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Stress Fracture of the Second Metacarpal Bone in a Badminton Player

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We present a rare case of stress fracture of the second metacarpal bone. A 14-year-old girl felt pain on the dorsal aspect of the right wrist without any history of major trauma, when she played a smash during a game of badminton. On the radiographs, periosteal reaction was detected on the ulnar aspect of the base of the second metacarpal bone. She was treated conservatively and she returned to the original activity level.

Stress fractures are partial or complete fractures of a bone resulting from its inability to withstand stress applied during repetitive trauma. Stress fractures of the lower extremity, such as the tibia and the metatarsal bone, are common injuries in physically active athletes; however, stress fractures of the upper extremity are significantly less common^{2,8}. In this report, we present a stress fracture of the second metacarpal bone in a badminton player at junior high school.

CLINICAL CASE

A 14-year-old, right handed, young woman felt pain on the dorsal aspect of the right wrist without any history of major trauma, when she played a smash during a game of badminton at junior high school. She had practiced 3 hours a day on weekdays and 8 hours a day on the weekend for the past 2 years. She swung her racket using a Western grip. She continued practicing for three weeks after she felt the initial right wrist pain.

On physical examination, the patient had tenderness at the base of the second metacarpal bone on the dorsal aspect of the right wrist. Active motion of the wrist and the fingers was not limited; however, pain was induced when she extended the index finger. Radiographs showed no abnormal findings (Figure 1A). We suspected a diagnosis of tendinitis of the extensor tendons or enthesopathy of the extensor carpi radialis and administered conservative therapy with anti-inflammatory drugs without limiting of her sports activity. However, the right wrist pain during badminton did not resolve. Five weeks later, radiographical examination was again performed. Periosteal reaction was detected on the ulnar aspect of the base of the second metacarpal bone (Figure 1B) and we diagnosed her with stress fracture of the second metacarpal bone.

Conservative treatment continued with the further instruction not to engage in any sports activities. Two months after the onset of pain, she was free from symptoms. She started playing badminton 5 weeks after her second visit and was still free from pain at the wrist while playing badminton at her latest follow-up one and a half year after initial onset.

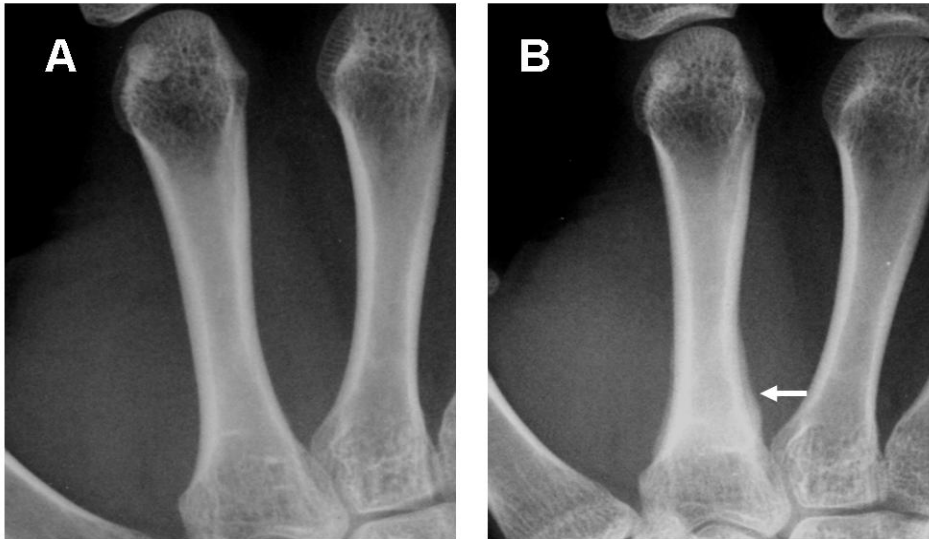


Figure 1. Radiographs of the hand.

There was no abnormal finding at the first visit to the hospital (A). Periosteal reaction (arrow) was detected on the ulnar aspect at the base of the second metacarpal bone 5 weeks after the first visit (B).

DISCUSSION

Stress fracture of the metacarpal bone is a rare disorder previously reported among tennis, softball, and boating athletes^{1,3,6,7,9,10}. In tennis, a stress fracture typically occurs in the second metacarpal bone, leading Muramatsu to speculate the mechanical features of stress fracture in soft tennis players as follows: Because the second metacarpal is the longest bone among the metacarpals and articulates to the carpal bone with the large facet by stable ligaments, the second metacarpal bone bears the mechanical stress at the point when the player hits the ball using a racket⁷. Similarly, Knudson demonstrated that the mechanical force on the base of the index finger increases at the impact of a forehand stroke in tennis⁵.

Moreover, there are two major patterns of tennis grip, Western and Eastern grip (Figure 2) and the choice of grip appears to play a significant role in the onset of stress fracture^{1,7,10}. In the Western grip, the palm is parallel with the surface of the racket, while, in the Eastern grip, the palm is perpendicular to the surface of the racket. The previous report suggests that a combination of the anatomical features of the second metacarpal bone and the mechanical force applied by gripping the racket causes the stress fracture of the second metacarpal bone in tennis players⁷. Waninger *et al.* speculated that Western grip has a stronger influence on this fracture among tennis players and suggest changing to an Eastern grip and using proper equipment as preventative methods in this type of stress fracture¹⁰.

SECOND METACARPAL STRESS FRACTURE IN BADMINTON

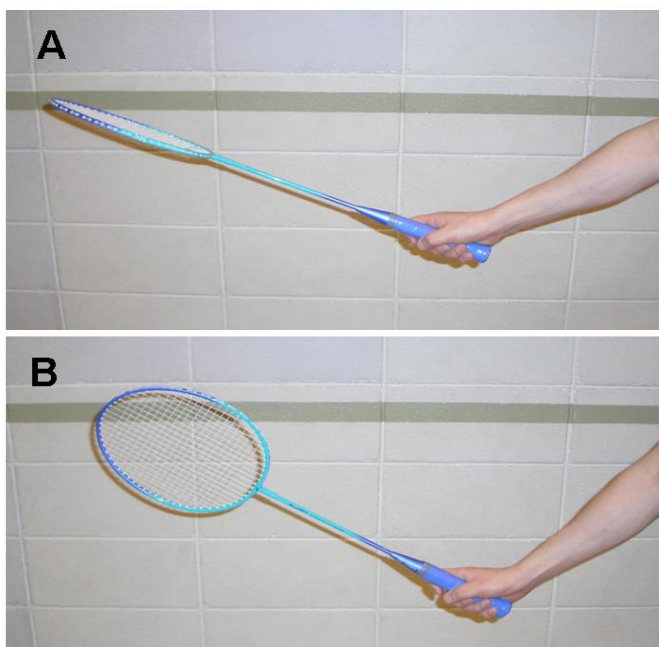


Figure 2. Gripping technique Western (A) and Eastern (B) grip.

In badminton, there are similarly two major gripping techniques, Western and Eastern. However, badminton players frequently change racket grip during play while the grip is fixed during tennis. Therefore, mechanical stress among badminton players may not be as concentrated on the second metacarpal bone as in tennis players. The patient reported in the present paper used Western grip and strongly believed this to be the correct grip and therefore she did not change her grip during play. It is suggested that overuse of this grip type led to continuous stress on the second metacarpal bone causing the stress fracture.

Badminton is one of the most popular sports in the world, which is played from childhood to old age. Although injuries of the Achilles tendon, foot, ankle, elbow, and shoulder can be caused in badminton, risk of injury in badminton is relatively low⁴. This is the first case report of stress fracture of the second metacarpal bone in a badminton player. The racket and the shuttlecock used in badminton are light compared with the racket and the ball used in tennis, however, stress fracture of the second metacarpal bone can occur if the player favors continuous use of a Western grip and practices very frequently. Therefore sports coaches and doctors should be aware of the risk of stress fracture to the second metacarpal bone if players persistently favor a Western grip when playing badminton.

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