

## Jumper's Knees Case Report - Neuromuscular Rehabilitation of a Basketball Player with Bilateral Patellar Tendon Ruptures

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### Introduction

A 55 year old competitive basketball player and professional videographer were engaged in a game at a neighborhood community center when he prepared to accelerate upwards to block a ball. Standing right foot planted firmly in front of the left, his left knee flexed as he perched on his left forefoot, he heard sequential pops- first in the left knee, then the right. He collapsed to the floor of the gymnasium, unable to bear weight or extend his legs. He reports, "My knee caps were in my thighs." He experienced no pain until a team mate attempted to stand him up. Incapacitated, he was transported by ambulance to a local emergency room and within hours was in the operating room where he underwent a primary heavy suture repair to reattach the patella tendons at their site of rupture from the osseotendinous junction between the inferior pole of the patella and the tibial tuberosity.

Radiographs obtained during emergency department evaluation are not available. The patient report that his knee caps could be seen subcutaneously in his distal quadriceps is consistent with lateral x-ray views of bilateral patellar tendon rupture case reports describing a high riding patella, with the distance from the lower pole of the patella to the tibial tuberosity greater than the length of the patella.

He was hospitalized for one week and received a week of physical therapy. He was discharged in bilateral dial knee braces locked in extension to allow the operative repair to heal without mechanical stress from lengthening or stretch of the patella tendons. He was issued crutches for weight bearing as tolerated ambulation and thereafter, abandoned. He was medically indigent.

The patient began playing competitive basketball at age 14 on a middle school team and continued through college. He recalls having knee pain at that age and was diagnosed with Osgood Schlatter's and patella tendinitis.

His chronic anterior knee pain was aggravated by the bending, kneeling and loading demands of his vocation. He frequently climbed stairs carrying heavy cameras and equipment. He was a self employed independent contractor unable to afford health insurance.

Six years prior to acute injury, he was evaluated in a regional trauma center emergency room for posterior knee pain and swelling that was localized to the right knee. He was diagnosed as having a Baker's Cyst and told nothing could be done about it.

At the time of injury, he was a physically fit, muscular man with no history of metabolic or inflammatory disease. He denied use of oral steroids and was never offered steroid injections. He did not "believe

in" using prescription drugs for pain, and relied instead on ice and inexpensive mentholated body balms to treat his chronic anterior knee pain.

One month after hospital discharge I evaluated him. He had received no follow-up by the operating orthopedic surgeon, out patient physical therapy or social services support due to a lack of health coverage. According to the patient, he dropped from a pre-injury weight of 190# to 170# due to malnutrition and the inability to cook or care for himself.

He was discharged with an ample supply of two opioid analgesics that caused cognitive impairment, imbalance and heightened fall risk, suppression of appetite and constipation. He continued to wear the bilateral dial knee braces in full extension and used crutches for support. He was single and had no one to assist him with home care, hygiene or meal preparation. He exhibited quadriceps atrophy on initial exam along with signs of a chronic patella tendinopathy and degenerative arthritis of the patella. The operative repair was stable.

My immediate concerns were for his weight loss and functional disability. He was unable to work as a self-employed director/videographer and was functionally incapacitated by the adverse effects of the opiate analgesics prescribed. He fell during efforts to board and disembark from public transit on a trip to my office. My initial actions were social service interventions designed to grant him temporary disability, optimize his nutritional support and identify alternative pain management methods including nutrient and calorie dense medical marijuana edibles and topical body balms applied directly to his knees to minimize adverse drug effects and maximize his functional status.

After communicating with both the operating surgeon and experts at the University of California at San Francisco Sports Medicine and Orthopaedic Institute, physical therapy was initiated following conventional guidelines progressing from isometric and passive resistance exercise to active resistance strengthening of quadriceps using closed kinetic chain body weight exercises.

### Discussion

"Patellar and quadriceps tendon ruptures from indirect injury in athletes represent the end stage of jumper's knee and result from repetitive micro trauma" [1].

Acute unilateral tears of the patella tendon are relatively rare injuries seen most often in athletes with pre-existing micro trauma or excessive loading from jumping or repetitive running. Athletes at risk of patellar tendon ruptures exhibit signs and symptoms of chronic anterior knee pain called "Jumpers Knee"-often seen in basketball players. Kelly DW, et al reviewed 13 patients with end stage jumper's knee, 10 with patellar tendon ruptures and 3 with ruptures of the

quadriceps tendon. Basketball was the most common sport involved. The authors found no relationship between ruptures and cortisone injections [1].

The mechanism of acute injury in athletes is sudden eccentric contraction of the quadriceps muscle while the knee is flexed. Kannus found that while complete ruptures of the patellar tendon occur most often in older individuals (mean age 65), in athletes the rupture most frequently occurs in high-power sports events, such as high jump, basketball and weight lifting, at the age of 15-30 years. A chronic patellar apicitis (jumper's knee) may predispose the tendon to rupture [2-4].

Simultaneous bilateral tears of the patella tendons are even more rare. When R J Hannon described a case of bilateral patellar tendon ruptures in a 58 year old man with emphysema whose legs "gave way" as he was walking down a short flight of steps in 1989, there were only ten reports in the literature and nine patients had underlying systemic diseases [2].

Clark et al. describe bilateral patellar tendon ruptures in a fit man with a history of repeated local steroid injections. On biopsy, histological changes implicated repeated steroid injections in causing the rare occurrence [3]. Hannon found well documented spontaneous rupture of tendons in patients with collagen disorders and in patients treated with local steroids. In these cases, tendon rupture occurred due to "stress" micro tears in connective tissue with impaired healing ability indicating degeneration within the body of the tendon itself rather than at the distal insertion [2].

Kannus et al. found histopathological evidence of pre-existing pathological changes in all 891 specimens of tendon ruptures microscopically examined and argues, "The above findings suggest repetitive strain alone is not sufficient to result in tendon rupture in apparently healthy individuals and that there needs to be preceding tendon degeneration [4].

Many experts argue a healthy tendon should not rupture under physiologic loads [4-6]. Indeed, McMaster showed the normal patellar tendon has enormous tensile strength and the forces required for tendon rupture was calculated to be 17.5 times the body weight [6].

The patellar tendon connects the lower pole of the patella to the anterior tibia at the tibial tuberosity. The patellar tendon ruptures at the osseotendinous junction between its origin at the inferior pole of the patella and its insertion at the tibial tuberosity in acute trauma [6]. Thus, it can be classified as an avulsion fracture of the inferior pole of the patella.

A rupture of one or both patella tendons is a devastating injury for a competitive athlete. Without an intact patella tendon it is impossible to bear weight, straighten the leg against gravity or engage in sports. In the case presented, traumatic bilateral patella tendon ruptures and delays in initiation of physical therapy to restore normal range of motion of the extensor mechanism of the knee, led to malnutrition, quadriceps atrophy, functional disability and financial devastation for a man dependent on a vocation requiring full weight bearing status and muscular strength.

Advanced age and the cumulative trauma of jumping and occupational strain clearly predisposed this patient to bilateral tendon ruptures. The patient described himself as a fierce competitor and explosive jumper known for his muscular calves. Explosive jumps causing abrupt eccentric contraction of the lengthened quadriceps

muscle and patellar tendons may have contributed to his acute bilateral simultaneous ruptures [1].

Traumatic rupture of the patellar tendons as the result of severe overloading of the extensor mechanism of the knee has been described in younger, athletic patients, Rose and Frassica describe a variety of systemic diseases associated with an increased tendency to rupture with little or no trauma including connective tissue diseases, diabetes, rheumatoid arthritis, systemic lupus erythematosus, renal failure and hyperparathyroidism [7].

While debate rages over whether the patella tendon is truly a tendon connecting muscle to bone or is, in actuality, a ligament connecting bone to bone, the extensor mechanism of the knee requires that the quadriceps muscle, quadriceps tendon, patella and patella tendon act as a smooth, well-coordinated kinetic chain.

Bilateral patellar tendon ruptures require urgent surgical intervention to prevent quadriceps wasting and to retrieve the dislocated patella and prevent adhesions. Greis et al report good results in patients with patellar tendon ruptures with prompt diagnosis, secure repair and close follow-up [8].

The procedure is performed under general or regional anaesthesia and involves reattaching the torn tendons to the knee cap by passing the tendon through drill holes in the patella for fixation using heavy absorbable non-breakable sutures. Primary repair of the defect may be augmented by a cerclage of wire, suture or screw when the integrity of the tissue is questionable.

The knees are immobilized in hinged braces for 6 to 8 weeks until the integrity of the repair has been confirmed by the operating surgeon. Physical therapy and gradual increases in allowable levels of flexion using the hinged brace begin when the tendon repair is deemed stable. Continuous passive motion generally can be initiated early with a secure repair. Active full extension of the knee may take as long as 6 months [8,9].

The patient presented in this case report advanced from gentle passive resistance and isometric exercises to active resistance strengthening of quadriceps using closed kinetic chain body weight exercises. Select open kinetic chain exercises (where the distal extremity is free) including hamstring curls, leg raises and standing leg curls performed at light to progressively heavier loads began one year post injury.

There is a role for resistance bands and the Pilates reformer in the neuromuscular rehabilitation of bilateral patellar tendon ruptures. Stability balls for wall squats and hamstring curls allow advancement to multijoint kinetic chain high load resistance training using the sled style leg press and Smith machine.

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