CASE REPORT

Case Report

Bilateral Proximal Epiphyseal Clavicular Stress-related Lesions in a Male Gymnast

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Abstract

Background Stress lesions of the upper extremity are relatively uncommon, and physeal stress lesions of the clavicle are rare. We present a case of bilateral physeal stress-related lesions of the proximal clavicular growth plate near the sternoclavicular joint in an adolescent male gymnast.

Case Description A 13-year-old gymnast presented with a 3-week history of insidious onset of pain in the proximal clavicular area of his left shoulder. He had no pain at rest or

at night. He recently had added a new maneuver to his routine. His radiographs were normal, but further study with CT scanning confirmed a stress lesion of his proximal clavicular physis. The lesion healed with time, and he returned to gymnastics with no symptoms. Approximately 5 months after the initial symptoms on the left side, he felt a pop and immediate pain in his right sternoclavicular joint area while doing a routine. Imaging revealed a chronic stress lesion of the proximal physis similar to that of the other side. The patient achieved healing with rest and returned to gymnastics with no limitations.

Literature Review Physeal stress-related lesions of the proximal clavicular physis have not been reported in the literature.

Purpose and Clinical Relevance Medial clavicle pain in adolescent gymnasts may be secondary to stress-related lesions of the proximal clavicular growth plate. Such lesions are rare.

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All ICMJE Conflict of Interest Forms for authors and *Clinical Orthopaedics and Related Research* editors and board members are on file with the publication and can be viewed on request. Each author certifies that his or her institution approved the reporting of this case report, that all investigations were conducted in conformity with ethical principles of research, and that informed consent for participation in the study was obtained.

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Introduction

Traumatic fractures of the upper extremity are relatively common injuries, and those of the clavicle account for approximately 4% of all fractures and 35% of all fractures of the shoulder girdle [13]. However, stress fractures of the upper extremity are relatively uncommon compared with those of the lower extremity, and stress fractures of the clavicle are particularly rare [10, 20]. One 10-year study of sports-related injuries [10] reported no clavicular stress fractures and only one case involving the clavicle in a group of 44 upper extremity stress fractures (2.3%) [20]. The clavicular stress fractures previously reported occurred in the shaft, rather than the physis, of the clavicle [1, 3, 7, 8, 14, 17, 18, 22, 23].

Although some physal stress lesions in the upper extremity, such as those involving the proximal humeral physis “little league shoulder” [2, 5, 6], are well-documented, other physal stress fractures around the shoulder, such as lesser tuberosity fractures associated with throwing a baseball [15, 21], are rare. Using PubMed, EMBASE, and Scopus, we identified no English language reports of proximal clavicle physal stress lesions. We present the case of an adolescent male gymnast with bilateral stress-related lesions of the proximal clavicular growth plate near the sternoclavicular joint.

Case Report

A 13-year-old, high-level male gymnast who practiced 5 days a week presented to his primary care physician with a 3-week history of left sternoclavicular pain and swelling. The pain and swelling had begun insidiously with no acute trauma. The patient stated the onset of swelling was associated with a change in his training routine, to which he directly attributed the beginning of his symptoms. This particular maneuver on the parallel bars required him to catch his full body weight after swinging on the bars with both hands. Because he initially was unable to catch his weight with both hands, he used his right axilla and left arm. He began having pain in his left proximal clavicle shortly after beginning this maneuver; there was no traumatic event associated with the onset of the pain. The patient was otherwise in good health with no joint or bone problems. He had no family or personal history of osteoporosis, acute or chronic steroid use, malabsorption syndromes, vitamin-D deficiency, bone fragility, epiphyseal dysplasia, slipped capitofemoral epiphysis, or connective tissue disorders.

After examining the patient, the primary care physician sent the patient to a musculoskeletal sports medicine specialist 3 weeks after onset. She noted the patient had no pain at rest, night pain, fever, or chills. He had pain only when participating in gymnastics and even then only with certain movements of his arm. He was not involved in weight lifting or any other sports activities. On physical examination, he was in no acute distress and had no atrophy. He had swelling of his left proximal clavicle near the sternoclavicular joint. The swelling was firm, nonfluctuant, and minimally tender to palpation. He had no palpable cervical lymph nodes, and his neck ROM was normal. He had full, pain-free ROM of his shoulder and was neurologically intact in his upper extremity for sensation and motor nerve testing. He had 2 + distal pulses, symmetric capillary refill in his fingertips, and no arm swelling or discoloration. Conventional AP radiographs obtained at that time showed no abnormality of his sternoclavicular

area (Fig. 1). His clavicles were otherwise complete and had no other abnormalities. A subsequent CT scan showed poorly defined cortical destruction and widening of the proximal clavicular physis (Fig. 2). The opposite sternoclavicular joint showed no abnormalities on this CT scan. The community radiologist suggested that the differential diagnosis included an infection or a lytic lesion of the clavicle. The resultant blood studies revealed a normal leukocyte count (4400 cells/mm³), a normal hematocrit (39.5%), and a negative C-reactive protein (0.4 mg/dL).

The patient was allowed to continue gymnastics involving his lower extremity only; weightbearing activities of his upper extremity were restricted for 1 month. Because he continued to have symptoms with physical activity, all gymnastic activity was restricted for an additional 1 month. In the following 2 months, the patient was allowed to resume light activity, ie, only those that would not put too much strain on his upper extremities. Radiographs obtained 4 months after symptom onset showed no discernable change in the physal findings. After 5 months, the patient was able to compete in gymnastics without symptoms.

Fig. 1 A plain AP radiograph of the chest and clavicles shows no abnormality of the bony structures or of the proximal clavicle.

Fig. 2 An axial CT scan of the left proximal clavicular physis shows sclerosis and widening of the physis (closed arrow). The normal right proximal clavicle is shown on the opposite side (open arrow).

Approximately 10 months after the initial onset of symptoms on the left side and 5 months after they had resolved, the patient (then 14 years old) reported to a local emergency department with acute onset of excruciating pain in his right sternoclavicular region. He reported that before this acute onset, he had experienced insidious onset of pain in his right sternoclavicular joint area for 3 weeks when he began a new maneuver in gymnastics. He had no acute injury to this area and he ignored the pain as much as possible until the episode that made him present to the emergency room. In this maneuver, which aggravated his symptoms, he straddled the parallel bars with his arms and swung his legs up so that the momentum helped him extend his arms into a straight position. While performing this maneuver, he felt a pop in his right sternoclavicular region with immediate onset of pain and swelling. He did not apply more stress to that area than was routine for that maneuver, and there was no traumatic event. He went that day to the emergency department, where he was evaluated with a CT scan that was incorrectly interpreted by the radiologist as normal. In the emergency room, he was treated with a sling and was given acetaminophen with codeine and a NSAID for pain.

Three days later, the patient was evaluated by a musculoskeletal specialist who subsequently sent the patient to our orthopaedic clinic for reevaluation because the condition now was believed to be bilateral. The patient now complained of swelling over the proximal clavicle on the left and right sides. The pain in his right sternoclavicular area was resolving, but he was still unable to participate in gymnastics. On examination, he had mild swelling over his right sternoclavicular joint and proximal clavicle (Fig. 3). He was tender in the area of the swelling, but there was no warmth or fluctuance. He was neurologically intact and had painful but full ROM of his shoulder. Conventional radiographs showed some sclerosis at the sternoclavicular joint on the right side. A new CT showed physeal widening and irregular metaphyses with adjacent metadiaphyseal

Fig. 3 The patient presented with swelling of both sternoclavicular joint areas.

bone sclerosis (Fig. 4). To fully delineate the lesion, MRI of the clavicle was obtained (Fig. 5). MRI revealed bone marrow edemalike signal in the medial clavicle extending from the physis into the metadiaphysis, reflecting an osseous stress reaction. These changes are similar to the ricketslike changes described as a “gymnast wrist” [12, 19]. This study was interpreted by our musculoskeletal radiologist as being consistent with a stress lesion of the proximal left and right clavicular physes. The imaging studies subsequently were evaluated by several academic sports-medicine-trained surgeons and several pediatric orthopaedic surgeons at our institution who concurred the lesions most likely represented chronic stress physeal lesions, and not acute fractures at the sternoclavicular physis nor did it represent a form of epiphyseal dysplasia.

Fig. 4 A CT scan was obtained after the onset of symptoms in the right proximal clavicle area (closed arrow). The healed left side is shown (open arrow).

Fig. 5 An MR image of the right (closed arrow) and left (open arrow) proximal clavicles and sternoclavicular joints shows there is metaphyseal edema bilaterally despite the patient having symptoms only on the right.

The patient refrained from gymnastics for 4 weeks, performing only upper extremity ROM and strengthening exercises. The pain in his right shoulder resolved gradually, and he returned to gymnastics after 2 months without pain or limitations.

The patient was reevaluated 24 months after his second shoulder symptoms began. He was completely asymptomatic and competing at level-10 gymnastics with no limitations. On examination, he still had prominence of both proximal clavicles, but there was no tenderness to palpation. He had a normal neurovascular examination and full ROM and strength in both shoulders. The patient and his family refused additional radiographs or CT imaging. The patient continued to perform at a high level of gymnastics for 36 months after his initial onset. He subsequently was lost to followup.

Discussion

The proximal physis of the clavicle is one of the last growth plates in the body to fuse, typically between 22 and 25 years [16], and traumatic injuries to this area in adolescents typically represent acute fractures and not sternoclavicular dislocations. Clavicular stress fractures have been reported in the distal portion [18], the midportion [22], and the medial third [1, 8, 17, 23] of the clavicle, and all but one case occurred in the adult population. We found no report of a stress fracture or any stress-related lesions in the proximal clavicular physis in the English literature.

Other differential diagnoses for these lesions in our patient included traumatic fracture, tumor, systemic arthritis affecting both sternoclavicular joints, epiphyseal dysplasia, cleidocranial dysostosis, and a congenital abnormality of both sternoclavicular joints. The patient had no precipitating event or injury to suggest that these lesions represented acute fractures. Similarly, the patient had normal clavicles and shoulders, which would rule out epiphyseal dysplasia or cleidocranial dysostosis.

Evaluating injuries to the sternoclavicular joint and the proximal clavicle can be challenging. In adolescents, acute, traumatic injuries to this area typically occur in the proximal clavicular physis and can result in displacement of the proximal clavicle in relationship to the epiphysis. If there is posterior displacement of the proximal clavicle, it can present similar to a posterior sternoclavicular dislocation seen in adults. In rare instances, the posteriorly displaced end of the proximal clavicle can compress or erode into the great vessels, the esophagus, and the trachea, but this type of displacement occurs in association with trauma [4]. As a result, patients with acute proximal clavicular injuries should be examined carefully for dyspnea, difficulty in

swallowing, vascular congestion of the arm, and neurovascular compromise.

The proximal sternoclavicular physis is also difficult to evaluate radiographically because standard AP radiographic views often do not show enough detail of the physeal region because of overlapping of ribs and vertebrae. A “serendipity view” [11] is recommended as a good radiographic alternative; the view involves a 40° cephalic-tilt radiograph showing both medial clavicles [9]. CT scans provide detail of the proximal clavicle and sternoclavicular joint and also allow comparison to the opposite side. Because CT imaging is cross-sectional, it removes the overlap from other structures, which is what makes radiographic evaluation of the sternoclavicular joints challenging. In this patient, the changes seen at the physis on the CT scan were consistent with a chronic process because there were no sharp edges or displacement of the clavicle, as are typically seen in acute injuries to the sternoclavicular physis. MRI with and without contrast is indicated if there is concern for a tumor or infectious process; in our patient, MRI without contrast was performed to confirm the diagnosis of a stress lesion. Blood tests also could be used to detect infections, and bone scans simply would indicate a healing process, but not the cause of the lesion.

The treatment of physeal stress lesions is typically rest until symptoms resolve [2, 5, 6]. Patients usually can exercise unaffected extremities or find ways to maintain aerobic fitness without additional injury to the affected extremity. To return to full activity, our patient needed 5 months after presenting for evaluation of the first side and 2 months after presenting with symptoms on the other side. It is not clear why recovery from the first lesion took longer, but he eventually was able to return to athletic activity with no restrictions.

This is the first reported case of a proximal physeal stress lesion of the proximal clavicular physis in an athlete. This diagnosis is based on the insidious onset of the patient’s pain without trauma, his physical examination findings (which revealed only tenderness and swelling of his proximal clavicular physeal area), the characteristic radiographic findings (which are typical of physeal stress lesions), and his recovery (which was consistent with this type of physeal stress lesion). Biopsy of these lesions was not medically indicated, and the athlete refused additional evaluation with CT scanning at longer followup. Other possible diagnoses, such as epiphyseal dysplasia, cleidocranial dysostosis, chronic infection (SAPHO syndrome), or other lesions were ruled out by history, hematologic evaluation, examination, and CT. The athlete was capable of returning to sports activities without limitations, as would be expected after a healed physeal stress lesion in other locations in the body. This case report may heighten

clinicians' awareness of and appreciation for proximal clavicular stress lesions.

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