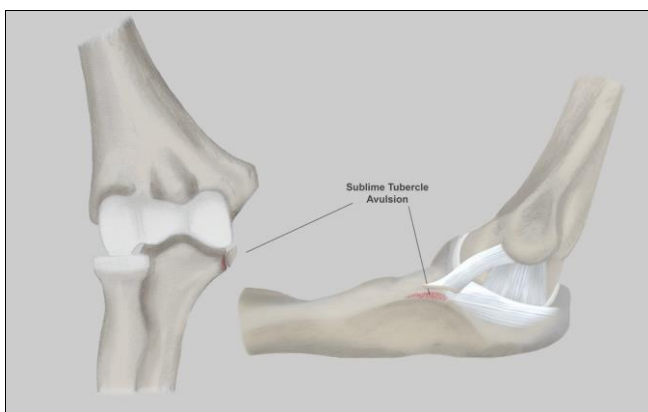
### Introduction

Overhead throwing athletes, particularly baseball pitchers, are at increased risk of multiple medial elbow pathologies due to repetitive valgus stress during acceleration<sup>[1]</sup>. Injury to the ulnar collateral ligament (UCL) of the elbow is increasingly common and may be managed nonoperatively or with surgical reconstruction<sup>[1-3]</sup>. In addition, these athletes are at risk for other common throwing-related pathologies, including medial epicondylitis, osteochondral lesions and medial epicondylitis<sup>[1, 4]</sup>. Fractures to the coronoid process of the ulna result from rotation with hyperflexion or hyperextension as is seen in overhead throwers<sup>[5]</sup>. Regan and Morrey have classified coronoid fractures into three types according to fragment size<sup>[6]</sup>. Type I fractures involve only the coronoid tip, type II involve 50% or less and type III involve greater than 50% of the coronoid height<sup>[6]</sup>. Type III fractures that involve the base of the coronoid may extend into the sublime tubercle which is located at the medial aspect of the coronoid base. Less commonly, the sublime tubercle can fracture independently from the coronoid. Only four cases of a sublime tubercle avulsion fracture in an overhead throwing athlete have been reported in the literature<sup>[4, 7-9]</sup>. Proposed management strategies for delayed unions include continued conservative treatment, bone fixation, UCL reconstruction, and shock wave therapy<sup>[4, 8, 9]</sup>.

The sublime tubercle of the ulna serves as the insertion for the brachialis muscle and attachment site for the anterior joint capsule and anterior bundle of the UCL (AUCL) (Figure 1)<sup>[10]</sup>. Thus, the sublime tubercle has been cited as the most critical bony stabilizer of the elbow joint<sup>[11]</sup>. We discuss a unique case in which a collegiate baseball pitcher suffered an avulsion of his sublime tubercle with a partial UCL tear which progressed to a nonunion and he subsequently developed medial epicondylitis who was treated successfully with platelet-rich-plasma (PRP) injection. (Figure 2).



**Fig 1:** Anatomic illustration of the sublime tubercle and medial collateral ligament



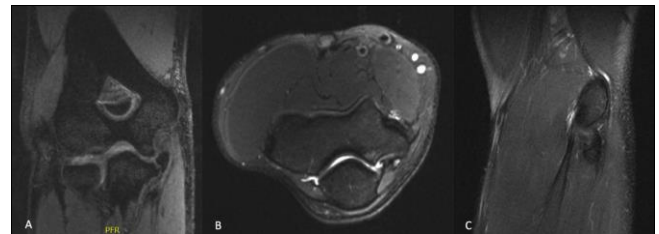
**Fig 2:** Illustration of a sublime tubercle avulsion

### Case Report

A 21-year-old collegiate baseball pitcher presented with three months of focal medial elbow pain in his dominant pitching arm. At age 13, he suffered a coronoid fracture and was casted for 6 weeks before he was able to make a full return to sport. He was pain free throughout his high school career and two years at the collegiate level. During his third season, he developed non-radicular pain in the medial elbow without a decrease in throwing velocity or performance. Physical examination revealed full range of motion in all planes, tenderness at the medial epicondyle, and pain with moving valgus stress of the elbow. Radiographs revealed a fibrous nonunion of the sublime tubercle of the coronoid (Figure 3) and an elbow MRI demonstrating medial epicondylitis and a partial UCL tear (Figures 4). His symptoms did not affect his performance, so he did not miss any games during the season. He was treated conservatively with intermittent anti-inflammatories, ice, an institution-specific throwing rehabilitation, and decreased pitch count during practices. At the conclusion of the season, the team physician performed a PRP injection into the origin of the flexor-pronator mass as well as the UCL ligament. After the injection, he completed two weeks of rest followed by 6 weeks of strength rehabilitation to the elbow and a return to throw program. He was then allowed to fully return to sport in time for the fall season. He completed the entire following season without pain and returned fully to his previous level of performance. We obtained written informed consent from our patient to author this manuscript.



**Fig 3:** Anteroposterior (A), oblique (B) and lateral (C) elbow radiographs demonstrating a fibrous nonunion of the sublime tubercle, best seen on the oblique view



**Fig 4:** T2-weighted elbow MRI demonstrating the fibrous nonunion of the sublime tubercle and hyperintense signal along deep and proximal portion of the common flexor origin

### Discussion

Multiple treatment options were considered for the management of this patient. UCL reconstruction and open reduction with internal fixation are both surgical options for patients when a sublime tubercle avulsion does not achieve union after conservative management [8, 9]. However, both surgical options require prolonged rehabilitation ranging from 4-15 months [8, 9]. Electrical bone stimulation is a common treatment method for delayed union of long bones [12-16]. Recent case reports have shown efficacy of electric stimulation in fractures of the coronoid process, including two case reports of successful treatment in baseball pitchers [4, 17]. However, the electrical stimulation required one month of immobilization. Nonsurgical rehabilitation has been shown to be effective in management of coronoid process fractures not effecting the sublime tubercle [18, 19]. Given the location of this specific fracture at the sublime tubercle and prolonged 6 month return to sport time reported by Hetling, we decided against these sport specific rehabilitation programs [18].

PRP injection leads to an increased concentration of growth factors and bioactive proteins which can increase the healing response in tendons, ligaments, muscle, and bone [20]. However, its role in fracture nonunion is unclear. Preclinical evidence suggests PRP may enhance bone healing [21-24]. A systematic review of clinical evidence found 3 randomized controlled trials which showed no benefit in functional outcome of nonunion fractures following PRP and 2 which showed superior outcomes [25]. Current clinical recommendations are unable to recommend PRP in fracture care at this time [25, 26]. Likewise, the benefit of PRP in the management of medial epicondylitis is uncertain. Varshney *et al.* showed PRP to be more effective than corticosteroid injections in the treatment of elbow epicondylitis but the breakdown between medial and lateral epicondylitis is unclear [27]. Current guidelines for the management of elbow tendinopathy acknowledge the potential of PRP but do not mention it as a treatment option due to lack of clinical evidence [28, 29].

Management of partial UCL tears with PRP therapy have been more successful. Dines *et al.* showed 32 of 44 baseball players to have a good or excellent outcome with a mean return to sport time of 12 weeks<sup>[30]</sup>. Another study found 88% of overhead throwing athletes treated with PRP for partial UCL tear were able to return to sport at 12 weeks<sup>[31]</sup>. Deal *et al.* utilized a series of 2 PRP injections but found 96% of athletes showed stability at 2 weeks and all showed some degree of reconstitution of the ligament on MRI<sup>[32]</sup>. I Given the multifaceted nature of the injury, the pain generator may have been from the fracture, partial ligament tear, or epicondylitis specifically or a combination of all three sources. It was determined that PRP injection was the best course of treatment for this patient. PRP has some clinical evidence in favor of its use in partial UCL tears and it offers rapid rehabilitation and return to play. The patient was able to return to play without pain and did not have follow up imaging. While short term outcomes are promising, long term follow up is needed. Despite these limitations, this case may provide an additional conservative option in the treatment of throwing athletes with similar elbow injuries.

### Conclusion

Platelet-rich plasma injections to the medial elbow may be an effective treatment option in the management of an overhead athlete presenting with a triad of a sublime tubercle nonunion, partial UCL tear, and medial epicondylitis.

### Data Availability

The data used in this paper to support the findings of this study are included within the article.

### Consent

The athlete has given his informed consent for this case report to be published.

### Disclosure

The authors declare that they have no disclosures.

### Funding

No funding was required for this study.

### Conflicts of interest

The authors declare that they have no competing interests.

### References

- Chen FS, Rokito AS, Jobe FW. Medial elbow problems in the overhead-throwing athlete. *J Am Acad Orthop Surg.* 2001;9(2):99-113.
- Jobe FW, Stark H, Lombardo SJ. Reconstruction of the ulnar collateral ligament in athletes. *J Bone Joint Surg Am.* 1986;68(8):1158-1163.
- Morrey BF, An KN. Articular and ligamentous contributions to the stability of the elbow joint. *Am J Sports Med.* 1983;11(5):315-319.
- Tanaka K, Kanamori A, Yamamoto Y, *et al.* Extracorporeal shock wave therapy for avulsion fractures of the sublime tubercle of the ulna in high school baseball players: A report of two cases. *Asia Pac J Sports Med Arthrosc Rehabil Technol.* 2017;10:1-3.
- Sanchez-Sotelo J, O'Driscoll SW, Morrey BF. Anteromedial fracture of the coronoid process of the ulna. *J Shoulder Elbow Surg.* 2006;15(5):e5-8.
- Regan W, Morrey B. Fractures of the coronoid process of the ulna. *J Bone Joint Surg Am.* 1989;71(9):1348-1354.
- Glaichen N, Schwartz ML, Andrews JR, Gladstone J. Avulsion fracture of the sublime tubercle of the ulna: a newly recognized injury in the throwing athlete. *AJR Am J Roentgenol.* 1998;170(3):627-628.
- Akagi M, Ito T, Ikeda N, Nakamura T. Total avulsion fracture of the coronoid tubercle caused by baseball pitching. A case report. *Am J Sports Med.* 2000;28(4):580-582.
- Salvo JP, Rizio L, 3rd, Zvijac JE, Uribe JW, Hechtman KS. Avulsion fracture of the ulnar sublime tubercle in overhead throwing athletes. *Am J Sports Med.* 2002;30(3):426-431.
- Rausch V, Wegmann S, Hackl M, *et al.* Insertional anatomy of the anterior medial collateral ligament on the sublime tubercle of the elbow. *J Shoulder Elbow Surg.* 2019;28(3):555-560.
- de Haan J, Schep NW, Eygendaal D, Kleinrensink GJ, Tuinebreijer WE, den Hartog D. Stability of the elbow joint: relevant anatomy and clinical implications of *in vitro* biomechanical studies. *Open Orthop J.* 2011;5:168-176.
- Alvarez RG, Cincere B, Channappa C, *et al.* Extracorporeal shock wave treatment of non- or delayed union of proximal metatarsal fractures. *Foot Ankle Int.* 2011;32(8):746-754.
- Furia JP, Juliano PJ, Wade AM, Schaden W, Mittermayr R. Shock wave therapy compared with intramedullary screw fixation for nonunion of proximal fifth metatarsal metaphyseal-diaphyseal fractures. *J Bone Joint Surg Am.* 2010;92(4):846-854.
- Leal C, D'Agostino C, Gomez Garcia S, Fernandez A. Current concepts of shockwave therapy in stress fractures. *Int J Surg.* 2015;24(Pt B):195-200.
- Taki M, Iwata O, Shiono M, Kimura M, Takagishi K. Extracorporeal shock wave therapy for resistant stress fracture in athletes: a report of 5 cases. *Am J Sports Med.* 2007;35(7):1188-1192.
- Moretti B, Notarnicola A, Garofalo R, *et al.* Shock waves in the treatment of stress fractures. *Ultrasound Med Biol.* 2009;35(6):1042-1049.
- Rettig AC, Mathis CE. Stress fracture of the coronoid process of a nonthrowing athlete: a case report. *Clin J Sport Med.* 2007;17(4):321-322.
- Hetling T, Bourban P, Gojanovic B. Stress Fracture and Nonunion of Coronoid Process in a Gymnast. *Case Rep Orthop.* 2016, 9172483.
- Moon JG, Bither N, Jeon YJ, Oh SM. Non surgically managed anteromedial coronoid fractures in posteromedial rotatory instability: three cases with 2 years follow-up. *Arch Orthop Trauma Surg.* 2013;133(12):1665-1668.
- Foster TE, Puskas BL, Mandelbaum BR, Gerhardt MB, Rodeo SA. Platelet-rich plasma: from basic science to clinical applications. *Am J Sports Med.* 2009;37(11):2259-2272.
- Marcazzan S, Taschieri S, Weinstein RL, Del Fabbro M. Efficacy of platelet concentrates in bone healing: A

- systematic review on animal studies - Part B: Large-size animal models. *Platelets*. 2018;29(4):338-346.
22. Dulgeroglu TC, Metineren H. Evaluation of the Effect of Platelet-Rich Fibrin on Long Bone Healing: An Experimental Rat Model. *Orthopedics*. 2017;40(3):e479-e484.
  23. Gianakos A, Zambrana L, Savage-Elliott I, Lane JM, Kennedy JG. Platelet-Rich Plasma in the Animal Long-Bone Model: An Analysis of Basic Science Evidence. *Orthopedics*. 2015;38(12):e1079-1090.
  24. Guzel Y, Karalezli N, Bilge O, *et al*. The biomechanical and histological effects of platelet-rich plasma on fracture healing. *Knee Surg Sports Traumatol Arthrosc*. 2015;23(5):1378-1383.
  25. Roffi A, Di Matteo B, Krishnakumar GS, Kon E, Filardo G. Platelet-rich plasma for the treatment of bone defects: from pre-clinical rationale to evidence in the clinical practice. A systematic review. *Int. Orthop*. 2017;41(2):221-237.
  26. Le ADK, Enweze L, DeBaun MR, Dragoo JL. Current Clinical Recommendations for Use of Platelet-Rich Plasma. *Curr Rev Musculoskelet Med*. 2018;11(4):624-634.
  27. Varshney A, Maheshwari R, Juyal A, Agrawal A, Hayer P. Autologous Platelet-rich Plasma versus Corticosteroid in the Management of Elbow Epicondylitis: A Randomized Study. *Int. J Appl. Basic Med Res*. 2017;7(2):125-128.
  28. Taylor SA, Hannafin JA. Evaluation and management of elbow tendinopathy. *Sports Health*. 2012;4(5):384-393.
  29. Donaldson O, Vannet N, Gosens T, Kulkarni R. Tendinopathies Around the Elbow Part 2: Medial Elbow, Distal Biceps and Triceps Tendinopathies. *Shoulder Elbow*. 2014;6(1):47-56.
  30. Dines JS, Williams PN, ElAttrache N, *et al*. Platelet-Rich Plasma Can Be Used to Successfully Treat Elbow Ulnar Collateral Ligament Insufficiency in High-Level Throwers. *Am J Orthop (Belle Mead NJ)*. 2016;45(5):296-300.
  31. Podesta L, Crow SA, Volkmer D, Bert T, Yocum LA. Treatment of partial ulnar collateral ligament tears in the elbow with platelet-rich plasma. *Am J Sports Med*. 2013;41(7):1689-1694.
  32. Deal JB, Smith E, Heard W, O'Brien MJ, Savoie FH, 3rd. Platelet-Rich Plasma for Primary Treatment of Partial Ulnar Collateral Ligament Tears: MRI Correlation With Results. *Orthop J Sports Med*. 2017;5(11):2325967117738238.

**How to Cite This Article**

Dayton SR, Angileri HS, Nicolay RW, Terry MA, Tjong VK. Nonunion fracture of the sublime tubercle in a collegiate baseball pitcher: A case report. *International Journal of Case Reports in Orthopaedics*. 2022;4(2):101-104.

**Creative Commons (CC) License**

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 4.0 International (CC BY-NC-SA 4.0) License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.