

De Quervain Disease in Volleyball Players

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Background: Chronic inflammatory tendon diseases in athletes are frequent, and they often result from modifications in normal kinematics of a tendon associated with a patient's anatomical determinants. De Quervain stenosing tenosynovitis is an inflammatory disease of tendons of the first dorsal compartment of the wrist. There is no literature about this disease concerning professional volleyball players.

Hypothesis: Limited, multiple trauma on the dorsal radial portion of the wrist, associated with long training times, can be involved in the pathogenetic process of de Quervain disease in professional volleyball players.

Study Design: Case series; Level of evidence, 4.

Materials and Methods: The authors studied 45 consecutively enrolled volleyball players (27 professional, 18 nonprofessional) satisfying clinical criteria for the diagnosis of de Quervain stenosing tenosynovitis. All patients were evaluated by questionnaire and physical examination. They were divided into group A (mild) and group B (severe) based on the severity of the symptoms and physical findings; they were followed for a mean of 37 months.

Results: Total training quantity (mean weekly training time multiplied by mean sports activity duration) in group A was 74, whereas it was 155 in group B ($P < .01$). No neuropathies were found in group A, whereas they were found in 3 patients in group B. Fifty percent of surgical patients had a longitudinal fibrous septum, whereas 54% showed multiple tendon sheaths making up the abductor pollicis longus tendon.

Conclusions: This study shows that increased training time and consequent microtrauma associated with professional volleyball activity can increase the likelihood of de Quervain disease.

Keywords: de Quervain; tenosynovitis; volleyball; wrist

De Quervain disease⁵ is an inflammatory response of tendon synovia of the extensor pollicis brevis (EPB) and abductor pollicis longus (APL) muscles within the first dorsal compartment.⁸ Women between 20 and 40 years of age are most often affected. However, in some conditions, the age of onset can be even younger. Because of pain and functional limitation of the first ray of the affected hand, some patients experience occupational and recreational discomfort if the disease is not early diagnosed and treated. International literature lacks data about de Quervain disease in volleyball players. Our study considered 45 volleyball players, of which 27 were professionals and 18 were

not. The aim was to investigate some factors that may contribute to de Quervain disease development in volleyball players.

The most radial dorsal compartment is the first of 6. This fibrous and bony tunnel is 15 mm in length and is lined by synovia, which spreads proximally to the muscle-tendon junction and distally to the tendon insertion on the first metacarpal bone. The APL and EPB muscles often lie together, but various anatomical and surgical studies described several variants; the APL can show some fibrous bridges that insert either on the proximal epiphysis of the first metacarpal or on the trapezius, the carpal volar ligament, the opponens pollicis, or the abductor pollicis brevis muscles.^{2,16} The EPB is a phylogenetically young muscle and can be absent in up to 5% of patients. There can be 1 or 2 fibrous septa, which should be individuated to correctly perform tenolysis.^{12,15} The 2 branches of the radial nerve lie in the superficial subcutaneous tissue and can be injured either by direct trauma on the styloid or by inaccurate surgical approaches.

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No potential conflict of interest declared.

MATERIALS AND METHODS

This is a multicenter study that was performed at 3 different institutions from January 2000 to January 2001, with a mean follow-up of 37 months (range, 30-42 months). In the same period, we treated (either nonsurgically or surgically) 496 patients suffering from de Quervain disease not related to volleyball activities. The authors acted as consultants because none of them is a team physician. The diagnosis of de Quervain disease was based on 3 different features: pain over the first extensor compartment, tenderness to palpation over the first extensor compartment, and a positive Finkelstein test.¹⁴ Forty-five consecutive volleyball players diagnosed with de Quervain stenosing tenosynovitis according to these criteria were enrolled, of which 27 were professionals and 18 were not. Thirty-one were women and 14 were men. The mean age was 24 years (SD = 5 years), mean height was 188.6 cm (SD = 10.6 cm), mean weight was 78 kg (SD = 13.3 kg), and mean symptoms duration was 5.1 months (range, 1-10 months). The most affected side was the right, with a 3 to 1 ratio. Questionnaires about training time, type, and correlation between trauma and symptoms were administered to all patients. No patients affected by de Quervain disease had previously sustained major trauma of the hand or wrist. All had at least a 4 times a week training program, with a weekly mean training time of 15 hours (range, 12-18 hours), and they all had been playing volleyball for more than 8 years.

Patients were divided into 2 subgroups, A and B, depending on the severity of the symptoms and physical findings, as described later. Group A was made up of 13 patients (4 men, 9 women) with the following features: mild to moderate pain with active and passive flexion-extension of the wrist and abduction of the thumb, mild pain with ulnar flexion of the wrist, a lightly positive Finkelstein test, and mild evoked pain with pressure applied on the radial dorsal portion of the wrist. Patients in this group had a mean symptoms duration of 6.3 months (range, 3-10 months).

Group B was made up of 32 patients (10 men, 22 women) suffering from severe pain with active and passive flexion-extension of the wrist and abduction of the thumb, a positive Finkelstein test, and pain evoked when directly pressing on the radial dorsal portion of the wrist associated with swelling. Three patients in group B (2 men, 1 woman) showed signs of neuropathy (paresthesia and dysesthesia) of the superficial cutaneous branches of the radial nerve. A Tinel test on these branches was positive in these 3 patients. Patients in group B had a mean symptoms duration of 3.9 months (range, 1-6 months).

Patients in group A were nonsurgically treated for a period of 2 weeks with a thermoplastic orthosis on the radial dorsal side of the wrist, which maintained the first finger in a physiologic position, with a flexion of approximately 30°, not including the distal interphalangeal joint. We administered oral medications, such as nonsteroidal anti-inflammatory drugs, for 10 days; then we injected 40 mg methylprednisolone acetate and 1 mL lidocaine 1%

into the first compartment.^{22,24} The group B patients were surgically treated in an outpatient setting with a regional anesthesia performed with carbocaine and using a pneumatic tourniquet. A V-shaped skin incision was performed on the radial styloid process, followed by an accurate dissection of the cutaneous branches of the radial nerve. We then sectioned the first compartment and liberated the APL and EPB tendons. Three patients had an associated neuropathy of the superficial cutaneous branches of the radial nerve, clinically diagnosed as earlier described, which was treated by means of a neurolysis. All patients used a thermoplastic orthosis for 2 weeks after surgery. The sterile dressing was changed on the third postoperative day, and sutures were removed 10 days after surgery. By the second postoperative week, patients entered a progressive physical therapy program based on water exercises and gripping a soft ball. Allowed movements included pronosupination, flexion-extension, and adduction-abduction of the thumb. Patients received physical therapy for a mean of 10 days (range, 8-17 days) and returned to specific training after 25 days from surgery (range, 22-31 days).

Mean weekly training time (in hours per week) and mean sports activity duration (in years) were multiplied to calculate the total training quantity (TTQ). We calculated TTQ in group A (TTQ_A) and in group B (TTQ_B); then we studied patients in the 2 groups, statistically comparing TTQs, rate of associated neuropathies, and recurrence rate using the Student *t* test.

RESULTS

Of 32 patients in group B (severe de Quervain disease), 24 were professionals, whereas only 3 of 13 patients in group A (mild to moderate de Quervain disease) were professionals. Group A mean weekly training time was 10 ± 5 hours, and group B patients had training times of 17 ± 2 hours per week (*P* < .01). Patients in group A had a mean TTQ of 74, whereas mean TTQ in group B was 155 (*P* < .01, 95% confidence interval). No patients in group A showed associated neuropathies, whereas 3 patients in group B showed associated neuropathies (*P* < .01).

During surgery, we found an intense synovitic reaction. The first dorsal compartment was divided by a longitudinal fibrous septum in 50% of cases; the APL tendon was made up of multiple tendon sheaths in 54% of cases. Two patients had an isolated tunnel for the EPB tendon.^{2,12,15,16} All patients, whether nonsurgically or surgically treated, returned to their sports activities in 3 to 4 weeks with generally high satisfaction. No complications, local or general, were observed. After a mean follow-up of more than 3 years, no recurrence has been found in surgically treated patients, whereas 5 patients in group A reported some recurring symptoms. Of these patients, 2 were surgically treated, whereas 3 gave up volleyball because no nonsurgical treatment was effective. In these last 3 patients, symptoms slowly decreased with functional prolonged rest.

DISCUSSION

It is a generally accepted idea that de Quervain tenosynovitis results from anatomical factors associated with some mechanical stressors. Women are more affected than men because of some manual work (ie, housekeeping activities and child rearing) influencing first compartment dynamics. Skoff described women affected by de Quervain disease after delivering their infants because of work involved with caring for the newborn.²¹ Sports medicine has rarely studied this disease. However, tendinopathies have been described in different kinds of sports with overuse abnormalities caused by repeated movements.^{1,11,13} Achilles tendon disease in runners and epicondylitis in tennis players are two of the most extensively studied conditions.^{3,9,10} Patellar tendinopathy of jumpers described in basketball and volleyball players is a result of alterations of the quadriceps femoralis muscle and tendon.^{7,20,23} Du Toit et al indicated the repeated movements of canoe rowers as a determinant of tenosynovitis of wrist extensors.⁶

De Quervain disease has been described in video game players and in tennis players,¹⁷⁻¹⁹ but there is no established correlation with volleyball. We tried in our study to discover some of the factors involved in the pathogenetics of de Quervain tenosynovitis in volleyball players.

Our study did not focus on the general population but only on volleyball players. The TTQ, which takes into account the mean weekly training time and the mean sports activity duration, can be considered a parameter for measuring the training intensity. Our hypothesis was that training intensity is the major factor in determining de Quervain disease in volleyball players. Group A patients had a mean TTQ of 74, whereas group B patients had a mean TTQ of 155. Patients in group B showed the most severe symptoms of our series. Moreover, 24 of the 27 professionals belonged to group B (surgical indication), and only 3 were included in group A.

Professional sports activity implies higher TTQ values, which exposes volleyball players to repeated microtraumas of the radial dorsal region of the wrist. These microtraumas may produce an inflammatory response of tendon synovia. The ball-receiving position affects the radial dorsal portion of the wrist. Repeatedly hitting a ball that can move at speeds of more than 90 km per hour damages the skin, subcutaneous tissue, and tendons in the first dorsal compartment of the wrist. Neuropathy can potentially be produced either by continuous trauma to the superficial cutaneous branches of the radial nerve or by repetitive movements.⁴ Professional athletes are more exposed to this kind of trauma than nonprofessionals because of higher TTQ, so it is our opinion that repeated trauma due to ball impaction on an abducted and flexed thumb, as occurs when the athlete is on the receiving position, can determine the development of de Quervain disease in professional volleyball players. Group A actually represents a confirmation of our hypothesis in that of 13 volleyball players, only 3 are professionals, whereas 10 are not.

Some anatomical variants were found in patients in group B (54% with multiple tendon sheaths forming the

APL tendon, 50% with a longitudinal fibrous septum, 2 patients with an accessory EPB tendon tunnel), and they may represent the anatomical conditions facilitating the development of de Quervain disease. Anatomical variants are well described in the literature; Jackson et al found them in up to 75% of their series,¹² whereas Bahm et al found them in 60% to 76%.² This article does not support the hypothesis of anatomical variants as a primary factor in determining de Quervain tenosynovitis. We rather consider them as preexisting, predisposing cofactors that can potentially become more important with higher TTQs.

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