Clinical Case Report Competition

West Coast College of Massage Therapy

April 2012

Second Place Winner

Jodi Blasco

The effects of transverse friction massage on chronic patellar tendinopathy

P: 604.873.4467
F: 604.873.6211
research@massagetherapy.bc.ca
massagetherapy.bc.ca

Table of Contents

Abstract

Objective: To evaluate the effectiveness of deep transverse friction massage to the patellar tendon. The pathology affecting this area is patellar tendinopathy, also known as "jumpers' knee." The goals of the patient were to reduce the residual pain experienced after activity, specifically volleyball, reduce pain and discomfort felt during activities of daily living (ADL"S), to increase pain-free range of motion of the knee and to reduce adhesions found in the patellar tendon.

Case Selection: This study was conducted on a 32 year old male with chronic patellar tendinopathy of the left knee. The injury was acquired from years of playing volleyball at a competitive level, consisting of acceleration and deceleration movements primarily jumping and landing. The overuse injury resulted in chronic anterior knee pain and inflammation, pain specifically during and after physical activity, weakness of the left Vastus medialis muscle (VM) and crepitus felt within the knee during range of motion.

Methods: The treatment protocol consisted of five, one hour treatments that took place over the course of three weeks. All five treatments were nearly identical in all aspects and were accompanied by remedial exercise and hydrotherapy. The treatment addressed both the right and left leg. The main treatment modality that was administered was transverse frictions. Accessory modalities such as myofascial release, joint mobilizations and Swedish techniques were also administered.

Results: The patient experienced a decrease in anterior knee pain during and after activity plus a decrease in pain with ADL's. Crepitus was limited to initial extension of the left knee. Active flexion of the right knee was equivalent to the left side and no pain or discomfort was noted in either knee during active, passive or resisted flexion or extension. The palpable adhesions were significantly less noticeable within the patellar tendon.

Conclusion: In regards to the selected patient, deep transverse frictions accompanied with hydrotherapy, remedial exercise and accessory modalities such as Swedish massage were able to alleviate the signs and symptoms of patellar tendinopathy. However, this case study does not represent enough data to support further treatment applications of this nature to the noted pathology. A larger sample population would be required to create a valid baseline of treatment outcomes towards patellar tendinopathy and its clinical presentation.

Keywords: transverse frictions, patella, tendinopathy, rehabilitation, vastus lateralis, vastus medialis, prolotherapy, patellofemoral, massage therapy, tendon

Anatomy and Biomechanics of the Knee

The knee is a commonly injured joint due to the mechanics of the knee, the forces acting upon it, and the knees anatomical position and its relationship with the hip and the ankle. The configuration of the knee involves four bones, the femur, tibia, patella and fibula (Magee, 2008).

The patellofemoral joint, between the patella and femur, is a modified plane joint. The posterior surface of the patella is marked with five facets, superior, medial, lateral inferior and odd. As the tibiofemoral joint moves from flexion to extension, different facets of the patella are in contact with the intercondylar groove of the femur.

The patella is considered a sesamoid bone due to its orientation within the patellar tendon. The patellar tendon is a continuation of the quadriceps complex; Vastus lateralis (VL), VM, Vastus medialis obliquus (VMO), and Rectus femoris (RF). The complex creates numerous lines of action and pull on the patella. Typically, the counteracting forces from medial to lateral are equal which allows optimal movement of the patella during movement of the knee complex (Magee, 2008, p.730).

Tendon Anatomy and Pathophysiology

Three layers of connective tissue surround and strengthen muscle tissue: the epimysium, the most superficial layer, the perimysium which surrounds muscle fibre bundles and the endomysium which surrounds each individual muscle fibre. In the knee,

all three layers are continuous and join to form the patellar tendon. The patellar tendon attaches the four Quadricep muscles to the tibial tuberosity on the anterior proximal tibia (Tortora & Derrickson , 2006).

The patellar tendon fibres hold a wave-like configuration. When stretched less than two percent of their length, the tendon will maintain the wave-like constitution. Micro-tears and fibre trauma can occur if the force stretches the tendon up to four percent of its original length (Tan & Chan, 2008). The stretch force causes the normal parallel collagen bundles to lose their longitudinal alignment and to lose their differentiation. Hyper-cellularity is noted in both fibroblast and endothelial cell proliferation along with neovascularization and an influx of small nerves. These changes represent the bodies attempt at healing (Warden & Brukner, 2003). Apoptosis is characterized as programmed cell death and is found at twice the rate in a tendinopathic tissue compared to that of healthy tissue. The ground substance of the tendon becomes hydrophilic, creating a boggy or soft environment within the tendon. The exact pathogenesis time line is still unknown (Xu &Murrell, 2008).

Etiology

Many factors contribute to the development of patellar tendinopathy. In general, the primary cause is due to extrinsic factors of overuse. Overuse injuries develop from micro-traumas due to excessive mechanical loading of the tendon, which can occur from high intensity, long duration and frequent physical activity in addition to factors such as training on improper surfaces or poor footwear (Rutland, O'Connell, Brismee, Sizer, Apte & O'Connell, 2010). Intrinsic factors, such as posture, proper body alignment,

ankle mechanics and strength imbalances also contribute to the progression of tendinopathies (Rutland et al, 2010).

Volleyball players, along with basketball players, are said to have a possible increased risk to developing patellar tendinopathy due to the extreme forces such as jumping and landing and acceleration and deceleration movements involved with the sport (Rutland et al, 2010).

Common Medical Intervention

Patellar tendinopathy is relatively common, especially in volleyball players, and its management is difficult and an ongoing process. There are thought to be three approaches to managing patellar tendinopathies: physical therapy focused around eccentric training, injection therapy, and lastly, a conservative treatment approach which involves rest, cryotherapy, anti-inflammatory agents, massage and/ or a knee orthosis (Hyman, 2008).

Prolotherapy or Proliferation therapy involves the injection of a solution or irritant into an area where connective tissue is damaged or weakened (Banks, 1991). Prolotherapy is said to initiate the healing cascade by re-injuring the connective tissue and causing the initial inflammatory response. The new collagen is contracted and becomes tighter then the damaged collagen providing strength to the tissue (Banks, 1991).

Functional rehabilitation, the second management approach to treatment focuses around reversing the pathophysiology of the tendinopathy. The general principle of eccentric loading rehabilitation for a tendinopathy is that the load and stretch to the tendon will “damage” the new blood and nerve supply, mentioned above, and will cause

micro trauma to the new disorganized collagen fibres. In turn, the healing process is initiated (Warden & Brukner, 2003).

To target the patellar tendon specifically, unilateral squats on a decline board angled at 25 degrees, compared to a flat squat, have been found to be the most beneficial (Dale & Caswell, 2007, p.8). The frequency and repetition of the exercise varies between studies, however Dale and Caswell (2007, p. 9) suggest a routine that does not produce soreness until the last set of repetitions is best (Dale & Caswell, 2007, p. 9).

The last management approach, massage, more specifically deep transverse friction massage (DTFM), has been studied and utilized by both registered massage therapists and Physiotherapists (PT). In 1975, Dr. James Cyriax popularized the technique in the rehabilitation of tendinopathies (Brosseau, Casimiro, Milne, Welch, Shea, Tugwell & Wells, 2009, p.3). Cyriax's states "DTFM is a technique that attempts to reduce abnormal fibrous adhesions and makes scar tissue more mobile in sub-acute and chronic inflammatory conditions by realigning the normal soft tissue fibres" (Brosseau et al, 2009, p 3). Since the technique became popular numerous studies have been done to test the effectiveness of DTFM. In 2009, The Cochrane Collaboration (Brosseau et al, 2009, p.5), reviewed and collaborated all relevant studies up until the year 2002. The nineteen studies which qualified for further review included interventions such as placebo, no therapy and/ or active treatments. The effectiveness of DTFM was primarily measured by the level of pain relief achieved.

The review concluded that DTFM combined with other physiotherapy modalities did not clinically reduce symptoms of tendinopathies compared to their counter parts stating that "more well designed randomized control trials are needed before including or

excluding this specific type of massage in the treatment of this condition" (Brosseau et al, 2009, p.7).

Case Introduction

The case study patient was a 32 year old male sales representative. He is mesomorph build, standing 6'3'tall and weighting 190 lbs. He leads a very active lifestyle outside of work, which is spent at a desk or in his car. His activities consist of competitive volleyball two to three, two hour sessions a week, as well as physical training which involve both cardio and weight lifting four to five times a week. His lower extremity workouts include jump training, plyometrics and agility training along with a weight lifting routine. The mechanism of injury is not specific to one event, but began giving my patient problems 12 years ago. The patients' primary complaint is his left knee, directly inferior to the patella. During the initial appointment my patient described a "burning pain", which intensified with palpation inferior to the patella. He scored his pain at that time to be a five out of ten, which worsened to a seven or eight post activity. He complained of pain scored at this level to last two to three days after volleyball. He also experiences pain in the right knee, scoring lower on the pain scale than the left. In May of 2010, my patient began Prolotherapy, receiving 12 treatments and sought the expertise of a PT. He found both treatments to be temporary relief. Currently the patient takes Naproxen, a Non-Steriodal anti-inflammatory drug to prevent pain, prior to volleyball and vigorous activity. He has no history of injuries to his lower extremities and expressed no known heredity conditions.

In standing position, lateral shifting of the left patella can be observed. The patient also presents with hyper-extended knees and his right VMO is more developed then the left VMO. With palpation, the patients left Iliotibial Band (ITB) was significantly more hypertoned then the right and the patient complained of tenderness with palpation to the distal third of the ITB. The left patellar tendon was noted to contain palpable granular pieces through out the tendon between the patella and tibial tuberosity. The patient expressed no complaints of neurological symptoms or referred pain. There was no significant limitation to range of motion in either knee however the right knee presented with less active flexion then the left. The right knee presented with crepitus through active flexion and extension, and the patient complained of a stretch sensation with full active flexion. The patient complained of discomfort, with passive over pressure into flexion of the left knee, directly located at the left patellar tendon. Crepitus was noted at the superior patella with active extension of the left knee. Resisted range of motion provoked pain with left knee extension. The patient scored the pain a five out of ten. There was limited lateral joint play to both patellas, more limited in the right then the left. The patient was able to perform a functional squat, however the test initiated a sharp pain located at the tibial tuberosity of both the right and more significantly the left tibia. The patient felt that during the rise phase of the functional squat, the left knee was “catching” at about a quarter of the way to knee extension. During manual muscle testing, weakness was evident in the left VM and the left hamstring group. Special tests indicated the ligamentous structures of the knee were all intact and strong in both knees. The numerous tests to identify ITB pathologies, patellar tracking dysfunctions and meniscus degeneration were also found to have negative results. A positive result was found while

testing for the presence of a plica, the remnants of an embryonic sac (Magee, 2008, p.795), in the left knee.

Treatment Protocol

The treatment protocol consisted of five, one hour treatments that took place over the course of three weeks. All five treatments were nearly identical in all aspects and were accompanied by remedial exercise and hydrotherapy. The treatment addressed both the right and left leg. The main treatment modality that was administered was cross fibre frictions. Accessory modalities such as myofascial release, joint mobilizations and Swedish techniques were also administered. The first modality used was the application of deep moist heat for ten minutes via a hydrocolator to the thigh, shin and knee areas. Deep moist heat was followed by a series of intermuscular techniques used to address all of the muscles which either attach to or cross the knee joint. The specific muscles addressed were the VL, RF, Semitendonousis (ST), Semimembranousis (SM), the quadriceps as a group along with the Gastrconemius and Soleus. Myofascial release techniques were followed by grade two oscillations in the lateral direction to the patella. Next, cross fibre frictions to the patellar tendon were carried out with the hip in slight flexion and the knee in full flexion. Initially the cross fibre frictions were administered for one minute, gradually increasing the time to two minutes by the fifth treatment. A 30 second quadricep stretch was then administered followed by Swedish flushing techniques.

The patient was given ice after each treatment and was educated on the appropriate length of time for the ice. He was informed he would experience a sequence of

sensations: cold, burning, ache and lastly numbness would indicate the time to remove the ice. (Rattray & Ludwig, 2000, p. 71)

Remedial exercise was given in the form of eccentric loading of the patellar tendon. This involved one legged squats onto a stool or chair. This was initially carried out three times per week, six to eight repetitions for two sets. When the patient felt that he was capable, and the soreness from the activity diminished, the exercise was gradually increased leading to 12 reps per set, three times a week.

Results and Analysis

The patient's primary symptom was pain after vigorous activity such as volleyball. The pain was located directly at the patellar tendon, the left more so than the right. The level of pain was established using a scale from one to ten, one being mild discomfort and ten being severe pain. The patient was asked to keep note of the pain experienced during and after volleyball sessions and to note how long the pain lasted for. A pain scale of seven to eight after playing volleyball was established before the first treatment. The patient was sore after the first treatment for a couple of days and indicated that the next time he played volleyball the pain was more intense during the activity, the left knee more so than the right. Following the second treatment, the patient indicated he experienced less post treatment soreness and he did not experience pain during the next session of volleyball. The following two treatments followed similar patterns, post treatment residual pain became less and pain during and after volleyball decreased. Before the last treatment, the patient scored the level of pain at a one out of ten after playing volleyball, the pain never exceeding a four out of ten during the activity.

The primary signs of dysfunction was the discomfort and crepitus noted while assessing active and resisted range of motion. The patient was asked to do active full flexion of each knee, followed by active extension. He was instructed to stop the motion as soon as he experienced pain or dysfunction. Prior to the first treatment, both active flexion and active extension produced a crepitus quality of movement at the proximal patella. The right knee was slightly limited in full flexion compared to the left side and produced a stretching sensation when end range of flexion was passively reached. The patient experienced slight discomfort at the patellar tendon during passive flexion of the left knee. Resisted range of motion was graded using a resisted range of motion scoring scale from zero to five; five being full range of motion with maximum resistance. If pain is produced during this test, the pain is scored on a scale from one to ten, ten being severe pain. The patient scored a five during both flexion and extension resisted range of motion. Resisted extension of the left knee produced pain scoring a five out of ten. Prior to the last treatment, the patient was similarly assessed, noting numerous differences. Active flexion of the right knee was equivalent to the left side and no pain or discomfort was noted in either knee during active, passive or resisted flexion or extension. A single "click" type crepitus was noted during initial extension of the left knee.

Conclusion

The primary outcome of this study was to research the validity of deep transverse frictions in decreasing the signs and symptoms of patellar tendinopathy. In regards to the patients goals of reducing pain during and after volleyball and minimizing pain during ADL's, the goals were accomplished. Along with the patient's goals, granular adhesions

within the tendon were reduced and a better quality of pain free range of motion was obtained. However, this case study does not represent enough data to support further treatment applications of this nature to the noted pathology. A larger sample population would be required to create a valid baseline of treatment outcomes towards patellar tendinopathy and its clinical presentation.

Citations

Banks, A. R. (1991). Rationale for prolotherapy. *Journal of Orthopaedic Medicine. Vol. 13* (3).

Brosseau, L,. Casimiro, L., Milne, S., Welch, V., Shea, B., Tugwell, P., & Wells, G.A. (2009). Deep transverse friction massage for treating tendonitis (review). *The Cochrane Collaboration.* (1) 1-15.

Chan, O., & Tan. S. C. (2008). Achilles and patellar tendinopathy: current understanding of pathophysiology and management. *Disability and Rehabiliation. Vol. 30.* 1608-1614.

Dale, B. R., & Caswell. C. (2007). Functional Rehabilitation for "jumpers knee". *Athletic Therapy Today. Vol. 12 (*5), 7-10.

Hyman, S.G. (2008). Jumpers knee in volleyball athletes: advancements in diagnosis and Treatment. *Current Sports Medicine Reports, Vol. 7* (5), 296-302.

Khan, K. M., Maffulli, N., Coleman, B.D.,Cook, J. L., & Taunton, J. E. (1998). Patellar Tendinopathy; some aspects of basic science and clinical management. *Sports Medicine. Vol. 32.* 346-355.

Magee, D.J. (2008). *Othropedic Physical Assessment, Fifth edition.* Missouri: Sanders Elsevier.

Rattray, F., & Ludwig, L. (2000). *Clinical Massage Therapy: understanding, assessing and treating over 70 conditions.* Ontario: Talus Incorcorporated

Rutland,M., O'Conelle, D., Brismee, J., Sizer, P., Apte, G., & O'Connel, Janelle. (2010). Evidence-supported rehabilitation of patellar tendinopathy. *North American Journal Of Sports Physical Therapy. Vol. 5.* (3), 166-178.

Tortora, G. J., & Derrickson,B. (2006). *Principles of Anatomy and Physiology 11th Edition.* Hoboken, NJ. John Wiley &Sons Inc.

Warden, J. S., & Brukner, P. (2003). Patellar tendinopathy. *Clinics in Sports Medicine. Vol. 22.* 743-759.

Xu, Y., George, A.C., & Murrel, M.D. (2008). The basic science of tendinopathy. *Clinical Orthopaedics and Related Research. Vol. 466* (7). 1528-1538.