Bilateral Patellar Tendon Rupture

Mary Kamienski

The knee is the most complex and largest joint in the body. Injuries to any part of this joint affect the entire body. There are multiple injuries that can occur to the knee, with the most common being ligament and meniscus tears. A not-so-common injury to the knee is a patellar tendon rupture. A bilateral patellar tendon rupture is extremely rare. A case study of a 43-year-old man who sustained a bilateral patellar tendon rupture while playing softball is used to present this devastating injury. This discussion includes the incidence and diagnosis of the tear, surgical repair, as well as a description of the comprehensive rehabilitation process necessary to allow the patient to return to normal physical activity. Risks and complications of this surgery and the expected outcomes are also presented.

The knee is one of the most complex systems in the body. It is the joint that connects the thigh and the tibia. The knee involves bone, tendons, muscle, ligaments, and cartilage, as well as nerves and blood vessels. It is also the largest joint in the body (Figure 1). When any part of it becomes injured or damaged, the entire system can be affected. Intact knees allow us to stand, walk, run, and even sit. Most problems with knees are related to injuries from a blow, a twist, or falling onto the knee. There are multiple injuries that can occur in the knee that include but are not limited to fractures, dislocations, strains, sprains, and tears.

Common injuries to the knee are ligament and meniscus tears. However, a not-so-common injury is a patellar tendon rupture. The patellar tendon attaches to the tibial tubercle on the front of the tibia. The quadriceps muscle, which is a large muscle on the front of the thigh, attaches the superior portion of the patella. This combination of muscles and tendons allows the knee to flex and extend and allows us to walk and run.

Case Study

A 43-year-old man was brought to the emergency department via ambulance. He was playing softball at the time of the injury. He made a twisting motion and began to run to first base and immediately fell to the ground. The player stated he was in severe pain and was very concerned that he could not move his legs. Another player was an orthopaedic surgeon and diagnosed bilateral patellar tendon rupture based on the clinical presentation that showed swollen knees, a high-riding patella, a gap below the inferior poles, and an inability to actively extend the knees. The player was reassured by the surgeon that this injury could be surgically repaired. He was transported to the hospital and the diagnosis was confirmed by x-ray examination.

The patient was medicated for pain with morphine sulfate, 2 mg IV, and then Dilaudid (hydromorphone) 2 mg IV as the pain was still unrelenting. Operative repair was performed the following day.

Bilateral rupture of the patellar tendons is an extremely rare and disabling injury in healthy individuals. This patient had no history of systemic disease that can cause weakened collagen such as lupus erythematosus, rheumatoid arthritis, or chronic renal failure, which are thought to be a precursor to this injury. He denied any steroid use and had no previous knee injuries. Fluoroquinolones have been associated with this injury; however, the patient had no history of use of this antibiotic (Annunziata, 2017). He was a physically active individual who played basketball and softball and had played 18 holes of golf the day preceding the injury.

Incidence and Diagnosis

The incidence of acute patellar injury is not actually known, but it is the third most common injury to the extensor mechanism of the knee (Fazal, Moonot, & Haddad, 2015). The time between the injury and the repair is critical. This injury can be commonly missed. Careful clinical assessment is often the key to diagnosis of this injury, but a thorough examination is frequently not possible due to the pain and patient anxiety. Knee radiographs are routinely obtained to exclude fractures, and the lateral view can reveal a high-riding patella. Ultrasoundography and magnetic resonance imaging (MRI) are also useful in some cases. In this case study, the bilateral high-riding tendon above the patella was immediately diagnostic.

Early diagnosis and definitive treatment produce the best results with this devastating injury. The extent of the tear is a predictor of what treatment will be offered. Most commonly, this acute injury involves a complete disruption of the tendon. A partial tear can occur; and
the patient may be able to maintain full, active extension and normal patellar position. This can be treated nonoperatively with physical therapy; however, operative repair is the treatment of choice. The chronicity of the tear must also be considered. After 6 weeks, direct operative repair becomes challenging. The use of a hamstring tendon autograft has been found to be effective in the treatment of chronic rupture of the patellar tendon (Abdou, 2014). However, repair or reconstruction is the optimal treatment of a patellar tendon tear.

The surgeon discussed nonoperative as well as operative management of this injury, and the surgeon and the patient agreed that operative intervention would be the best choice. The risks of the procedure were explained and included infection, bleeding, neurovascular injury, persistent pain in the knees, arthrofibrosis, stiffness in the knees, along with possible extensor lag or quadriceps weakness, as well as a failure to return to full form and flexion. The possibility of the need for revision procedures in the future was also discussed, as well as the medical risks such as deep vein thrombosis (DVT), pneumonia, and pulmonary embolism (PE). The patient was advised that extensive rehabilitation would be required (Epstein, 2013).

Surgical Repair

Operative repair was performed the following day. The patient received general anesthesia and interoperative antibiotics (2 g of Ancef [cefazolin] IV). There were found to be tears of both medial and lateral retinacula. The tear in the lateral retinaculum did extend completely through the lateral tissues on the knees. Three drill holes were placed in the patella, and fiberwire sutures were passed through the holes. The same procedure was performed on the contralateral knee. The surgeon noted that the patient had “thin” patellas, which may have had some influence on this injury (Epstein, 2013).

Rehabilitation

The patient began rehabilitation on the day of surgery. He stood and took 10 steps without incident. He did admit to feeling severe pain during ambulation and was medicated with oral analgesics with some relief. He was discharged from acute care in 72 hours and went directly to an inpatient rehabilitation facility. After 7 days, he was discharged home and underwent at-home physical therapy for 4 weeks. At this point, he was able to ambulate with a walker and underwent outpatient physical therapy for 3 months. Much of the therapy focused on gradual extension/flexion of the knees.

At this time, the patient is experiencing stiffness of the knees and has had two intra-articular injections bilaterally of hyaluronate (Synvisc), which is an antirheumatic medication. He remains physically active, does biking, and plays golf, softball, and basketball.

Postoperative Care and Rehabilitation

Postoperative care is aimed toward the return of normal knee mechanics and strength. This includes non-weight bearing with use of crutches for 3 days postoperatively. A hinged knee brace should be locked in extension. No motion and no exercise should occur during this time. For the next 4–13 days, the patient may toe touch with crutches with the knee brace locked in extension. Motion should include active flexion to 45° and passive extension to 0° three times a day. The continuous passive motion machine may be prescribed for use at least 10 times per
day. Swelling may be controlled with ice, gentle medial and lateral patellar mobilization, gentle isometric hamstring exercises, and contralateral isometric quadriceps exercises three times a day. Pain management remains a priority.

For the next 6–12 weeks, weight bearing may occur as tolerated, with the hinged knee brace locked in extension. The knee brace may be discontinued when quadriceps control and normal gait are achieved. From 12 weeks to 6 months, the patient may return to complete weight bearing and a progressive return to running and sport-specific activities. After 6 months, the patient may return to jumping and contact sports (Luks, 2015).

Postoperative Risks
Any injury requiring surgical repair can be associated with many complications. Decreased quadriceps strength and the loss of full knee flexion can occur. Manipulation under anesthesia or arthroscopic lysis of adhesions may be necessary to improve motion. Patients who return to physical activities before the tendon(s) are completely healed may suffer re-rupture, failure of fixation, or both (Annunziata, 2017).

Pain Management
Adequate pain control is a major challenge for these patients. To promote active rehabilitation, pain management becomes a priority. The pain associated with this injury and the postoperative rehabilitation make opioids the drug of choice. Some of the medications prescribed in the immediate postoperative period include hydrocodone, hydromorphone, and oxycodone. The side effects of these medications include constipation, drowsiness, and nausea and vomiting. These side effects can interfere with a safe rehabilitation program. Constipation occurs quickly and can be treated with lubiprostone, methylsalatrexone, and naloxegol. More importantly, patients can become quickly tolerant and require more and more of the drug to reduce pain. This is not the same as addiction; however, if patients use opioid medication over an extended period of time, they can develop dependence. When the drug is abruptly stopped, withdrawal symptoms are not uncommon, which include diarrhea, nausea and vomiting, muscle pain, anxiety, and irritability.

Nonopioid analgesics include nonsteroidal anti-inflammatory drugs (NSAIDs). Aspirin and acetaminophen are two of the most widely used analgesics. Ketorolac (Toradol) is a good option for inflammatory-related pain. It is often preferred postoperatively over narcotic painkillers. The optimum approach to postoperative pain management in patients with patellar tendon rupture repairs is a ladder approach. Starting with opioid analgesic and progressing as soon as possible to NSAIDs or a combination of acetaminophen and NSAIDs has been the most effective approach. A pain management plan should be discussed with the patient pre- and postoperatively. Patients should be educated about the benefits and risks of opioid use, as well as the evidence that alternative management is effective and will allow for a successful rehabilitation.

Postoperative Complications
Wound Care and Infection
As with any surgical procedure, wound breakdown and infection are a possibility. Perioperative antibiotics and closed-suction drains may be used. Wound breakdown may occur more frequently because of the limited soft tissue along the anterior knee and the need to operate through inflamed tissue. Starting the initial incision through uncompromised skin can reduce the incidence of infection. Careful attention to wound care is essential. The patient in the case study was referred to a wound care specialist 3 weeks after surgery. The wound was treated with silver sulfadiazine, which helps decrease the risk of bacteria spreading to the skin or blood. Sterile technique should be followed when applying the cream. Because of the hinged knee brace used for these patients, the wound must remain covered.

Thrombophlebitis and Pulmonary Embolism
Thrombophlebitis is another risk factor after this surgery. This can lead to PE, which can be life-threatening. Thrombophlebitis can be superficial or deep. Deep vein thrombosis requires immediate treatment, and DVT of the lower extremities can lead to the development of PE, which is very serious and can be fatal.

The diagnosis of superficial phlebitis can be made by examination. Warmth, tenderness, redness, and swelling along the vein are highly suggestive of superficial phlebitis. Ultrasonography is commonly used to diagnose superficial phlebitis or DVT. It is highly reliable. Computed tomography, MRI, and venography are imaging tests that can also be used to diagnose this condition.

D-dimer test is a blood test that can be diagnostically useful. D-dimer is a chemical that is released by blood clots as they start to degrade. A normal result makes the diagnosis of thrombophlebitis unlikely. However, this test lacks specificity because an elevated D-dimer level is found in other conditions such as pregnancy or an underlying cancer.

If DVT is suspected or diagnosed, anticoagulation therapy may become necessary. This is usually done by injection of low-molecular-weight heparin (LMWH) (enoxaparin [Lovenox] or fondaparinux [Arixtra]). Therapeutic doses of unfractionated heparin may be prescribed, followed by oral anticoagulation with warfarin (Coumadin). Tests for monitoring LMWH are anti-factor Xa (anti-FXa), activated partial thromboplastin time, and thrombin generation. Anti-FXa is the gold standard test (Thomas, Lybeck, Strandberg, Tynngård, & Schött, 2015).

Current guidelines recommend anticoagulation therapy for a minimum of 3 months. Symptomatic distal DVT should be treated with anticoagulation therapy. Asymptomatic patients may be monitored with serial imaging for 2 weeks. Most patients with DVT or low-risk PE can be treated in the outpatient setting. The most commonly used medications are as follows:

- Apixaban (Eliquis)
- Dabigatran (Pradaxa)
• Edoxaban (Savaysa)
• Fondaparinux (Arixtra)
• Heparin
• Rivaroxaban (Xarelto)
• Warfarin (Coumadin). (Kearon et al., 2012)

Pulmonary embolism results from a blood clot in the leg that travels to the lung. It is always a risk for patients following lower extremity orthopaedic surgery. Efforts should be taken to prevent PE immediately following surgery. This includes starting ambulation as soon as possible. The use of elastic stocking (TED, Thrombo-Embolic Deterrent Hose) below the knee is recommended. Performing 10 ankle pump exercises each hour is also prescribed to prevent phlebitis.

The signs and symptoms of PE include dyspnea, tachypnea, pleuritic chest pain, cough, and hemoptysis. A low-grade fever may be present. Patients should be advised on the signs and symptoms of thrombophlebitis and PE and understand the importance of reporting any signs immediately to the provider. The patient in this case was diagnosed with a blood clot while being discharged from rehabilitation and underwent tests confirming it as superficial. Treatment was not necessary.

Conclusion
Bilateral patellar tendon rupture can be a devastating injury. However, bilateral rupture in patients without systemic disorders or steroid medication use is exceedingly rare (Kellersmann, Blattert, & Weckbach, 2005; Rose & Frassica, 2001). A successful outcome is related to immediate diagnosis and operative repair; followed by a comprehensive and extensive rehabilitation. The patient in this case study has returned to his previously active life; however, he continues to experience knee pain and stiffness.

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