Surgical Treatment Of Proximal Tibiofibular Joint Instability Using Dynamic Fixation With Two Tightropes In Diverging Fashion And Bioabsorbable Cortical Screw Fixation

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Citation

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Abstract

Proximal tibiofibular joint instability is a relatively rare diagnosis and there is a lack of consensus regarding its best surgical treatment. The current case report documents the presentation and successful surgical treatment of proximal tibiofibular joint instability in two patients using dynamic fixation with two TightRopes in diverging fashion and bioabsorbable screw fixation. The described surgical procedure can be performed with basic surgical instruments at relatively low cost and minimal risk to the patient.

INTRODUCTION

Injuries of the proximal tibiofibular joint were discussed in the literature as early as 1907 [3]. It is estimated that proximal tibiofibular joint instability is present in up to 9% of multiligament knee injuries [8]. Anterolateral instability is the most common type [12] and is caused by a mechanism involving knee flexion, foot inversion, and plantarflexion [6,12]. Patients often present with pain, tenderness to palpation, swelling, locking or popping sensation, hypermobility, and limited ability to bear weight [2,5,6,13]. Surgical treatment is indicated in cases of chronic dislocation, chronic pain, symptomatic instability, or failed conservative treatment [5,7,13]. A number of techniques have been presented for surgical treatment of proximal tibiofibular joint instability [1,2,4,5,7-11,13,14]; however, there is currently no consensus for the best technique. The current case report describes the surgical treatment of proximal tibiofibular joint instability in two patients using dynamic fixation with two TightRopes in diverging fashion and bioabsorbable screw fixation.

CASE REPORT

Case 1

A 46-year-old male presented with a several year history of a painful popping sensation about the right lateral knee with squatting, kneeling, or sitting for a prolonged period and a persistent altered sensation from the lateral leg to anterior ankle. Surgical history included a high tibial osteotomy eight years prior to the presentation, posterolateral corner and lateral collateral ligament reconstruction five years prior to the presentation with hardware removal two years later, and three separate common peroneal nerve decompressions prior to the presentation.

The patient demonstrated full active range of motion at the knee and negative ligamentous testing. Increased mobility with pain of the proximal fibula was elicited in an anterolateral to posteromedial direction. Hypoesthesia was present from the lateral leg extending to the dorsal ankle.

Radiographs showed evidence of prior procedures consistent with his history and one metallic screw retained in the tibia. The fibula appeared in posteromedial alignment with a double trochoid articular facet. Nerve conduction velocity and electromyography study results were normal. Noncontrast computed tomography and magnetic resonance imaging showed the following: chronic rupture of the proximal lateral collateral ligament; screw tracks in the lateral, posterior, and proximal tibial metaphysis and lateral femoral condyle; graft construct beginning at the posterior margins of the lateral tibial condyle extending to the lateral femoral condyle; rupture of the posterolateral corner graft

construct; chronic partial tearing of the popliteus tendon; scar remodeling of the popliteal fibular ligament; and a prominent 1 cm × 2.7 cm postsurgical bone spur at the proximal tibial metaphysis in the region of the screw tracks.

Preoperative scores for the 2000 International Knee Documentation Committee (IKDC) Subjective Knee Evaluation Form and the Lysholm Knee Scoring Scale were 55.2 and 68, respectively.

Case 2

A 30-year-old male presented with a several year history of right lateral knee pain and instability of the lateral knee with squatting, climbing stairs, and walking on uneven surfaces. He reported multiple episodes of subluxation of the fibular head with squatting that resulted in his inability to fully extend the knee and bear weight. He also described pain radiating along the common peroneal nerve distribution. He failed conservative treatment and right knee arthroscopy for a suspected meniscal tear. Documentation of the intraoperative examination indicated a hypermobile proximal fibula bilaterally and a small radial tear of the posterior horn of the lateral meniscus.

Tenderness to palpation was elicited at the proximal tibiofibular articulation and along the course of the common peroneal nerve. Active range of motion of the knee was full, and ligamentous testing was negative. There was increased mobility of the proximal fibula of about 22 mm in an anterolateral to posteromedial direction when examined in 90° knee flexion. After the mobility examination, a clunk was noted about the fibular head with knee extension. The Anterior Drawer Test about the ankle had trace laxity.

Magnetic resonance imaging of the right knee was obtained prior to the presentation and documented a moderate-sized effusion and a small Baker's cyst. Results of electromyography and nerve conduction velocity studies of the right lower extremity were considered normal.

Preoperative scores for the 2000 IKDC Subjective Knee Evaluation Form and the Lysholm Knee Scoring Scale were 83.9 and 89, respectively.

Surgical Technique

The same surgical technique was used for both patients as follows. Approximately 60 mL of autologous bone marrow tissue aspirate was obtained from the intramedullary canal of the proximal tibia. An 18 cm longitudinal incision was made from the superior tip of the fibular head extending distally in line with the proximal fibula. Blunt dissection was carried down to subcutaneous tissue. The lower portion of the iliotibial band and fascia were opened longitudinally to expose the proximal fibula and common peroneal nerve, which was gently decompressed. A periosteal elevator was used to elevate the periosteum off the fibular head and lateral fibula.

The knee was then placed in full extension with the proximal tibiofibular syndesmosis reduced into anatomical position. Four cortices were drilled in a posterolateral to anteromedial direction parallel to the knee joint at the level of the fibular head. A guide pin for a TightRope suture button device (Arthrex, Naples, FL) was passed and exited out of the anteromedial tibia. The medial button was flipped, the toggling mechanism was used to securely fixate the lateral button into position in a knotless fashion, and excess suture was transected. Four cortices were drilled in a similar but slightly diverging fashion at the level of the fibular neck and a second TightRope was inserted.

The peroneal nerve was carefully retracted out of position to allow for drilling of three cortices between the angular formation of the TightRopes using a Trim-It Drill Pin (Arthrex, Naples, FL). This was then drilled with a cannulated drill bit, tapped, and countersunk. A 4.5 mm × 60 mm bioabsorbable poly-L-lactic acid screw was passed parallel to the knee joint in a tricortical fashion. This screw engaged the medial cortex of the tibia to obtain compression across the syndesmosis for additional static support and was flush with the lateral cortex of the fibula to minimize risk of irritation to the common fibular nerve.

The incision was closed in layered fashion, and the knee was examined with the proximal tibiofibular syndesmosis instability pattern reevaluated. Next, the distal tibiofibular syndesmosis was evaluated. Coexisting distal tibiofibular instability present in both patients was treated with a single TightRope.

Approximately 10 mL of autologous hematocyte bone marrow tissue aspirate concentrate was injected into the capsular region around the proximal tibiofibular syndesmosis to aid in healing and overall stabilization of the capsular and ligamentous structures. The patients were placed in a Bledsoe boot and knee immobilizer (locked at 0° knee flexion).

Follow-up

At evaluation three days after the procedure, both patients were without instability. They were provided with a protocol for physical therapy to be performed twice per week for six weeks that included continued use of crutches and the Bledsoe boot. The protocol began with toe-touch weight bearing at approximately two weeks postoperative and progressed to full weight bearing at around six weeks postoperative.

At evaluation one month after the procedure, the patient in Case 1 was being treated for postoperative deep vein thrombosis and was instructed to resume physical therapy at the discretion of the vascular surgeon coordinating his care. Despite vascular complications during treatment, he denied symptoms of instability in the proximal tibiofibular joint. The patient in Case 2 denied symptoms of instability and reported a gradually increasing weight-bearing status.

At telephone follow-up 18 months after the procedure, both patients reported improvement in symptoms and denied instability of the proximal tibiofibular joint. IKCD and Lysholm scores for the patient in Case 1 improved from 55.2 and 68, respectively, to 73.6 and 73. IKCD and Lysholm scores for the patient in Case 2 improved from 83.9 and 89, respectively, to 94.5 and 95.

Figure 1

Postsurgical radiographic imaging; AP radiograph of the right knee of the patient in Case 1 taken on postop day three demonstrating tunnels used for TightRope and bioabsorbable screw placement as well as retained hardware from prior surgical intervention.

DISCUSSION

Many acute injuries of the proximal tibiofibular joint respond favorably to conservative treatment. However, patients with instability who do not respond to conservative therapy may require surgical intervention. Surgical interventions described in the literature include arthrodesis with fibular osteotomy [2], reconstruction [1,7,9,11], temporary screw fixation [4,5,10,13], and permanent screw fixation [8,14]. To our knowledge, no studies with a large sample size or comparison type studies exist on this topic. Suggested surgical treatment is predominantly based on case studies, such as that presented here.

The approach described in the current case report allows for dynamic stabilization of the proximal tibiofibular joint with limited soft tissue trauma, and the procedure can be performed with basic surgical instruments at relatively low cost. Additionally, the procedure avoids adverse effects from

use of ligamentous autograft or allograft and issues with static fixation, such as broken screws or a second procedure to remove hardware. Further, the use of a dynamic technique for stabilization avoids associated injury to the ankle from increased rotational forces. Risk to the patient with this approach is relatively minimal aside from iatrogenic damage to the peroneal nerve, which appears to be a risk in all techniques used for stabilization. There has been no reported failure of fixation, hardware failure, recurrent instability, infection, recurrent peroneal nerve entrapment, or other complications of the procedure in these patients.

Suture button fixation is a relatively new technique that has been described for treatment of distal tibiofibular syndesmosis injury. Westermann et al. [15] compared dynamic suture button fixation of the distal tibiofibular syndesmosis to screw fixation in cadavers and found that suture button fixation of the syndesmosis yielded a superior reduction compared with rigid screw placement because it resulted in less post-fixation displacement. To our knowledge, no similar study has been performed at the proximal tibiofibular joint.

Both patients in the current case report responded favorably to the procedure with subjective improvement in symptoms and objective improvement in IKDC and Lysholm scores.

CONCLUSIONS

The surgical technique described in the current case report used dynamic fixation with two TightRopes in diverging fashion and bioabsorbable screw fixation. This procedure can be performed with basic surgical instruments at relatively low risk to the patient, and should be considered for surgical treatment of proximal tibiofibular joint instability that does not respond to conservative treatment.

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