Original Article

Stress fracture of the ulna in a softball pitcher

Hiroyuki Fujioka^{a,*}, Tetsuo Nishikawa^b, Satoshi Koyama^b,
Kenjiro Tsunemi^c, Takanori Oi^c, Yohei Takagi^c, Juichi Tanaka^c,
Shinichi Yoshiya^c

^a Department of Physical Therapy, School of Rehabilitation, Hyogo University of Health Sciences, 1-3-6, Minatogima, Chuo-ku, Kobe 650-8530, Japan

^b Nishikawa Orthopaedics and Rehabilitation Clinic, 1-2-1 Mukonosono-honmachi, Amagasaki, 661-0031, Japan

^c Department of Orthopaedic Surgery, Hyogo College of Medicine, 1-1, Mukogawa-cho, Nishinomiya, 663-8501, Japan

ARTICLE INFO

Article history:

Received 28 October 2013

Accepted 6 March 2015

Available online 29 March 2015

Keywords:

Stress fracture

Ulna

Softball

ABSTRACT

Background/aims: We present a rare case of stress fracture of the diaphysis of the ulna in a softball pitcher. **Case:** A thirteen-year-old girl felt pain over the distal third of the right forearm during pitching. Stress fracture was detected as callus formation of the ulna before fracture displacement. When windmill pitching for softball, the pitcher rotates their arm around the shoulder joint and powerfully hits their forearm to their thigh, which is accompanied by simultaneous pronation of the forearm and flexion of the wrist. The ball is then released and this movement is known as “brushing”. **Conclusions:** The typical throwing form in a softball pitcher can play an important role in stress fractures of the ulna.

© 2015 Prof. PK Surendran Memorial Education Foundation. Published by Elsevier, a division of Reed Elsevier India, Pvt. Ltd. All rights reserved.

1. Introduction

Stress fractures, which are partial or complete fractures of a bone resulting from its inability to withstand repetitive mechanical stress, are common injuries of the lower extremities in physically active athletes; however, stress fractures of the upper extremities are not as common.¹ In this report, we present a stress fracture of the ulna in an adolescent softball pitcher who was treated conservatively.

The patient and their family were informed that data from the case would be submitted for publication and gave their consent.

2. A case report

A thirteen-year-old girl, who was a softball pitcher in junior high school, felt pain over the distal third of the right forearm during pitching. The range of motion of the wrist, the forearm, and the elbow was not limited. Although there was neither rest

pain nor sensory disturbance, tenderness was detected at the distal third of the ulna. No abnormal findings of the forearm, including the fracture line, were detected on the radiograph at the first visit (Fig. 1A). We instructed the patient to immobilize the forearm and the wrist with a brace and to reduce sports activities using the right hand for one month.

One month after the first visit, callus formation of the distal third of the ulna was detected on the radiographs (Fig. 1B) and the patient was diagnosed with a stress fracture of the ulna. The patient was allowed to remove the brace for immobilization and was treated with physical therapy, which included muscle exercises for the affected upper extremities.

Two months after the onset of pain, the patient could return to the original level of sports activities. At the latest follow-up two years after the initial onset, the patient was still free from pain at the forearm and could continue sports activities without any symptoms.

* Corresponding author. Tel.: +81 78 304 3000; fax: +81 78 304 2745.
E-mail address: hfujioka@huhs.ac.jp (H. Fujioka).

Fig. 1. Radiographs of the anteroposterior view of the right forearm. At the first visit (A) and one month after the first visit (B).

3. Discussion

Stress fracture of the ulna is a rare disorder and has been reported in manual workers as a “lifting fracture”.² Farm laborer and cook have been known to sustain stress fractures of the diaphysis of the ulna when repetitively lifting heavy sacks of oats or saucepans. Stress fractures of the ulna can be caused by repetitive manual work when the forearm is fully supinated and the elbow is flexed to a right angle. Suzuki et al has reported stress fracture of the diaphysis of the ulna caused by repetitive axial loading to the forearm during excessive training requiring standing on the hands with the ankles held by a partner.³ These stress fractures of the diaphysis of the ulna reported in references 2 and 3 were detected as displaced fractures on the radiographs.

By contrast, stress fractures of the diaphysis of the ulna, reported in softball and volleyball, are detected as callus formation of the ulna before fracture displacement, and the patients were successfully treated through the reduction of sports activities and with rest.^{4,5} Mutoh et al suggested that the mechanism of stress fracture of the ulna in athletes is the same as the “lifting fracture”² because the actions during underhand throwing of softballs and underhand receiving of volleyballs overload the wrists and forearms with full forearm supination and the elbow flexed to a right angle.⁴

It is considered that the typical throwing form of a softball pitcher plays an important role in stress fractures of the ulna.⁵ During windmill pitching, the pitcher rotates and swings their arm around the shoulder joint from the shoulder's maximum elevated position through the posterior to the anterior and powerfully hits their forearm to their thigh (around the greater trochanter). This is

Fig. 2. Illustration of the softball pitch. During windmill pitching, the pitcher rotates and swings their arm around the shoulder joint from the shoulder's maximum elevated position through the posterior to the anterior and powerfully hits their forearm to their thigh (around the greater trochanter). This is accompanied by simultaneous pronation of the forearm from the supinated position and flexion of the wrist from the extended position, which then leads to the release of the ball in order to throw it high. This movement is known as “brushing”.

accompanied by simultaneous pronation of the forearm from the supinated position and flexion of the wrist from the extended position, which then leads to the release of the ball in order to throw it high. This movement is known as “brushing” (Fig. 2). While using this pitching form, although the elbow is extended, the wrist and fingers are flexed by the forearm flexor muscles powerfully and the forearm is stressed by torsion and a direct blow. We think that stress fractures at the diaphysis of the ulna are caused by these characteristics of the softball pitching form.

The physicians and instructors should be aware of stress fractures of the diaphysis of the ulna in softball pitchers, detect fractures before fracture displacement, and treat conservatively by reducing sports activities.

Conflicts of interest

All authors have none to declare.

References

1. Jones GL. Upper extremity stress fractures. *Clin Sports Med.* 2006;25:159–174.
2. Evans DL. Fatigue fractures of the ulna. *J Bone Joint Surg Br.* 1955;37:618–621.
3. Suzuki T, Yagi M, Iwasaki Y, Fujita K, Maruno H, Fujioka H. Stress fracture of the ulnar diaphysis due to excessive training associated with axial loading. *J Orthopaedics.* 2005;2: e4, E-published <http://www.jortho.org/2005/2/1/e4/index.htm>.
4. Mutoh Y, Mori T, Suzuki Y, Sugiura Y. Stress fractures of the ulna in athletes. *Am J Sports Med.* 1982;10:365–367.
5. Tanabe S, Nakahira J, Bando E, Yamaguchi H, Miyamoto H, Yamamoto A. Fatigue fracture of the ulna occurring in pitchers of fast-pitch softball. *Am J Sports Med.* 1991;19:317–321.