

Kienbock's Disease That Manifested in a Badminton Player: Case Report

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Abstract Badminton is considered to be a very safe sport, and is one of the most widely-played sports in the world. The reported frequency of badminton injuries are between one and four percent. The majority of the injuries are due to overuse, primarily in the lower limb. We report on a 23 year old professional badminton player who had painful and limited wrist movements, and was diagnosed with Kienbock's disease (KD). KD is osteonecrosis of the lunate bone. The exact cause of KD is not known, though there are thought to be a number of factors predisposing a person to KD. Sports-related KD has been reported in tennis players, as well as in other sports. It is unusual in badminton players however, which is the basis of this report. The current case demonstrates the importance of raising awareness of these diseases as potential sports-related problems in the badminton players.

Keywords Badminton, Kienbock's Disease, Lunate Bone, Osteonecrosis

1. Introduction

Badminton is a sport that has been around for hundreds of years in different forms. This non-contact sport has been considered to be a very safe sport which is one of the most widely-played sports in the world[1]. Several international competitions are played with all different levels of competition, including the Olympic level. Badminton was added as a Summer Olympics sport in 1992, with the first competitive Olympic matches being held in Barcelona. This helped to bring even more attention and popularity to the sport on every level, from junior to Olympic levels. While badminton is requiring jumps, lunges, quick changes in direction and rapid arm movements from a wide variety of postural positions it is played by people of all ages and at all levels[1]. The reported frequency of badminton injuries were %1-4[1,2]. The majority of the injuries were due to overuse, primarily in the lower limb. Most Badminton injuries occur around the ankle region, with a sprained ankle the most common injury, followed by Achilles tendonitis [1,2]. Because of the involvement of a racquet, upper limb injuries such as tennis elbow and rotator cuff injury are also quite common in Badminton[1,2].

We report a 23 year old professional badminton player

who had painful and limited wrist and diagnosed as Kienbock disease (KD). KD was first determined as an osteomalacia on lunate bone by Robert Kienböck. However, today it can be determined on avascular necrosis and depending on it, it can be said a disease that determine wrist problems[3]. It is often punctuated in curtness of ulna radius as well as vascular and mechanical reasons in etiology. Pain is mostly the first symptom and it starts in the center of wrist. Dorsiflexion of middle finger and the rising of the pain are typical. With the rising of the disease may make progress in the way of leading carpal collapse and advance osteoarthritis [3,4].

Sports-related KD has been reported in tennis players, as well as in other sports. It is unusual in badminton players, however, which is the basis of this report. The current case demonstrates the importance of raising awareness of these diseases as potential sports-related problems in the badminton players.

2. Case

The case is a 23-year-old man, who is a right dominant professional badminton player. His chief complaint was dorsal wrist discomfort, pain and stiffness while training for six months. There was no nocturnal pain and no history of a specific traumatic episode. He was in generally good health and no known risk factors for avascular osteonecrosis like sickle cell disease, Gaucher's disease, coagulation disorders, systemic lupus erythromatosus, high dose corticosteroid

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administration, and alcohol abuse. He had a Visual Analogue Scale (VAS) score of 7 for wrist pain but he was getting relief by regular use of analgesics such as acetaminophen. Examination revealed dorsal swelling and tenderness with restricted active motion: flexion 0-50°; extension 0-35°; compared to the normal wrist where flexion was 0-75° and extension 0-55°. The grip force was reduced (23.5 kg) compared to the left side (33 kg). Watson's scaphoid shift test was positive. Pinch strength was normal. Neurological examination including deep tendon reflexes, sensation, and motor strength of the upper extremities and vascular examinations were reported as unremarkable.

Radiographs showed sclerosis and minimal collapse of lunate bone. A magnetic resonance imaging (MRI) study of the wrist revealed abnormal signal intensity of the entire right lunate which was graded according to Lichtman and colleagues classification as the stage IIIA of KD (Figure 1).

Based on the grade of the disease, the patient was treated surgically and pedicled vascularized bone grafts from the dorsal distal radius based on the fourth and fifth extensor compartment arteries has been applied successfully. For the first three weeks the wrist was splinted at all times, as well as using local anti-inflammatory and ice. The next eight weeks a gradual increase in stretching was involved. Regular massage to the wrist flexor and extensor muscles was also done for decrease tone, which can affect joint function. After the fourth month of the surgery the wrist had painless 0-70° range of flexion and 0-45° range of extension. He started his regular training program with a tape on wrist.



Figure 1. Hypointense fracture line of Lunate bone is seen in T1 weighted magnetic resonance imaging and Lunate bone hyperintensity is seen in fat-suppressed T2-weighted magnetic resonance image

3. Discussion

Injuries during Badminton have been reported to occur at a rate of 2.9 injuries per player per 1000 hours of Badminton playing[1,2]. Badminton requires explosive power for flicks of the wrist, lunges, jumps and rapid changes of direction and these repeated actions can put stress on the tissues and cause injury[1,2]. The published research indicates that men seem

to sustain slightly more badminton injuries than women and that more injuries occur the older the players get[2,5]. Generally, overuse injuries tend to occur as player gets older because the joint and tendon tissue become less able to withstand stress. Also, unlike in younger people, this tissue doesn't heal so well when we get older[2,5]. So training errors are the one of most common cause of overuse injuries such as lateral epicondylitis (Tennis Elbow), medial epicondylitis (Golfer's Elbow), shoulder injuries, patellar tendonitis (Jumper's Knee), Achilles tendinopathy and sacroiliac joint dysfunction in badminton players[1,2,5]. Overuse injuries also happen in player who are returning to a sport or activity after injury and try to make up for lost time. Also common injuries such as ankle sprain, meniscus tear, muscle strain are acute injuries which occur usually accidental in badminton players. Ankle sprain may occur when the athlete steps on his partner's foot and land with a plantar flexed, inverted and supinated foot.

Shariff et al. were investigating the pattern of musculoskeletal injuries sustained by 469 Malaysian badminton players[1]. According to results of their study approximately 60 percent of the injuries occurred in players younger than 20 years of age. The majorities of injuries (91.5 percent) were categorized as mild overuse injury and mostly involved the knee. Of the upper extremity injuries, the shoulder was frequently affected (36.9%), with rotator cuff tendinopathy (48.4%) being the commonest diagnosis made[1]. Elbow injuries were the second most affected area of upper extremity injuries. The commonest elbow injuries diagnosed were golfer's elbow (54.2%) and tennis elbow (12.5%). The commonest injury affecting the wrist was wrist sprain (89.1%)[1]. But there was no osteonecrosis case in the mentioned injuries in this study. Høy et al. was reported percentage of severe injuries is % 27 of the total badminton injuries[5]. This study revealed a high percentage of serious injuries such as Achilles tendon tears, calcaneofibular ligament and anterior talofibular ligament injuries but there was no osteonecrosis case too. We don't observe any case of KD in the badminton players in the reported literature

KD is a condition where the blood supply to one of the small bones in the wrist, the lunate, is interrupted[3,4]. The etiology of KD remains controversial. Various biomechanical and anatomic changes can cause repetitive compression loading and microfractures of the lunate bone that result in vascular compromise. Even though trauma may precipitate the disease, the most consistent mechanical risk factor is negative ulnar variance at the wrist. An increase in negative ulnar variance or shortening of the ulna increases the load borne by the ulnocarpal joint. There is probably no single cause for loss of blood supply and it seems to involve multiple factors such as loss of the blood supply through to the arteries or degradation of the blood drainage (veins), skeletal variations and overuse injuries[3,4]. Trauma, either a single event or repeated significant trauma, may affect the blood supply to the lunate bone[3,4].

Repetitive trauma was first suggested in 1920 by Walter Muller, who coined the term "occupational lunatomalacia."

Since a long time, this has been supported by studies that reported a high percentage of manual workers suffering from KD[6]. This bias was avoided when data collected from general public hospitals were available. The fact is that the prevalence of the disease among workers using vibratory tools is not higher than among workers with sedentary jobs[6].

In a retrospective cohort study in tennis players, Maquirriain has reported an elevated absolute risk for stress fractures (12.9%) in elite tennis players over a 2-year study period[7]. Upper limb injuries accounted for 22% of all injuries including two KD[7]. Nakamura *et al.* presented ten patients with KD who were actively engaged in sports activities involving repeated minimal trauma to the wrist[8]. In this comparative study between the 10 patients with sports-related KD and 82 manual laborers with KD, they showed no difference in clinical presentation or radiographic findings between these two groups[8].

KD is an uncommon presentation for badminton injuries. We wanted in this case report to emphasize how severe injuries such as osteonecrosis may occur, even in a safe game such as badminton.

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The authors declare that they have no conflict of interest.

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