Acromial apophysitis in a 13-year-old adolescent boy: a common condition in an uncommon location

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Abstract

Objective: Traction apophysitis is a common condition in physically active and skeletally immature adolescents. This case study describes the clinical presentation and plain film imaging of traction apophysitis of the acromion process of the scapula.

Clinical Features: A physically active 13-year-old adolescent boy presented to a chiropractic physician with an acute onset of moderate shoulder pain. Plain film radiographs of the shoulder were performed that revealed fragmentation, sclerosis, and irregularity of the left acromial apophysis.

Intervention and Outcome: The patient was treated with conservative therapy for 10 weeks, with complete resolution of symptoms. Follow-up radiographs 9 weeks later revealed no radiographic change in the appearance of the apophysis; however, clinical symptoms were absent. The apophyseal growth cartilage is the most vulnerable site in the muscle-tendon unit in the skeletally immature patient and is more susceptible to very small avulsion fractures. Repetitive microtrauma following chronic overuse at a tendon insertion site in a skeletally immature patient may result in traction apophysitis.

Conclusions: Acromial apophysitis should be included in the differential diagnosis when presented with a young active patient with shoulder pain. Early treatment with restriction of activities is important in the prevention of permanent injury to the acromial cartilaginous growth plate. This case demonstrates that a prompt diagnosis can be made with a careful history, physical examination, and conventional imaging.

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Introduction

Nomenclature of epiphyseal disorders can be confusing and thus has made diagnosis difficult for the

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clinician and the radiologist alike. *Osteochondroses* are defined as a group of disorders typically seen in the immature skeleton that are characterized by fragmentation, sclerosis, and collapse of the epiphysis or apophysis. Three distinctive categories of osteochondroses exist that must be differentiated: (1) conditions characterized by osteonecrosis, (2) conditions related to trauma or abnormal stress without evidence of osteonecrosis, and (3) variations in normal growth patterns.¹

Acromial apophysitis is the term used to describe traction apophysitis at the acromion. Very few reports regarding acromial apophysitis have been described; however, all described cases have similar clinical presentation, clinical findings, and radiographic appearances. Morisawa et al² describe 3 separate cases of acromial apophysitis in which the patients were active adolescents in throwing sports with pain localized to the tip of acromion, pain with shoulder movement, and relative absence of pain at rest. Plain radiographs in all 3 cases demonstrate sclerotic changes and irregularity of the acromion. In addition, all described cases suggest that vigorous contraction and relaxation of the deltoid muscle at the insertion of the acromion are the major contributing factors to traction apophysitis seen at the acromion.^{2,3}

This article concentrates on the category of osteochondroses related to trauma or abnormal stress without evidence of osteonecrosis. If the condition is related to abnormal stress due to chronic traction at the insertion site of a tendon, the condition is typically termed *traction apophysitis*.⁴ This case report will describe traction apophysitis in an uncommon location, the acromial apophysis, in a physically active 13-year-old adolescent boy with acute onset of shoulder pain.

Case report

A 13-year-old adolescent boy presented to a chiropractic physician with moderate left anterior shoulder pain of several days duration. The patient was active in basketball, football, soccer, and track and field. There was no known precipitating event at the onset of the pain. The shoulder pain was rated at 5 of 10 on the verbal pain scale that frequently increased to 10 of 10, with 0 representing no pain and 10 representing excruciating pain. The patient reported that his pain was exacerbated while lifting and carrying heavy objects.

Fig 1. Initial conventional radiographs of the left shoulder. (A) Anterior to posterior internal rotation and (B) baby arm views demonstrate irregularity, sclerosis, and fragmentation of the acromial apophysis. (C) Magnified image better demonstrates the fragmented appearance.

Physical examination revealed painful external humeral rotation of the left shoulder and a positive Apley scratch test result.⁵ The anterior aspect of the left shoulder was moderately tender to palpation. The overlying skin did not reveal any bruising or edema. Lumbar and cervical spine active ranges of motion were within normal limits. Cervical and lumbar spine orthopedic test results were negative. Deep tendon reflexes including biceps, triceps, brachioradialis, patellar, and Achilles were intact and symmetric. Motor strength of the C5-C8, T12-L2, L4, L5, and S1 myotomes was symmetric and intact. There was no pertinent medical history.

Radiographs of the left shoulder revealed a sclerotic, irregular, and fragmented left acromial apophysis (Fig 1). A diagnosis of acromial apophysitis was made on the basis of radiographic and clinical findings. Treatment of the left shoulder included soft tissue manipulation of the pectoralis major muscle, subscapularis muscle, and infraspinatus muscle and therapeutic exercises of the deep neck flexors, deltoid muscle, and short rotators of the left shoulder. Chiropractic manipulation of the cervical and thoracic spine was also performed, accompanied by interferential current applied to the left shoulder for pain control. Treatment was performed 1 to 2 times per week for 10 weeks.

Pain was reduced to 1 of 10 on the verbal pain scale by the third week of treatment accompanied by improvement in the patient's range of motion of the left shoulder. Pain was completely absent by the fifth week of treatment. Follow-up plain film radiographs of the left shoulder were performed 9 weeks following the initial presentation to assess for possible progression or resolution of the osseous abnormality. There was no interval change radiographically, which in conjunction with an improvement in clinical findings supports the initial diagnosis of acromial apophysitis. Written consent from the patient's guardian was obtained allowing us to publish his personal health information without divulging personal identifiers.

Discussion

Traction apophyses are areas of growth cartilage that unite tendon with bone. Typically large muscle groups attach to these apophyses, such as the deltoid muscle and trapezius muscle to the acromion.^{4,6} At birth, the acromion process is completely cartilaginous. Ossification of the proximal aspect of the acromion begins at

the age of 14 years, but it is not completely ossified until the age of 20 to 22 years.^{7,8} There are 2 to 5 separate growth centers of the acromion that typically ossify in a proximal to distal fashion.⁷ In a skeletally immature child, the apophyseal growth cartilage is the weakest site in the muscle-tendon unit and is therefore more susceptible to very small avulsion fractures.^{6,9} Traction apophysitis describes the result of repetitive microtrauma following chronic overuse at a tendon insertion site in a skeletally immature patient,^{9,10} typically in an athletically active child between 12 and 17 years old.⁴

The literature has a bountiful amount of information regarding traction apophysitis involving other regions of the body. The 3 most commonly encountered sites of traction apophysitis include Osgood-Schlatter disease of the tibial tuberosity, Sever disease of the posterior calcaneus, and Little League elbow of the medial epicondyle.^{11,12} One particular study that investigated the prevalence of Osgood-Schlatter disease found a 9.8% incidence in 956 adolescents between the ages of 12 and 15 years.¹³ This case study is a valuable addition to the literature, as there is a true paucity of information regarding traction apophysitis of the acromion.

Although athletic overuse is the most common cause of traction apophysitis, Moyes et al³ describe an interesting case of acromial apophysitis associated with the contraction of the deltoid muscle while carrying a heavy school bag. Doral et al⁴ suggest that repetitive microtrauma to the apophysis will stimulate an inflammatory response that may include the stimulation of inflammatory cells and vasoactive substances resulting in the release of enzymes that will incite tissue damage. This tissue damage will result in the typical conventional radiographic appearance of a sclerotic and fragmented apophysis.

Symptoms consistent with traction apophysitis include gradual onset of pain and swelling with no known inciting event.⁴ A history of overuse of the shoulder and the aforementioned symptoms localized to the anterior shoulder would be expected in acromial apophysitis. Characteristic radiographic findings of apophysitis include fragmentation, sclerosis, and irregularity of the apophysis.^{9,14} Conventional radiographs are usually sufficient for diagnosis, but magnetic resonance imaging (MRI) and radionuclide bone scan will be definitive if plain films are inconclusive or unavailable. T1- and T2-weighted MR sequences will demonstrate multiple foci of hypointensity and a change in the bony contour of the acromial apophysis when compared with the contralateral normal apophysis.^{6,10} This decrease in signal intensity visualized on

both T1- and T2-weighted sequences is attributed to the sclerotic nature of the apophysis. Fluid signal on T2, representing inflammatory changes, will also be visualized adjacent to or within the physis.⁹ Bone scintigraphy will demonstrate increased uptake in the area of the acromial apophysis due to the increased osteoblastic activity resulting from the reparative process of the apophysis.³ Following conventional radiography, MRI should be the imaging procedure of choice when imaging children given that ionizing radiation is not used with MRI.

In addition, diagnostic ultrasonography may be another alternative imaging option that carries no risk of ionizing radiation. There are no studies to date that specifically discuss the use of diagnostic ultrasonography for acromial apophysitis; however, several studies acknowledge the reliable effectiveness of ultrasonography in comparison to conventional radiography in the diagnosis of Osgood-Schlatter disease.^{14,15} Sonographic findings at the tibial tuberosity include irregularity of the apophysis, hypoechoic soft tissue swelling with elevation of the inserting tendon, and multiple fragmentations at the insertion of the tendon on the apophysis.¹⁵ Because both the tibial tuberosity and acromial apophyses are quite superficial, it seems reasonable that diagnostic ultrasonography and the respective findings should be reliable in the diagnosis of acromial apophysitis as well. One study assessed the correlation between ultrasonography and radiography for imaging of the growth plate (including the calcaneal apophysis). This study found high correlation between the 2 modalities, suggesting that diagnostic ultrasonography may replace the existing radiography method to determine growth plate maturity.¹⁶

There are several pathologic entities that present with nonspecific shoulder pain in the adolescent. The most commonly discussed overuse injury to the shoulder has been termed *Little League shoulder*, described as a stress injury to the proximal humeral physis that is mostly commonly seen in baseball pitchers.^{9,17-19} The typical clinical presentation of this entity is tenderness along the lateral aspect of the proximal humerus,¹⁷ differing from the clinical presentation of acromial apophysitis. Osteolysis of the distal clavicle is the second diagnostic consideration when confronted with a case of overuse injury due to repetitive microtrauma. Although this is a relatively common condition in the adult weightlifter, it may occasionally occur in the high-level adolescent athlete that weight trains year-round.¹⁹ Shoulder impingement may also present with shoulder pain and loss of internal rotation,²⁰ similar to acromial apophy-

sis. Differentiating factors include positive impingement test results²⁰ as well as negative results in shoulder radiographs. Other painful shoulder conditions (including humeral dislocation and acromioclavicular separation) are not common in children^{9,19} and are typically of a traumatic etiology, and are therefore not diagnostic considerations in a case with no known precipitating event.

Conservative treatment including rest and restriction of activities is usually sufficient and effective in the patient care of an adolescent with traction apophysitis.^{4,6} All 3 cases discussed by Morisawa et al² demonstrated satisfactory recovery with conservative care. Conservative management should consist of 1 to 6 months of restriction of activities involving the shoulder accompanied by rehabilitation exercises, followed by gradual reintroduction to activity.^{4,6} It is important to note that the child may be pain-free in 1 to 2 weeks following initiation of rest. It is of utmost importance to continue restriction of activities to allow adequate time for healing of the damaged apophysis. There should be no risk for long-term damage if the treatment is active and the restriction of activities is sufficient.¹² Doral et al⁴ suggest that an avulsion fracture at the site of the apophysitis may result without proper rest and restriction of activities.⁴ Improper treatment increases the risk of a serious situation such as an avulsion fracture, thus increasing the need for surgical intervention. With appropriate treatment, the fragmented and sclerotic distal acromion should fully resolve with complete skeletal maturation and ossification.

Limitations

When assessing physeal growth centers in children, it is usually valuable to obtain radiographs of the opposite, asymptomatic side for comparison. Unfortunately, in this case, these images were not obtained; and therefore, a true bilateral comparison cannot be made. The diagnosis was made based upon the clinical findings as well as the strikingly pathologic appearance of the symptomatic side, and the diagnosis of apophysitis was made with confidence.

Secondly, knowledge of the true height and weight of the patient was not included, which may have been helpful in the understanding of the clinical presentation. In addition, the handedness of the patient is unknown. This piece of information would have been beneficial to understanding the daily activities and possible overuse of the dominant arm. Although the aforementioned information is valuable, the radiographic findings are

well defined; and the description of this case remains an important addition to the literature.

Conclusion

Acromial apophysitis should be considered when presented with a physically active skeletally immature patient with anterior shoulder pain. Typical radiographic findings include fragmentation, irregularity, and sclerosis of the acromial apophysis. Restriction of activities accompanied by strengthening and conditioning is imperative to ensure proper healing of the affected acromial apophysis and to prevent an avulsion fracture.

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