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Fracture of the supracondylar process of the humerus in an adolescent athlete

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The supracondylar process of the humerus is an uncommon anatomic variant with a reported incidence of 0.8%-2.7% of the general population.[11] On average, the supracondylar process is located 5 cm proximal to the medial epicondyle and is an inferior projection from the anteromedial surface of the humerus that ranges from 2 to 20 mm in length.[7] This prominence typically occurs in conjunction with Struther's ligament, which connects the bony spur to the medial epicondyle. The combination of this ligament and the supracondylar process creates a fibro-osseous tunnel through which the median nerve and the brachial vessels pass.[6] Muscle variants associated with a supracondylar process include a high origin of the pronator teres or an insertion of the coracobrachialis.[4] Although typically clinically asymptomatic and found incidentally, pathology associated with this anomaly includes fracture, brachial artery claudication, and median nerve compression.[8]

The potential for the pronator teres having an accessory origin on Struther's ligament, the supracondylar process, or other attachments to the humerus has been previously documented.[4] During cadaveric dissection, the connection between the pronator teres and the supracondylar process was described in a patient with 2 bone origins of the pronator teres, one on the medial epicondyle and the other on the supracondylar process of the humerus, with Struther's ligament extending between them.[5] A prior case report described a fracture of the supracondylar process in a tennis player that was thought to be secondary to excessive traction of the pronator teres, such as with repeated forceful forearm pronation during a serve or backhand.[9] Although fractures of the supracondylar process usually follow direct trauma, the long and thin structure with pronator teres origin places this process at risk for an avulsion fracture during combined elbow extension and forearm pronation.

We report the case of a 16-year-old male overhead throwing athlete who presented with a mildly displaced fracture of the supracondylar process of the humerus that is believed to be secondary to rapid activation of the pronator teres during a basketball chest pass. We aim to draw attention to this condition and identify key factors to help make a proper diagnosis and treatment plan focused on optimizing functional outcomes. Nonoperative management with close observation and gradual return to activity resulted in fracture union with no symptoms of neurovascular compression while playing sports.

Case report

We report the case of a left-hand-dominant 16-year-old otherwise healthy male who presented with several days of elbow pain after he heard a pop during a forceful chest pass while playing a basketball game. He initially presented to his pediatrician with symptoms of swelling, bruising, weakness, and inability to comfortably use the left upper extremity. The patient presented to our clinic with persistent left elbow pain 5 days after the initial injury. At that time, radiographs of the left elbow revealed an anteriorly and inferiorly displaced transverse fracture of the supracondylar process of the patient's left humerus (Fig. 1).

Physical examination revealed no neurologic or vascular abnormalities. He was tender to palpation over the anteromedial distal humerus with discrete swelling over the brachium just proximal to the medial epicondyle that extended into the flexor compartment of the forearm. He reported pain with terminal extension and that resisted maneuvers of supination and pronation were limited secondary to pain, but he experienced no block to range of motion. His elbow was stable to varus and valgus stress. Given that our patient's only symptom was pain, surgical excision

Institutional review board approval was not required for this case report.

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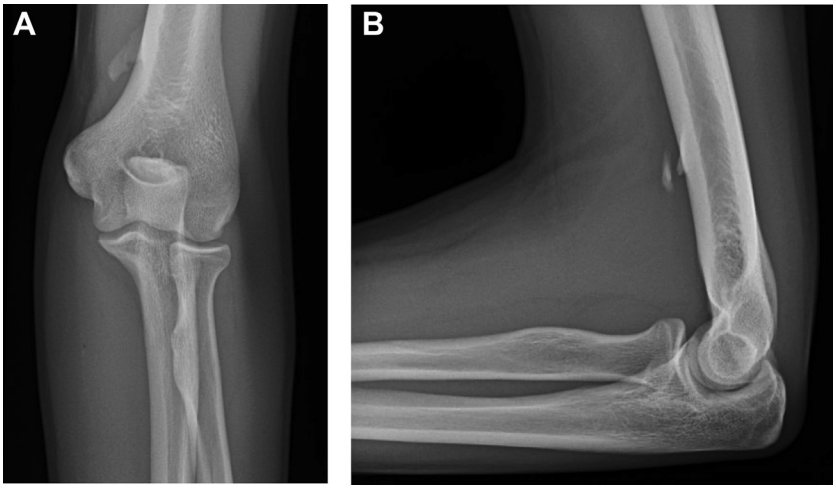

Figure 1 (**A**) Anteroposterior and (**B**) lateral radiographs of the left elbow obtained 5 days after the initial injury demonstrating a transverse fracture of the humerus supracondylar process with anterior and inferior displacement.

was discussed, but a trial of nonoperative management was recommended.

The patient and his parents elected for nonoperative management, and he received a sling to wear for comfort. Restrictions included avoidance of sports and no heavy lifting, but full range of motion was allowed. He was provided gentle stretching exercises and was instructed to monitor for signs of neurovascular compromise, including median nerve compression or brachial artery claudication. He was seen in clinic 2 weeks and 6 weeks after his initial presentation with the same elbow radiographic series obtained at each visit.

The patient had decreased pain at the 2-week follow-up appointment. Rehabilitation initially focused on the recovery of full range motion and subsequent progression of strengthening exercises. Heavy lifting and return to practice or games were still discouraged. At his 6-week follow-up appointment, radiographs demonstrated no significant change in alignment and the presence of hypertrophic callus surrounding the supracondylar process without union of this prominence to the humeral shaft (Fig. 2). The patient was able to return to basketball and baseball practice 6 weeks after initial injury without any interference in his performance level and has remained asymptomatic during all overhead activities.

The patient was also seen 8 months after his initial injury. At this time, radiographs showed a healed supracondylar humerus process fracture with bridging callus across the fracture site (Fig. 3). There was no evidence of neurovascular compression on examination, and he denied any symptoms while playing sports.

Discussion

When present as an anatomic variant, the supracondylar process of the humerus is largely asymptomatic, unless this bony projection is fractured or causes the compression of the median nerve or brachial vessels. A fracture of the supracondylar process usually presents as anteromedial elbow tenderness that is exacerbated by elbow extension and forearm pronation. Rarely, presentation includes neurovascular compression, which is seen as claudicant upper extremity pain (brachial artery compression) or pronator syndrome (median nerve compression), with symptoms of paresthesias, numbness, and weakness.[1,2,8] Differential diagnosis of this fracture should include post-traumatic myositis ossificans and osteochondroma. In contrast to osteochondromas that are directed away from joint lines, the supracondylar process of the humerus points toward the elbow joint and is not in continuity with the cortex of the humerus.[10]

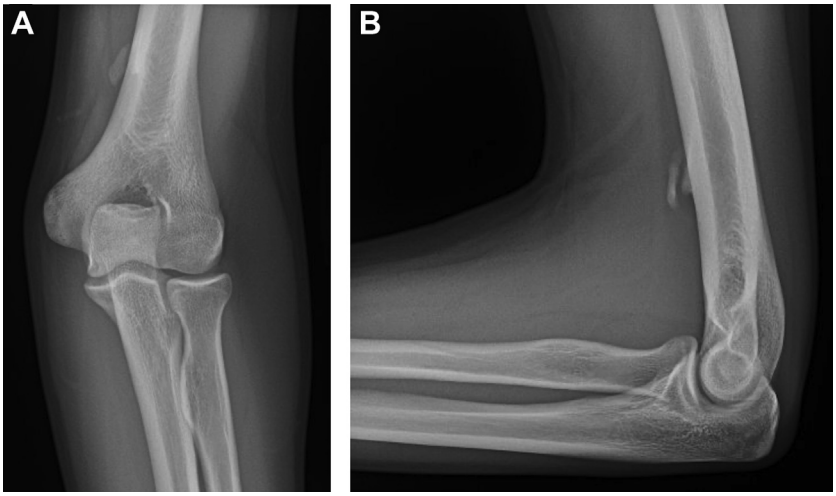

Figure 2 (**A**) Anteroposterior and (**B**) lateral radiographs of the left elbow obtained at the 6-week follow-up appointment demonstrating the presence of hypertrophic callus and nonunion of the humerus supracondylar process fracture.

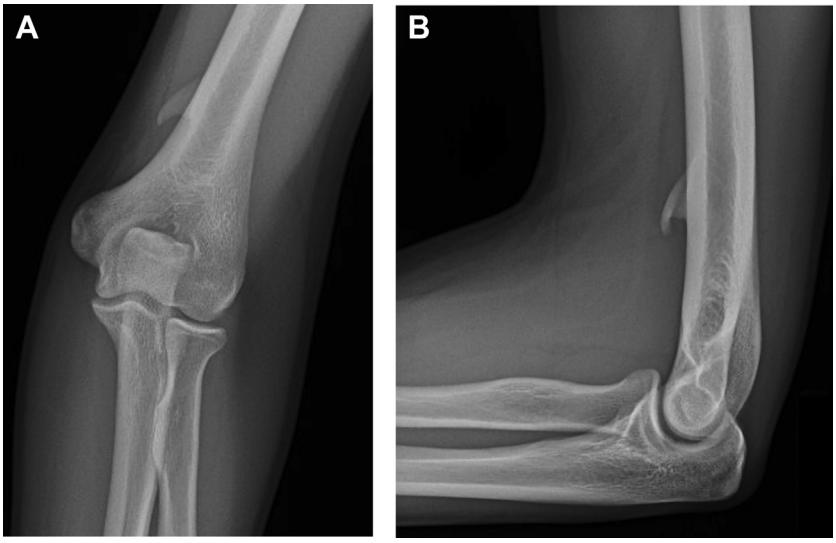

Figure 3 (**A**) Anteroposterior and (**B**) lateral radiographs of the left elbow obtained at the 8-month follow-up appointment demonstrating bridging callus and fracture union.

Our patient was a 16-year-old boy who presented with a displaced supracondylar fracture of the left elbow. Given that he had no symptoms of compression of the median nerve or brachial vessels, we elected for nonoperative treatment with sling immobilization for comfort, weight bearing and activity restrictions, and gentle gradual home physical therapy program. Follow-up imaging initially demonstrated callus formation around the fracture site with hypertrophic nonunion 6 weeks after the injury, but complete union was eventually observed. The patient experienced complete resolution of pain and returned to his prior level of baseball and basketball participation with no change in his level of function or performance.

Of 7 prior case reports of supracondylar ridge fractures in children or adolescents, only 1 was treated with nonoperative management, which was successful.[3] Our case confirms that conservative therapy is a reasonable treatment option that should be offered to all patients without evidence of neurovascular complications, but the risk of displacement and more importantly development of neurovascular complications should be discussed.

Similar to prior studies, we hypothesize that our patient's presentation could be due to a traction injury mechanism from excessive pull by the pronator teres at its origin on Struther's ligament or the supracondylar process during forceful contraction of this muscle during combined forearm pronation and elbow extension during a basketball chest pass.[5,9] Fractures of the supracondylar process usually follow direct trauma, but the lack of trauma experience by our patient indicates the potential for the pronator teres taking origin directly on the supracondylar process or indirectly to this bony projection via Struther's ligament.

Conclusion

To our knowledge, this is the first case report of a supracondylar process fracture in a noncontact, overhead throwing athlete. Supracondylar process fractures of the humerus should not be overlooked in athletes and should be considered with unexplained anteromedial distal humerus pain with or without neurovascular symptoms. Nonoperative management is an acceptable treatment when there are no signs of neurovascular compromise at initial presentation or during follow-up examinations.

Close observation and early mobilization of supracondylar process fractures can lead to return to prior level of function without development of neurovascular symptoms, loss of strength, or decreased range of motion. This case supports an avulsion fracture due to a partial origin of the pronator teres on either Struther's ligament or the supracondylar process and a traction mechanism during combined forearm pronation and elbow extension.

Disclaimer

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