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(Citation)
Knee Surgery, Sports Traumatology, Arthroscopy,12(2):162-164

(Issue Date)
2004-03

(Resource Type)
journal article

(Version)
Accepted Manuscript

(URL)
https://hdl.handle.net/20.500.14094/90000293

ULTRASOUND TREATMENT OF NONUNION OF THE HOOK OF THE HAMATE IN SPORTS ACTIVITIES

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ABSTRACT

Two cases of nonunion of the hook of the hamate were treated with low intensity pulsed ultrasound. The patients were baseball players and had been injured as a result of hitting repeatedly. Nonunion was detected on computed tomographic (CT) scans and was exposed to ultrasound for 20 minutes a day for 4 months using a Sonic Accelerated Fracture Healing System [SAFHS](Exogen, Piscataway, NJ, USA). In both cases, pain at the hypothenar eminence disappeared and bone union was confirmed on CT scans at the end of the ultrasound treatment.

Key Words: Baseball, Hook of the Hamate, Fracture, Nonunion, Low-Intensity Pulsed Ultrasound,

INTRODUCTION

Ultrasound can be defined as acoustic radiation at frequencies above the limit of human hearing. It is a form of mechanical energy that can be transmitted into the body and has been applied to the treatment of fractures. In a basic investigation of low-intensity pulsed ultrasound in fracture healing, it has been shown that ultrasound exposure of a rat fracture model increases the strength of the fracture callus and aggrecan gene expression [13, 16]. An increase of the production of prostaglandin E_2 (PGE_2) in osteoblasts with ultrasound exposure has been reported and it has been suggested that ultrasound exposure plays an important role in accelerating fracture repair, because PGE_2 is known to be involved in bone remodeling and to stimulate osteoblast proliferation [4, 6, 10]. Low-intensity pulsed ultrasound has further been shown to initiate and promote bone healing in rat nonunion fracture model [12]. In prospective, randomized, and double-blind clinical studies, low-intensity pulsed ultrasound has been found to accelerate the healing of fractures of the distal radius and the tibia [5,7].

Fractures of the hook of the hamate have been reported in golf, tennis, and baseball players, and as a result of motor vehicle accidents [1, 2, 11]. Acute fracture of the hook of the hamate treated within 7 days of the injury usually responds to 6 weeks of support in a short arm plaster cast or splint [15]. However,

nonunion of the hook of the hamate can caused by the poor blood supply of the hamate and the mechanical forces of the flexor tendons in the carpal tunnel which displace the fracture fragments [8, 14]. In this report, we present the successful treatment of two nonunions of the hook of the hamate in sports activities using low-intensity pulsed ultrasound.

CASE REPORTS

Between 1997 and 2002, two nonunions of the hooks of the hamates were treated by low-intensity pulsed ultrasound at our clinic (Table). The two patients were high school baseball players who were right handed hitters whose left hands had been injured by repeatedly hitting a ball with a bat. The first patient (case 1) had not been treated prior to visiting us and ultrasound treatment was started 5 months after injury. The second patient (case 2) had been treated with a splint for 3.5 months immediate after fracture was detected, however, the fracture had not healed. In both cases, they felt pain at the hypothenar eminence at hitting a ball with a bat, although they were not disturbed routine daily activities. Ununited fractures of the hook of the hamate were confirmed on computed tomographic (CT) scans before the ultrasound treatment. Ultrasound treatment was started 4 months after injury.

Ultrasound exposure at the hook of the hamate in the hypothenar eminence for 20 minutes was carried out daily for 4 months by the patients at home using Sonic Accelerated Fracture Healing System (SAFHS; Exogen, Piscataway, NJ). The activities of the both patients were limited to only routine daily activities, but immobilization with cast or brace was not applied.

At the end of the treatment, in both cases, there was no tenderness over the hook of the hamate on the hypothenar eminence and the grip strength of the affected hand had improved to match that of the unaffected hand. Union at the fracture site was confirmed on all slices of CT scan in all cases after treatment. As a representative case of nonunion of the hook of the hamate treated by ultrasound, CT scans of Case 2 before and after treatment are presented in Figure 1. Both patients returned to competitive activities two months after the end of ultrasound treatment without pain on the hypothenar eminence at hitting a ball with a bat. At the one year follow-ups, neither patient reported any complications such as pain at the hypothenar eminence and limitation of range of motion of the wrist.

DISCUSSION

Fracture of the hook of the hamate is caused in relation to sports equipment such as baseball bats, rackets, and golf clubs. It is difficult to know whether the

fracture has been caused by a single hit or by a stress mechanism of repeated micro-trauma. In nonunion of the hook of the hamate suspected to be a result of stress-injury by sports, fragment excision has often been recommended as the preferred treatment option [1, 6, 9]. One of its primary benefits is that sports players are usually able to return to sports activities within 3 months of the surgery [2, 9, 11]. However, some patients complain of mild residual symptoms, such as painful or weak grip, altered sensibility, or tenderness of the surgical scar [1].

In a previous report, we demonstrated successful treatment with ultrasound of ununited fracture of the hook of the hamate caused by motorcycle accident of which mechanism was not repeated trauma [3]. In contrast in the present report both patients were injured by hitting repeatedly and the healing mechanism at the fracture site might be disturbed with repeated micro-trauma. The period of treatment with ultrasound was 6 months after starting ultrasound treatment and it was long compared with that of surgery. However, ultrasound treatment might be useful for nonunion caused by a repeated stress and we consider that the ultrasound treatment for nonunion of the hook of the hamate is one option in various treatment methods.

ACKNOWLEDGEMENTS

This paper was read in part at the 10th Congress European Society of Sports Traumatology, Knee Surgery and Arthroscopy, Rome, Italy, April 23rd – 27th, 2002.

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LEGENDS

Figure 1 : CT scan of Case 2 before (A) and after (B) treatment with ultrasound.

An arrow indicates fracture.

TABLE

DATA ON THE PATIENTS

Case	Age(yrs.)	Gender	Involved Hand	Cause of Injury	Previous Treatment	Time from Injury to Treatment	Symptoms before Treatment	Bone Union
1	15	M	Left	Gripping a bat	None	5 months	Pain in hypothenar eminence Weak grip	United
2	16	M	Left	Gripping a bat	Splint	3.5 months (0 months)	Pain in hypothenar eminence Weak grip	United

Figure 1 : Case 1