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Chondromalacia of trochlear notch after healing of olecranon stress fracture: a case report

Received: 12 October 2004 / Published online: 20 October 2005
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Abstract *Introduction:* Chondromalacia of the trochlear notch and stress fracture of olecranon are uncommon injuries in the throwing athletes. *Materials and methods:* We report an 18-year-old high school pitcher who had persistent postero-lateral elbow pain after a healed olecranon stress fracture of the right elbow. Diagnostic arthroscopy revealed chondromalacia of the trochlear notch. *Results:* After treatment with arthroscopic drilling and abrasion chondroplasty, he returned to competitive pitching 1 year later postsurgery. This rare association between chondromalacia and stress fracture of the olecranon has not been reported previously in the literatures. *Conclusion:* Chondromalacia of the trochlear notch should be included as a differential diagnosis in evaluating athletes with persistent elbow pain after healed olecranon stress fractures.

Keywords Elbow · Olecranon stress fracture · Chondromalacia · Abrasion chondroplasty

Introduction

The valgus extension overload is a common pathway for the elbow injury in throwing athletes. The repetitive and intense stress on the olecranon may lead to physiological and pathological changes in the bone and surrounding tissue. The olecranon stress fracture is an uncommon source of the elbow pain in throwing athletes. Reviewing the literatures, a total of 19 cases in 10 articles [2, 3, 6–10, 12–14] had been reported since first described by Waris in 1946 [15]. Nonetheless, the association between

chondromalacia and stress fracture of the olecranon has not been reported in the literatures. In this article, we report a high school baseball pitcher with chondromalacia of the trochlear notch after the proper healing of an olecranon stress fracture.

Case report

An 18-year-old, right-hand dominant, Taiwanese high school pitcher experienced sharp pain over the postero-lateral aspect of the right elbow during a throwing session. He had no previous history of trauma prior to this incidence. The symptoms were most intense during the deceleration and follow-through phase of throwing. He continued to pitch occasionally for another 6 weeks before seeking medical help.

At our clinic, physical examination revealed tenderness over the soft spot between the olecranon tip, radial head, and lateral humeral epicondyle. There was a 10° loss of extension compared to the unaffected side. The range of motion in flexion, supination, and pronation were free without any noted instability of the elbow. The plain radiography revealed a transverse, irregular radiolucency running across the olecranon (Fig. 1 a).

Under the diagnosis of nondisplaced olecranon stress fracture, he was instructed to rest the elbow and cease all throwing activities. During the follow-up period, he ignored our advice and continued to pitch inconsistently. He was constantly bothered with repetitive elbow pain related to the throwing activity. Six months after the initial visit, the X-ray revealed poor callus formation with irregular radiolucency and sclerotic borders around the fracture site (Fig. 1b). The MR arthrography performed at the time demonstrated no other lesion than the olecranon stress fracture (Fig. 2). Fortunately, a complete fracture union was confirmed with serial radiographs one year after the injury (Fig. 1 c). The patient gained full range of motion of the elbow and he returned to previous pitching activities.

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Fig. 1 **a** The plain radiography revealed a transverse, irregular radiolucency fracture line running across the olecranon (*Arrow head*). **b** Six months after the initial visit, the X-ray revealed poor callus formation with irregular radiolucency and sclerotic borders around the fracture site. **c** One year after the injury, complete fracture union was achieved

Six months later, the patient visited our clinic again due to exacerbated posterior elbow pain while pitching. Physical examination of the right elbow did not show

any instability or range of motion deficit. Right elbow arthroscopy revealed proper fracture healing compatible with the radiographic findings. A transparent line, resembling fibro-cartilage tissue was noted over the fracture site (Fig. 3a). However, a chondromalacia lesion, about $0.5 \times 1.0 \text{ cm}^2$ with irregular chondral margin, was found on the articular surface of trochlear notch (Fig. 3b). There was no evidence of osteophyte formation or impingement of the olecranon fossa. The chondromalacia lesion was treated with abrasion chondroplasty and multiple subchondral bone drilling. The pain improved gradually and he returned to progressive pitching program 3 months after the arthroscopic procedure. After 1 year of follow-up, his elbow regained painless range of motion; and he was pitching competitively at the collegiate level. Currently, he is a pitcher in the Taiwanese professional baseball league.

Discussion

In the throwing athletes, valgus extension overload, which include medial tension overload, lateral compression overload and posteromedial shear stress, is the most common mechanism for elbow injuries [11]. In these throwing sports, the olecranon is repeatedly and forcefully driven into the olecranon fossa, and the olecranon tip impinges against the medial wall of the fossa by posteromedial shear stress. In 1995, Andrews [1] reported that the osteophyte formation at the tip of the olecranon was the most common finding (65%) in professional baseball players. Stress fractures are partial or complete disruptions of the bone, secondary to an inability to withstand repetitive loads. Stress fracture of the olecranon was first described by Waris [15] in 1946. Reviewing the literatures, the olecranon stress fractures, an uncommon source of elbow pain in athletes, occurred mostly among the throwing athletes including baseball players, gymnasts, javelin players, wrestlers, and lifters [2, 3, 6–10, 12–14].

The stress fractures and tip fractures of the olecranon are not the same entity although they are both seen in throwing athletes. The tip fractures are more likely to be seen in throwers after a particularly strong throw. Patients with stress fractures are more likely to sustain a chronic pain that occurred when they resume throwing [5]. The location of the stress fracture of the olecranon is more typically in the mid-articular portion with a non-displaced injury [4, 5]. The possible cause of olecranon stress fracture may be the result of intrinsic forces from the explosive muscle force contraction during the terminal phase of throwing and impingement of the olecranon against the medial wall of the olecranon [9]. Maffulli also stated that the more mature but delayed, not fused epiphysis may have contributed to the stress fracture of elbow [7].

The treatment of olecranon stress fracture is still controversial between conservative treatment [6, 7] and early surgical intervention with internal fixation. The

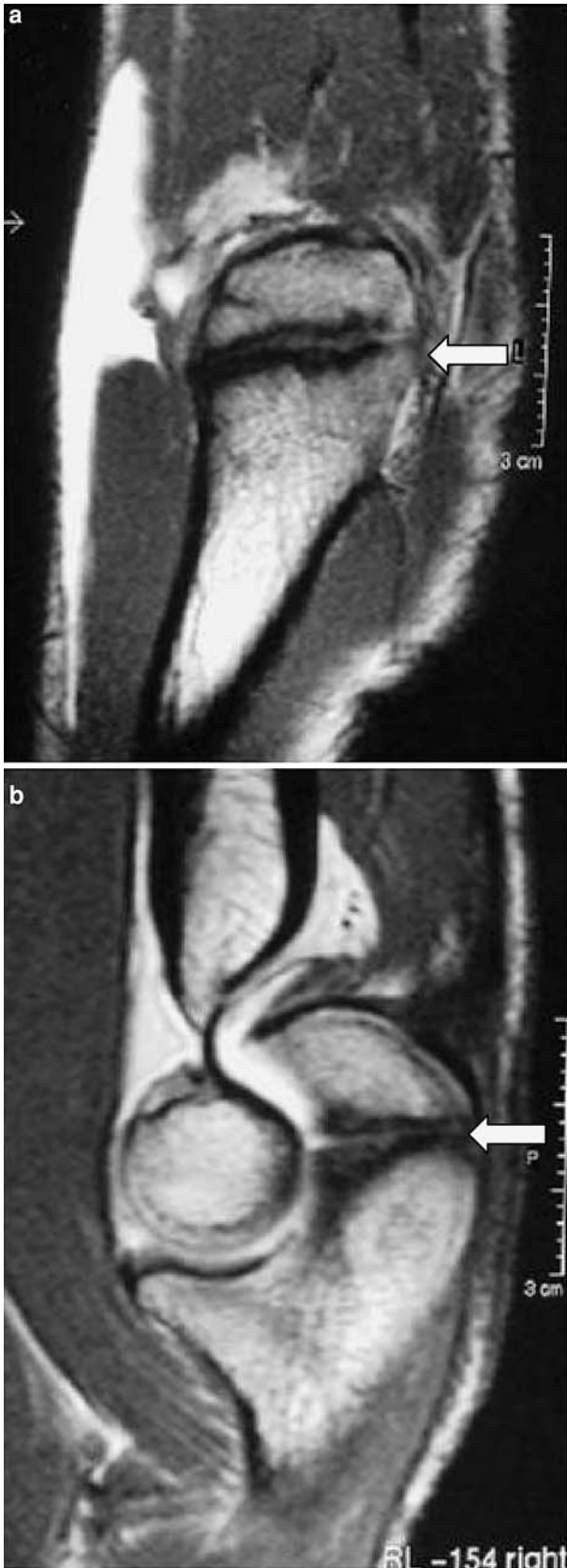


Fig. 2 a, b The MR arthrography demonstrated the olecranon stress fracture. (*White arrow*)

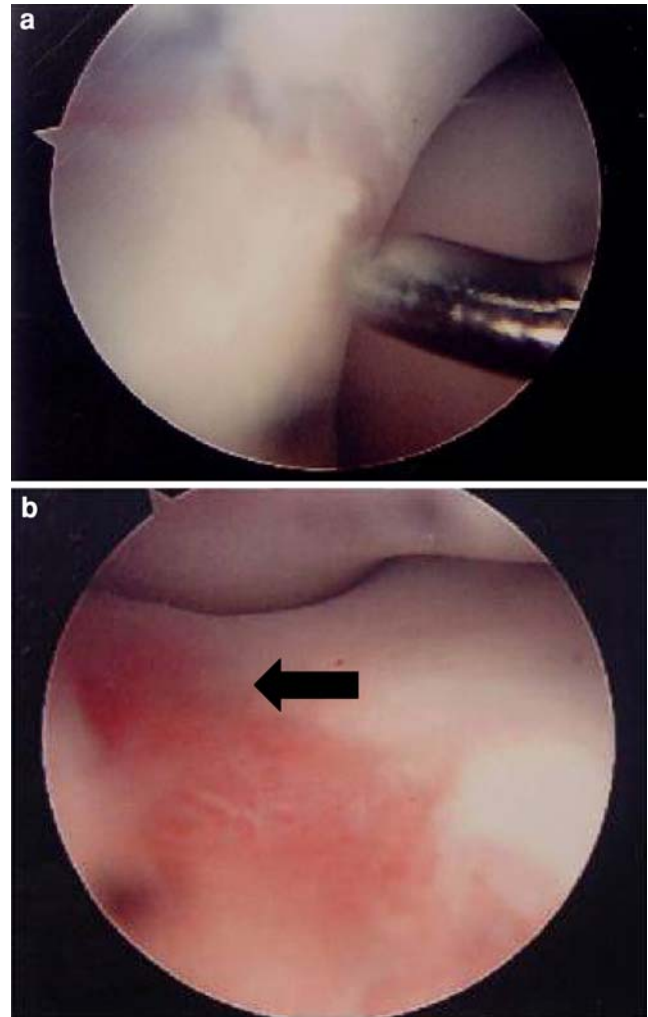


Fig. 3 a Right elbow arthroscopy revealed proper fracture healing compatible with the radiographic findings. A *transparent line*, resembling fibro-cartilage tissue was noted over the olecranon stress fracture site. **b** A chondromalacia lesion, about $0.5 \times 1.0 \text{ cm}^2$ with irregular chondral margin, was found on the articular surface of trochlear notch. (*Black arrow*)

process of healing of the middle third olecranon stress fracture is slow with potential for displacement [5, 9]. The incidence of nonunion and delayed union is higher after conservative treatment and requires secondary intervention [2, 10, 14]. It is not our intention to suggest strict immobilization or surgical interventions for all olecranon stress fractures. In our opinion, minimally or nondisplaced transverse fractures respond successfully to conservative measures, including activity restriction or immobilization with splint/cast. For those with displacement greater than 2 mm, we believe that surgical treatment yields more promising results and lower nonunion rates. We also agree with Suzuki's [10] statement suggesting an early surgical approach for oblique olecranon stress fractures. Symptomatic tip fragments should be excised [6, 8].

In our reported case, the healing time took as long as 12 months under conservative treatment. The delayed union may be due to the natural history of olecranon stress fracture or patient's poor compliance to activity restriction. Several factors were possible for the persistent elbow pain. Nonunion and fibrous union were excluded as the possible causes inducing the chronic elbow pain after carefully examining the elbow with X-ray, MRI, and physical examinations, and the above examination did not reveal any concomitant musculo-tendinous injuries either. Under arthroscopy, chondromalacia over the trochlear notch was diagnosed; and the lesion was treated with abrasion chondroplasty and multiple subchondral bone drilling. Finally, the improvement observed after the arthroscopic abrasion chondroplasty further indicated trochlear chondromalacia as the source of pain.

Most emphasis on chondromalacia in the past has been on the patella-femoral joint; however, similar lesions on the elbow may be underrated. It might be possible that the olecranon stress fracture induced mal-tracking of the olecranon-trochlea joint. Furthermore, the repetitive shearing stresses on the trochlear surface caused fatigue failure and injured the articular cartilage. A high index of suspicion and awareness of this entity is necessary when throwers present with persistent elbow pain, especially in cases with an unstable joint.

Conclusion

Early recognition and treatment of the stress fracture of olecranon is important in preventing the nonunion of the stress fracture and the associated lesion of the elbow. In this article, we point out that trochlear notch chondromalacia as a possible cause for chronic elbow pain after the proper healing of an olecranon stress fracture. Patient with poor compliance or in whom activity restriction is impossible, higher incidence of chondromalacia may be expected. In addition to making the proper diagnosis, arthroscopic abrasion chondroplasty with multiple drilling also provided remarkable result in this 18-year-old pitcher. Benefits from the arthroscopy

outweigh by far its shortcomings taking in account the devastating outcome that may emerge along with the cartilaginous wear.

Acknowledgements The authors gratefully acknowledge the assistance of Miss. Jui-Yu Cheng, Miss. Shu-Hua Ko, and Miss. Shu-Fang Chen in the preparation of this manuscript.

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