TIBIAL TUBERCLE TRANSFER TO CORRECT BILATERAL PATELLAR TENDINOPATHY IN A COLLEGIATE FOOTBALL PLAYER

by

Andrew D. Hamstra, ATC/L

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Andrew D. Hamstra, ATC/L

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John McChesney, Ph.D., LAT	Chair, Supervisory Committee
Kirk Lewis, M.D.	Member, Supervisory Committee
David Hammons, Ed.D., ATC, PES	Member, Supervisory Committee

The final reading approval of the thesis was granted by John McChesney Ph.D., LAT Chair of the Supervisory Committee. The thesis was approved for the Graduate College by John R. Pelton, Ph.D., Dean of the Graduate College.

DEDICATION

This is dedicated to my family. To my wife Danielle who encouraged me not to give up. To my parents Kent and Beth who have always supported me. And to Grandma Joan, this is the product of the fundamental education you blessed me with.

Thank you.

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ABSTRACT

Objective: To present a case of a competitive football player with chronic patellar tendinopathy and the associated bilateral tibial tubercle transfer surgeries performed leading to the reduction of pain and return to participation.

Background: A 19 year-old male football athlete (height= 187.96 cm, mass= 112.037 kg) presented with chronic patellar tendinopathy that began in his high school career and continued to worsen with the increased physical demands associated with participation in collegiate sport.

Differential Diagnosis: Chondromalacia patella and Osgood Schlatters disease.

Treatment: After nonsurgical intervention resulted in no decrease of pain, bilateral tibial tubercle transfer surgery was conducted to correct biomechanical flaws and decrease the amount of strain on patellar tendon.

Uniqueness: Patellar tendinopathy is a common athletic injury that is often resolved with the use of rest, therapeutic modalities, and rehabilitative exercise. This case showed no resolution with traditional treatment methods. Therefore, a more aggressive treatment was performed. Surgical anterior tibial tubercle transfer is most commonly performed to correct chronic patellar subluxation rather than used to treat patellar tendinopathy making this case unique.

Conclusions: It is our assumption that tibial tubercle transfer surgeries corrected causative structural factors within the patient’s knee that resulted in a decrease in pain with exercise. This case argues in favor for more research in the treatment of severe cases of patellar tendinopathy.

Key Words: patellar tendinopathy, tibial tubercle transfer, case report

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CHAPTER ONE: INTRODUCTION

Recently, American football has been under great scrutiny due to the physical nature of the game and the associated risk of injury.[1,2,3,4,5] Though head injuries currently receive the majority of media attention, overuse injuries associated with playing at an elite level are also problematic. Patellar tendinopathy is a common aliment among elite athletes from an array of different sports.[1,2,3,4,5,6] Though not often treated through surgical intervention, tibial tubercle transfer surgery was in this case used to improve biomechanical function and decrease pain of tendinopathy resulting in return to athletic participation at a causative level.

The purpose of this paper is to present a case report of a 19 year-old competitive football athlete who had been unable to participate due to chronic bilateral patellar tendinopathy. When traditional treatment and rehabilitative exercises did not alleviate persistent pain, surgical intervention was performed. Surgery included bilateral tibial tubercle transfers in an attempt to structurally alter the internal structure of the knee and correct the biomechanical flaws leading to the observed pathology. Despite the prevalence of patellar tendinopathy among elite athletes from an array of different sports, surgical intervention is rarely performed.[1,2,3,4,5,6] In this case, tibial tubercle transfer surgery, a procedure usually reserved for chronic patellar subluxation, was used to alter the strain placed on the patient's patellar tendons.

Patellar Tendinopathies

Tendinopathy is a generic term that refers to any pathology involving a tendon. Tendinopathy encompasses specific conditions such as tendinitis, tendinosis, tenosynovitis, and peritendinitis.[4,7,16] Experts in the sports medicine field classify patellar tendinopathies as "chronic" or "overuse" injuries because of the insidious onset with no specific mechanism of injury. Patellar tendinopathy can be frustrating to the athlete because of the ability for the injury to linger throughout an athletic career and in extreme cases may be career ending.

Flawed biomechanics of the knee, whether congenital or acquired, can predispose the athlete to patella-femoral pain.[3,7,8,9,10, 11,12,13,14,15] A common patella-femoral condition among athletes involves pathology to the patellar tendon.[1,3,4,7] The patellar tendon serves as the bridge connecting the quadriceps musculature to the tibial tuberosity allowing movement of the tibiofemoral joint.[16] Tendinopathy is an all-encompassing term to explain multiple pathologies that arise within the tendon. [4,10]

Clinically, athletic injuries can be classified as acute or chronic by the onset of pain. Injuries that have a specific mechanism of injury with a rapid onset are considered acute injuries compared to injuries that have an insidious onset, which are considered chronic.[1,2,4,5,7,16] The onset of patellar tendinopathy is considered a chronic injury. Though tendinopathy is a chronic condition, many athletes recall a period of time in which the frequency, intensity, or the duration of exercise increased leading to the onset of their pathology. Upon clinical evaluation, the most consistent finding in patellar tendinopathy is a focused pain at the inferior pole of the patella that is usually elicited with direct palpation by the clinician.[1,4]

Clinicians often use diagnostic imaging to diagnose tendinopathy. The use of x-rays, ultrasonography, and magnetic resonance imaging (MRI) are all forms of medical imaging used to diagnose patellar tendinopathies. The use of x-ray will not provide a diagnosis of tendinopathy but contributes to differential diagnosis of the condition. X-rays may produce enough information to rule out boney abnormalities within the knee that may produce similar symptoms of tendinopathy.[7,8,17]

Ultrasonography is a form of medical imaging that is useful in the diagnosis of pathologies within the patellar tendon and has proven to be especially useful because the patellar tendon's superficial nature. The use of MRI is also effective in viewing the patellar tendon. The use of both of these diagnostic imaging mediums allows the clinician to observe pathologies within the patellar tendon that may not be discovered during physical evaluation.[4,7,8,17] Because both types of imaging have a relatively similar sensitivity in the ability to diagnose pathologies within the patellar tendon, due to its availability and reduced cost, ultrasound is often preferred.[4]

It has been reported that patellar tendinopathy is a common condition affecting 22% of all athletes.[9,18] Tendinopathy, commonly known as jumper's knee within the athletic population, can be a significantly debilitating injury to athletes at any level in a variety of sports including but not limited to football, tennis, basketball, gymnastics, volleyball, soccer, and jumping events in track and field.[1,4,5,7] These sports require explosive movements and rapid changes of direction, increasing the stress placed on the patellar tendon. Repeated stress on the tendon may result in microtrauma. Athletes often develop patellar tendinopathies because of the continued overload placed on the tendon without adequate time for the tendon to structurally recover [4,19] Tendons have a low metabolic rate, hence a slow healing process, which causes the condition to worsen with repeated activity. Elite athletes are at a greater risk for patellar tendinopathy due to repetitive and intense training of explosive movements, which can lead to an increase in the amount of stress placed on the patellar tendon.

Patellar Tendinopathy, like most athletic injuries, is graded from mild to severe and classified in degree from 1-3 with grade three being the most severe. The severity is based on the symptoms relative to athletic participation.[16] Therefore, a first degree tendinopathy is marked by pain and slight dysfunction during physical activity. Second degree tendinopathy results in decreased function and pain during and after activity. Third degree tendinopathy is characterized by constant pain that prohibits activity. Additionally, sports medicine clinicians may also use diagnostic measures of MRI and diagnostic ultrasonography to determine the extent of the condition. The progression of healing for this injury is usually measured in the reduction of pain the patient reports before activity, during activity, and post activity because this condition is based mostly upon subjective measurements.[1,8,16,21]

Biomechanics

It has been proposed that a significant predisposition to injury lies in the specific biomechanics of the knee. Among the common defects, Q-angle and patellar orientation can play a significant role in the predisposition to conditions including, but not limited to, patella-femoral pain, lateral instability, and patellar tendinopathies.

Q-angle is a measurement used to explain the angle of extensor pull of the patellar tendon as it articulates with the lower leg.[11,12,13,14] Q-angle is formed by a line from the anterior superior iliac spine (ASIS) through the patella then to the tibial tuberosity.

Normal measurements of Q-angle are ≤13° for men and ≤18° for women.[11,14,16] A Q-angle measurement greater than this may cause pain because there is increased pressure on the lateral portion of the patella as it articulates in the trochlea of the femur leading to a degeneration of the patellar cartilage, the patellar tendon, or cause patellar dislocation or subluxation.[9,14]

Q-angle may be a strong predisposing factor in patellar tendinopathies, but the relative vertical location of the patella within the tendon may also predispose injury as well.[10] Patella alta or a high riding patella is a common congenital anomaly in which the patella sits above the tibiofemoral joint line during weight bearing.[16] The consequence of patella alta is that the patellar tendon is longer than in those without high-riding patellae. This causes a biomechanical disadvantage causing additional strain on the patellar tendon while the knee moves through a full range of motion.

Patellar tilt, referring to the rotation of the patella around its midsagittal axis, is also an important factor in the predisposition of injuries.[16] If a patellar tilt is present, it is likely due to tightness in the lateral structures, weakness in the medial structures, or a combination of the two.[10] This tilt of the patella is considered a disruption in the balance of the patella as it articulates within the trochlear groove.

Tibial Tubercle Transfer Surgery

The surgical procedure of tibial tubercle transfer may be considered an aggressive approach to treating patellar maltracking that commonly results in lateral instability of the patella-femoral joint.[12,39,40,41] It involves an ostotomy of the boney prominence of the tibial tubercle, which is then moved and secured via screw between 2-7 mm medially, as dependent on the specific needs of the patient based on patellar orientation and Q-angle.

Though this procedure can be effective, it is often performed after conservative treatment methods are exhausted.

The tibial tubercle transfer technique has been the topic of many studies and has been previously demonstrated to correct lateral instability of the patella-femoral joint.[12,39,40,41] However, there is little research suggesting that the surgical procedure is indicated to treat chronic patellar tendinopathy.

Common Treatments and Approaches

Due to the significant number of athletes that sustain patellar tendinopathy, sports medicine clinicians have developed a variety of different protocols to help aid in the decrease of pain and symptoms reported by the athlete. The protocols include the use an array of different therapeutic modalities including rest, cryotherapy, therapeutic ultrasound, phonophoresis, iontophoresis, and eccentric exercises.[1,4,7,17,20,21,22,23,24,25]

Perhaps the best method to combat patellar tendinopathy in athletes is a period of rest. During this period, athletes are encouraged to limit the volume and intensity of training and perform low impact activities.[1,4,7,26] Though this may in fact be the best course of treatment, high level athletes often do not have the opportunity to rest and remain able to perform at a competitive level. To optimize healing without a significant resting period, other modalities have moved to the forefront as treatment for this condition. Cryotherapy is a popular tool used in basic first aid of acute injuries, but also serves a purpose while treating patellar tendinopathy. Cryotherapy decreases the temperature of the tissue, which minimizes inflammation in the area while also providing an analgesic effect that reduces pain. [26]

Unlike cryotherapy, ultrasound is considered a form of thermotherapy. To maximize the effect of ultrasound, many clinicians include the use of phonophoresis, delivering an anti-inflammatory agent subdermally via ultrasound.[1,7,17, 21,22,26] Iontophoresis is another common treatment choice that also uses pharmaceutical anti-inflammatory agents via transdermal application.[17] Lastly, eccentric exercise has been used to successfully treat patellar tendinopathy.[20,24,26]

Clinically, patellar tendinopathy is treated either using conservative management or through the use of surgical intervention. Conservative intervention encompasses changes in the intrinsic and extrinsic factors and a systematic approach.[1,2,4,18]

Conservative treatment of patellar tendinopathies may include extrinsic factors such as training on a different surfaces allowing for less stress placed on the body. Important intrinsic factors to observe are biomechanical factors like Q-angle, patellar orientation, and anomalies present along the kinetic chain including in the foot and hip. Additionally, flexibility of the quadriceps and hamstring muscles may play a role in decreasing the likelihood of developing patellar tendinopathy.[11,13,15]

Due to the insidious onset of patellar tendinopathy, it is difficult to trace the injury back to one specific movement. Even though it is an insidious onset, athletes can occasionally change exercise type, frequency, or intensity that resulted in the tendinopathy.[1,4,18,26] Therefore, it is important for the athlete to be subjected to a wide variety of different exercises and training programs to reduce the amount of pathology arising from overuse.

As previously stated, tendinopathy likely is related to the mechanical overload of sports activity placed on the athlete. To combat the effects of patellar tendinopathy, a systematic approach is important to address the injury and treat the body holistically. Important pieces to this holistic approach include active recovery, the use of pharmacology, and the use of cryotherapy.[1,7,8]

Active recovery is an important component for the treatment of patellar tendinopathy because it allows for a competitive athlete to keep up the necessary amount of physical fitness without increasing the mechanical overload on the knee.[4,15] Active recovery includes low impact activities such as swimming, stationary bicycle, or an elliptical device. It is hoped that altering the training regimen, both in the intensity and type of exercise, will result in less stress placed on the patellar tendon, allowing healing to take place between bouts of exercise.[15,19,27]

One popular pharmacological aide widely used in the clinical setting to treat patellar tendinopathy are corticosteroids. Corticosteroids can also be injected directly into the tendon, often guided by ultrasonography. Corticosteroid injections are beneficial in the reduction of pain and can provide healing effects in treating the accumulation of adhesions in the patellar tendon due to overuse. Though corticosteroids may be beneficial for short-term healing, excessive use of corticosteroids is linked to long-term degeneration of collagen synthesis and therefore should be wisely administered.[4,23,24] Many practitioners feel corticosteroid injection directly into the patellar tendon is contraindicated due to the increase of rupture.

CHAPTER TWO: CASE REPORT

History and Physical Examination

A 19-year-old male collegiate football player first reported anterior knee pain while participating in football and basketball during high school. Patient attributed the knee soreness to "growing pains" and continued to participate, despite chronic pain. When the patient began his collegiate career, he again experienced chronic pain but was able to continue to participate. Toward the end of his second collegiate season, the patient was often unable to participate due to the severity of pain.

Clinical Evaluation

During high school, the patient visited an orthopedic clinic and was diagnosed with patellar tendinosis and chondromalacia, likely stemming from maltracking secondary to bilateral patellar malalignment. When conventional treatments failed to alleviate the pain, physicians decided to treat this malalignment through a surgical intervention known as a lateral release with debridement of both patellar tendons.

When patellae are observed to be in lateral malalignment, it is typically caused by hypertonicity in the lateral musculoskeletal connective tissues. This surgical intervention provided initial relief for the patient but did not have the lasting effect of a reduction of pain. After continued efforts by the sports medicine staff to treat the patient's condition, it became clear that surgical intervention was necessary. Team physicians ultimately decided to perform bilateral tibial tubercle transfers in order to correct causative biomechanical factors and decrease the strain placed on the patella.

Treatment

While in high school, the patient underwent arthroscopy on each knee separately that included bilateral lateral releases and patellar tendon debridement. Each debridement began with transverse incisions over the distal pole of the patella allowing access to the patellar tendon. Upon observation, it was noted that there was degeneration of both the tendons, indicating early stages of tendinosis. During the procedure, the patellar tendon was split, dissected, and the degenerative tissue was debrided from both the medial and lateral aspects of the incision until healthy looking portions of the tendon were exposed. The goal of these surgeries was to both excise degenerative tissues within the patellar tendons and to facilitate the formation of good scar tissue in the areas of the split tendons.

The patient was able to finish out his high school athletic career with only mild soreness but still presented with both patellae in lateral malalignment even after surgical intervention. The patient began his collegiate football career as a “redshirt”, practicing with the team but not participating in games. It is hoped that athletes that redshirt gain additional time to allow their growing bodies to mature and develop the necessary strength and body composition to reduce the chances of injury and refine the necessary skill sets needed for success in their sport.

Though collegiate football is considered a fall sport, athletes must train year round to be at their physical prime for competition. During the spring of the patient’s redshirt year, the intensity and volume of training began to re-aggravate the patient's knees and pain reappeared in the patellar tendons of both knees.

The patient received treatment and therapy under the supervision of the athletic training staff, utilizing multiple forms of modalities and exercises in order to combat the pain. The types of modalities included various forms of cryotherapy, thermotherapy, and massage therapy techniques.

The sports medicine staff determined that the best course of action was to treat the patient with modalities and specific exercises concurrently. The patient had a daily regimen of exercises designed to strengthen the quadriceps, hip adductors, and abdominals. The patient underwent a daily stretching routine in an attempt to elongate the hip abductors and release tension contributing to the lateral patellar malalignment. By the end of his summer conditioning program, the patient was experiencing pain in both knees.

The sports medicine staff decided to continue the treatment regimen as the season began, with additions of specific types of taping and bracing. The patient received daily McConnell tape applications on both knees. This technique is designed to pull the patella into its correct alignment during activity.[28] Athletic trainers also used a buttress brace commonly used for chronic subluxation of the patella. Applications of both McConnell tape and the use of a buttress brace aggravated the patient's knees rather than providingrelief and were discontinued.

Before the start of the 2011 season, it became clear that interventions of modalities and exercises were not having the desired effect in treating the patient's knees. The patient underwent magnetic resonance imaging (MRI) of the left knee, revealing both lateral maltracking and a lateral tilt of the patella. Additionally, the patellar tendon was positioned on the lateral femoral trochlea. The MRI on the right knee revealed a slight lateral tilt and a nodular pattern of tendinosis. Clinically, both patellae presented patella alta. The diagnosis of both knees was once again described as patellar tendinosis. After exhausting all of the conservative options for pain reduction, aggressive measures were considered necessary.

Due to the lack of success with traditional interventions to alleviate pain in both knees, the patient was given options for further treatment. The first option was to treat patellar tendons with injections of corticosteroids and/or viscosupplementation around the knee joint. A second option was to inject the tendon with plasma rich platelet (PRP), which would infuse the tendon with blood plasma that has been enriched with platelet, stimulating healing.[29,30] A third option was to undergo surgery and perform either another lateral release of the patellar tendon bilaterally with a debridement of the patella, or tibial tubercle transfer of both knees.

The patient participated during the 2011 football season but was limited in the volume of exercises during practice and strength training. Throughout the season, the patient began to experience increased amounts of discomfort, reducing the amount of activity during participation. As the season progressed, it became apparent that another surgical intervention was inevitable.

It was determined that tibial tubercle transfer was to be performed on both knees. This is considered an aggressive approach because the surgery is usually performed on patients with recurrent patellar subluxation rather than chronic anterior knee pain. There is little research showing that this surgery would alleviate the pain associated with patellar tendinopathy.[12,39,40,41] Also, there is little evidence to determine that this surgery has ever been conducted for tendinopathy on an elite football player or an athlete in any high level of sport.[12,39,40,41] Despite the lack of previous case studies, the sports medicine team determined that the best way to treat this patient's condition was to alter the structure of the knee itself since the ability to influence proper biomechanics through exercise had failed.

In January 2012, the patient underwent tibial tubercle transfer on his right knee. The surgery included an arthroscopy, tibial tubercle transfer, open debridement of patellar tendon, and partial lateral meniscectomy. The technique involves removing the anterior tibial tuberosity and relocating it medially, securing it to the bone via a screw. With the surgery on the right knee, the patient received a PRP injection to facilitate healing. Six weeks after surgery on the right knee, surgery was performed on the left knee. This surgery also featured arthroscopy, tibial tubercle transfer, partial lateral meniscectomy, and open debridement of the patellar tendon. Surgery also included a subcutaneous lateral release and a biopsy of the patellar tendon. The biopsy confirmed that the patient was suffering from tendinosis.

The patient recovered from both surgeries with only one major complication. After the initial surgery on the right knee, the patient experienced severe hemarthrosis requiring aspiration. It is hypothesized that the hemarthrosis was due to the PRP injection stimulating an excess of blood flow to the anterior knee. Complications sent the patient back to the hospital and forced physicians to irrigate and evacuate the hematoma to help facilitate the reduction of swelling. Due to the negative result of the PRP injection on the right knee, the patient did not receive a similar post-surgical injection on the left knee.

The patient reported no significant complications with surgical intervention of the left knee.

The patient missed the 2012 season while rehabilitating both knees. Over a year after the second knee surgery, the patient was able to participate in full practices and training with few limitations. It was hoped that the patient's physical condition will allow participation in a modified training program in preparation for full return in the 2013 football season.

CHAPTER THREE: DISCUSSION

While general exercise has been proven to be beneficial among the general population, participation in elite levels of sport may lead to the development of chronic injury. Competitive athletes focus on training regimens that push their physical limits in order to be more successful in their sport. Research has shown that becoming a better all-around athlete is likely to improve sport specific performance.[31,32,33,34,35] Companies such as Nike Inc. (Beaverton, Oregon) have developed specific training attire, equipment, and protocols based on this concept. Elite athletes spend their off-seasons becoming faster, stronger, and more explosive in an attempt to further develop their athleticism. An example of the importance of off-season training is the National Football League's Scouting Combine. In the Scouting Combine, the best collegiate football athletes undergo a series of speed, quickness, and strength tests that focus on athleticism rather than football specific skills. This process is not limited to professional football athletes. For both team and personal achievement, it is necessary for collegiate athletes to train rigorously to separate themselves from the competition.

It is no secret that the size, speed, and strength of football athletes have increased.[36,37,38] Athletes of greater size are performing feats of speed and strength in a way that has never been seen before. Though this evolution may be good for the sport itself, these powerful and explosive movements can have a negative effect on the athletes' bodies. Repetitive movements at high intensities potentially predispose elite level athletes to chronic injuries referenced by patellar tendinopathy. Combined with the physically demanding nature of the sport of football and the necessary year round training, there is a significant potential for both acute and chronic injuries among elite participants.

With injury, sports medicine clinicians categorize the tissue response to healing in three phases: the inflammatory, repair, and remodeling phases[42] Immediate treatment of acute injuries has been proven to shorten the time of the inflammatory phase resulting more rapid overall healing.[1,16,17,19, 27] Chronic injuries are more difficult to provide immediate treatment for due to the insidious mechanism. Secondary tissue death (injury to tissue not directly damaged by the initial injury) is a concern with both acute and chronic injuries. With acute injuries, once the primary injury occurs, the cause of the injury no longer exists. However, with chronic injuries, the cause of the injury remains, resulting in metabolic and enzymatic forms of secondary injury.

With chronic injuries such as patellar tendinopathy, the body's natural healing cycle is interrupted due to the consistent microtrauma caused by each bout of exercise. Prolonging the inflammatory phase inhibits the repair and remodeling phases, resulting in slower healing of the tissue. Tendons and other connective tissues have a comparatively lower blood supply than other soft tissues. This requires a greater amount of time to heal, causing frustration in athletes who suffer tendon pathology.

Due to the amount of time needed for connective tissues to heal, a myriad of treatments have been developed to speed up the healing process. In this specific case, a routine treatment protocol was conducted but provided little relief of reported pain by the patient leading clinicians to consider further treatment options. After surgical intervention, the same rehab protocols have produced a more favorable outcome, suggesting the pre-surgical treatments were not having an adverse effect, but the flawed biomechanics of each knee prevented healing and prolonged the patient's pain such that he was unable to participate.

When viewed in the lateral plane, the knee represents a third-class lever with the tibiofemoral joint serving as the fulcrum in both flexion and extension. Third-class levers produce a great amount of speed and range of motion but require a large amount of force in order overcome inertia and produce movements against even minimal resistance.[43] Specifically, the tibiofemoral joint serves as the fulcrum or "pivot" (P) point of this strong lever system and the effort generated through the patellar tendon at the anterior tibial tuberosity represents the "force" (F) needed for knee extension to overcome the "load" (L) of the distal segment. While most of the force generated is "tensile" (F_T) in nature within the patellar tendon, significant compressive forces (F_c) are generated at the petellofemoral joint during resisted knee extension. Furthermore, and facilitating to the pathologic state, these tensile forces are accentuated in the case of increased Q-angle through the center of the patella when viewed from a sagittal perspective. In our patient, the profound strain (F_T) placed on the patellar tendon during explosive and sport specific movements, leading to the chronic condition, was decreased by shifting the direction of force through the tibial tubercle transfer surgery, creating a more optimal biomechanics by decreasing the Q angle.[44] Additionally, high-riding patellae require more force during movement (knee extension) of the patellar tendon than normally positioned patellae.

In our case study, the high-riding position of the patient's patellae produced a less than optimal lever, resulting in increased tensile forces placed on the patellar tendon during knee extension. Though tibial tubercle transfer surgery did not shorten the patellar tendon, the medialization of the tibial tubercle (↓Q) increased the biomechanical function by allowing for earlier engagement of the patella within the trochlear groove during knee extension. In this case, the surgical intervention shifted the load placed on the patellofemoral joint and decreased the patient's Q angle reducing the tensile force with the intention to reduce pain. Therefore, we hypothesize that $\downarrow Q = \downarrow F_T = \downarrow$ pain. The decrease in pain will allow the patient to resume participation at a causative level.

Though the surgical intervention in this case study may be considered aggressive, it resulted in a decrease of pain, which facilitated a return to participation at a causative level. Patellar tendinopathy remains a significant problem among athletes of all sports and all levels. For elite athletes, this condition can be especially problematic due to the chronic discomfort and lack of opportunity to rest while remaining competitive. Though most cases of tendinopathy resolve through treatment and rehabilitative exercises, extreme cases will continue to reproduce painful symptoms despite therapeutic intervention. This specific case provides an alternate option for athletes with extreme cases of tendinopathy. Further study may be necessary to determine if this type of surgery is effective in decreasing painful symptoms of tendinopathy within a variety of sports and levels of participation.

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