CASE REPORT

Treatment of an Insertional High Grade Partial Patellar Tendon Tear Utilizing a Bio-Inductive Implant

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Abstract

The management of recalcitrant patellar tendinopathies in the athletic population can be vexing to both the surgeon and patient. To date the majority of treatments for this disease pathology are non-surgical in nature. When surgical intervention is required, open debridement and/or tendon take-down with repair has been necessary. We propose a novel technique for the treatment of insertional patellar tendinopathies and symptomatic partial tearing utilizing a bio-inductive implant.

Level of evidence: V

Keywords: Bio-inductive, Biologic, Jumpers' knee, Patella tendon, Patellar tendinopathy, Partial tendon tear

Introduction

Patellar tendinopathies and partial thickness tears can present a challenge to both the surgeon and the patient. These injuries are commonly seen in young and middle aged athletes, particularly those who engage in jumping sports or recreation. The prevalence of patellar tendinopathies can be as high as 40% in elite level volleyball and basketball players (1). This disease is typically seen in patients ages 16-40 (2, 3). The proposed histopathology of this disorder is a degenerative breakdown of the tendon fibers. As this occurs, the increased tensile loading of the tendon leads to micro-tearing of the tendon (4). As has been shown in the rotator cuff literature, a focal defect in the tendon of greater than 50% can lead to increased load and ultimately failure of the tendon (5, 6).

Current treatment for patellar tendinopathies primarily consists of non-surgical interventions. These modalities include: physical therapy, bracing, non-steroidal anti-inflammatory drugs (NSAID's), activity modifications, biologic injections, and dry needling (7-9). Foot orthoses have also been advocated in conjunction with these treatment options (10). Other more invasive modalities utilized include shockwave therapy and percutaneous ultrasonic debridement (11). Should these treatments fail to provide adequate pain relief, consideration of open debridement of the tendinotic tissue is warranted, with take-down and repair of high grade defects. While good to very good outcomes have been reported in literature in case reports, the recovery for the patient may often be significant (12).

We propose a novel technique for treatment of a patient with a high grade, recalcitrant patellar tendinopathy with high grade tearing utilizing a bio-inductive implant (REGENETEN ®, Smith and Nephew, London and Hull, United Kingdom). PUBMED and MEDLINE online searches yielded no previous case reports on managing the resultant tendon defect after debridement of the

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patellar tendon utilizing a bio-inductive implant. The implant used to address the defect is a highly porous collagen implant that is derived from bovine Achilles tendon (13). Over the past several years there have been an increasing number of articles published looking at the use of a bio-inductive implant for management of rotator cuff tendon defects (13-17). These defects have spanned the spectrum of rotator cuff disease, ranging from tendinopathy, to partial thickness and ultimately full thickness injuries. Schlegal et al reported on 24 patients treated with the implant who suffered from symtpmatic partial thickness rotator cuff tears (14). At 1-year follow-up, they found that clinical scores improved significantly and the mean tendon thickness increased by 2.0 mm. Furthermore, magnetic resonance imaging (MRI) demonstrated evidence of complete healing in 8 patients and a considerable reduction in defect size was shown in 23, whereas 1 lesion remained stable. In a separate study, Arnockzy et al performed tissue biopsies 6 months after bio-inductive implant placements in 7 patients (15). Histological analysis of these biopsies from human rotator cuff repairs showed cellular incorporation, tissue formation and maturation, implant resorption, and biocompatibility of the bio-inductive implant. As such the authors concluded that the implant was able to promote new connective tissue with the histological appearance of tendon over the surface of the native cuff tendon. Based upon the clinical and MRI outcomes presented in these reports, we extrapolated similar success could be obtained in the management of an insertional high grade partial patellar tendon tear with tendinopathy (15-17).

Case presentation

The patient is a 37 year old active duty member of the Air Force who presented with a 9 month history of worsening right knee patellar tendonitis. The patient reports that he has pain with jumping, squatting, running for an extended period of time, and descending stairs. He also noted that on days when he was on his feet for an extended period of activity, he would have swelling and pain at the insertion of the patellar tendon to the inferior pole of the patella. More recently he had experienced bouts of instability in the knee secondary to pain.

His treatment to date has consisted of physical therapy, wearing a patellar tendon strap across the painful area, NSAID's, avoidance of activity and crutch use for a period of 3 weeks. Furthermore he has undergone the Tenex® procedure approximately 3 months prior to presenting for surgical consultation. The patient noted that each modality helped to a degree, however, no treatment to date had allowed him to resume full duty.

On physical examination he had full range of motion of the knee with discomfort over the patellar tendon at the inferior pole of the patella at terminal flexion. He experienced extreme pain with resisted right knee extension with the knee flexed to 90°, and was unable to perform a single leg dip past 45° due to pain and

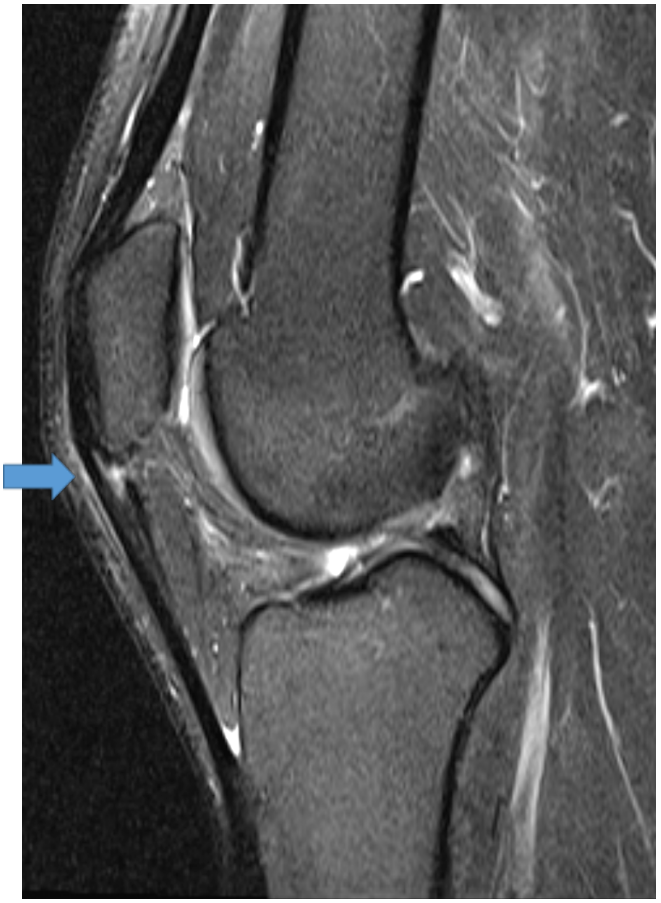

Figure 1. T-2 weighted sagittal MRI demonstrating high grade partial thickness tear of the patella tendon at the inferior pole of the patella.

instability at the insertion site. The remainder of his examination was negative for intra-articular pathology. His pre-operative MRI, shown in figure 1, demonstrated a high grade partial tear of the patellar tendon at the insertion of the inferior pole of the patellar. Intra-substance degeneration of the remaining tissue was also noted. There were no bony abnormalities associated with the lesion.

Operative Course

The patient was taken to the operating and prepped and draped for a standard patellar tendon repair. 30 cc's of venous blood was venipunctured and spun down into a 3 cc leukocyte rich platelet rich plasma (PRP) for later use. An incision was made extending from the mid portion of the patella to the tibial tubercle. Flaps were developed to inspect the integrity of the tendon and the surrounding retinaculum. The paratenon was incised vertically and protected for later repair. Once the exposure was complete the tendon was inspected at the insertion site on the inferior pole of the patella. A defect was noted upon palpation and a fibrous layer of poorly organized

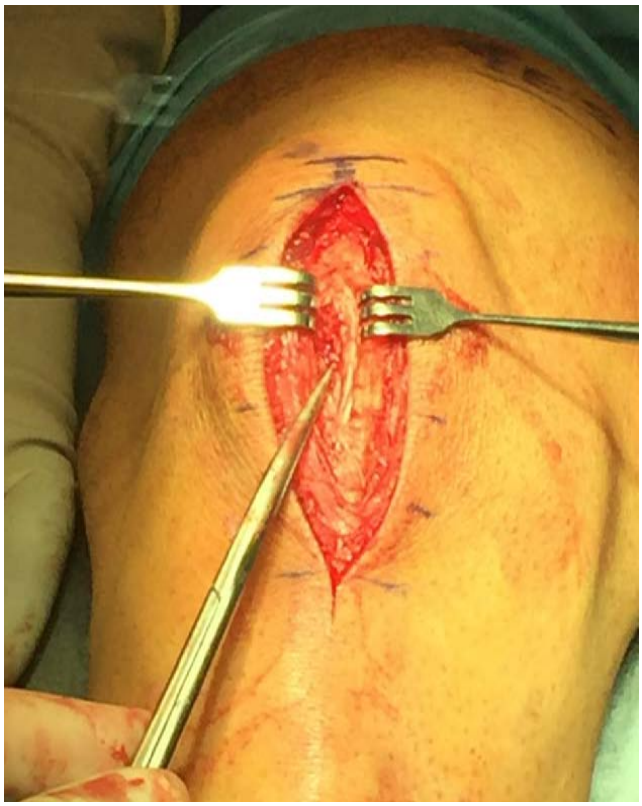

Figure 2. Open view of the patellar tendon demonstrating poor quality fibrotic tissue of the right knee.

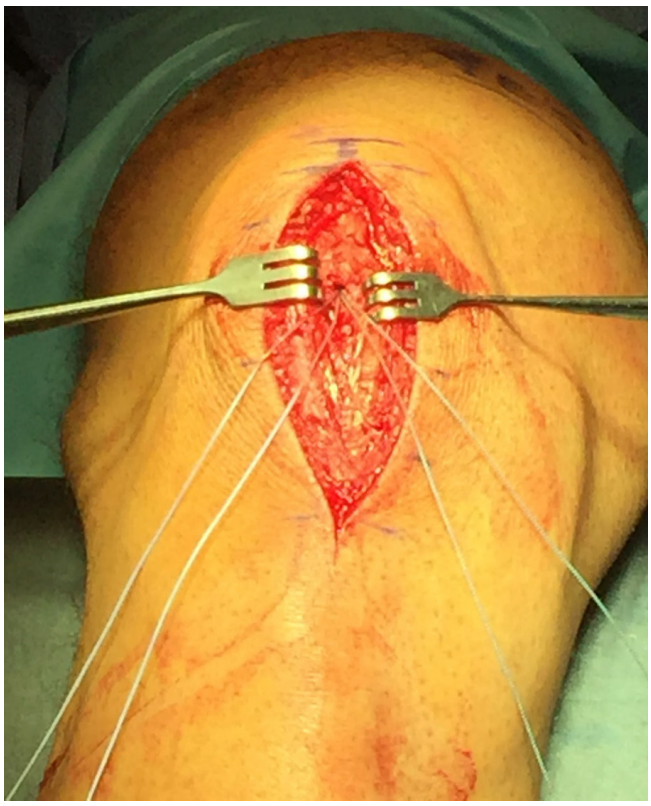

Figure 3. Open view of the right knee following debridement of the fibrotic tissue. A 2.9mm double loaded suture anchor was then placed at the inferior pole of the patellar tendon to oversew the weakened tendon.

tissue was noted in the associated defect [Figure 2]. A surgical scalpel was used to remove the fibrous tissue to clear margins.

Following the debridement, focal area of near full thickness defect was noted at the central portion of the tendon at the insertion on the patella. A rasp was used to create a bleeding bed of bone at this location and a double loaded 2.9mm anchor was placed [Figure 3]. A free needle was used to run the sutures in a locking manner through the tendon and tied. The knots were then buried by passing the free limb deep through the tendon prior to cutting the tails.

Next the REGENETEN® (Smith and Nephew, London and Hull, United Kingdom) was hydrated in the PRP solution for 90 seconds and placed over the area or tendon defect [Figure 4]. Prior to placing the implant, the remaining PRP was injected into the tendon at the junction of the patella-patellar tendon. The implant was held in place using the Rotation Medical implant insertion gun and secured to the patellar tendon using the Rotation Medical Tendon Stapler® along the margins [Figure 5]. 3-0 Vicryl suture was then used to over sew the proximal end of the implant to the retinacular tissue overlying the distal pole of the patella [Figure 6]. The knee was then taken through a full range of motion to ensure the stability of the implant. Next, the wound was closed via a standard subcuticular closure.

Post-Operative Course

The patient was discharged with crutches for 4 weeks with partial weight bearing. He was placed in a hinge knee brace allowing range of motion from 0-300 for 2 weeks. After this initial period he was advanced 150 until week 6, after which he was allowed motion as tolerated. Physical therapy was initiated at day 7 for isometric exercises and gait training. The patient was gradually re-integrated back into full activity at 3 months post-surgery. He began a zero-gravity treadmill program at week 10 and was allowed to resume formal jogging at week 18. Jumping sports were restricted until 6 months post-surgery.

Clinically the patient has improved in his self-reporting scores. At 6 months post-surgery his VAS score had dropped from a 7 to 2 with activity. He was able to cease narcotic pain medications 4 days post-op and was not utilizing NSAID's after week 9. An MRI was performed 10 months after surgery for an unrelated new knee injury. During MRI review, evaluation of the tendon reconstitution and intact repair were noted [Figure 7]. The MRI demonstrated improved appearance of the tissue quality. Furthermore, there

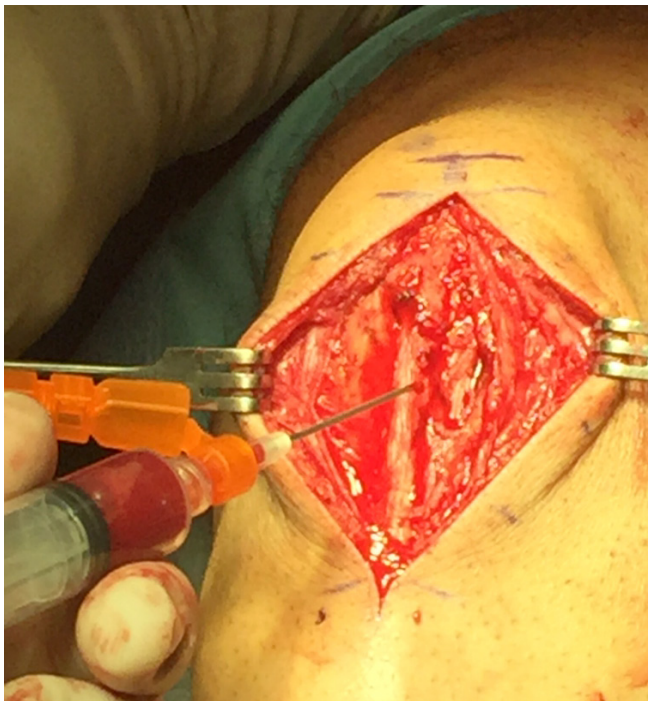

Figure 4. Following the oversewing of the debrided patellar tendon, 3 cc's of platelet rich plasma (PRP) were injected in and around the tendon repair site.

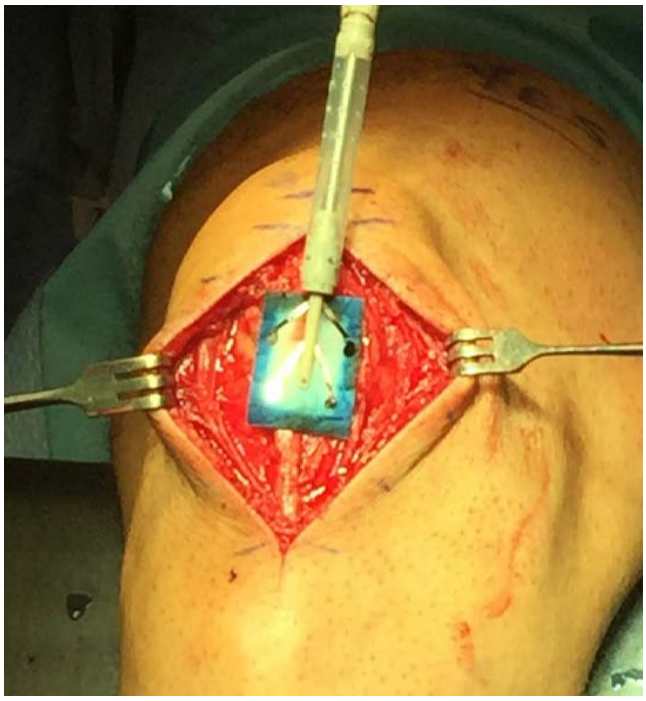

Figure 5. The bio-inducuctive implant is placed over the area of tendon defect and held in place by the surgical assistant utilizing the Rotation Medical® deployment gun.

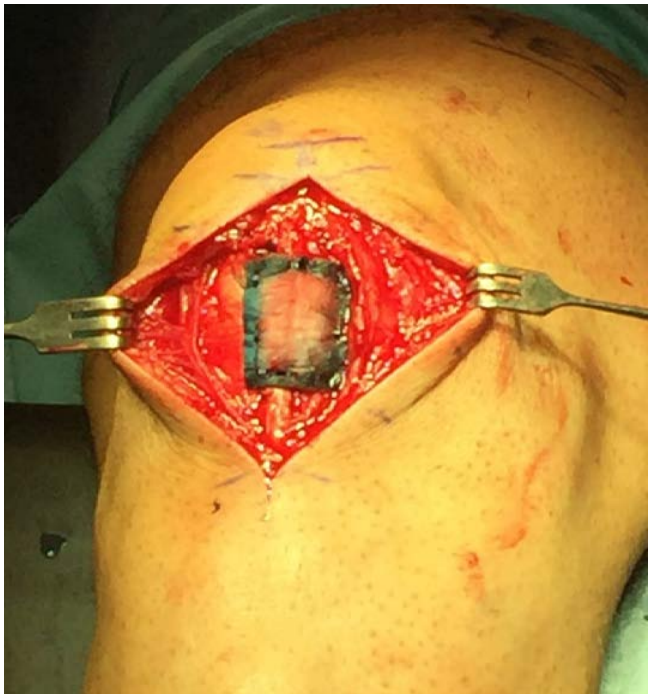

Figure 6. The bio-inductive implant has been secured into place via placement of PLLA staples along the margins of the xenograft.

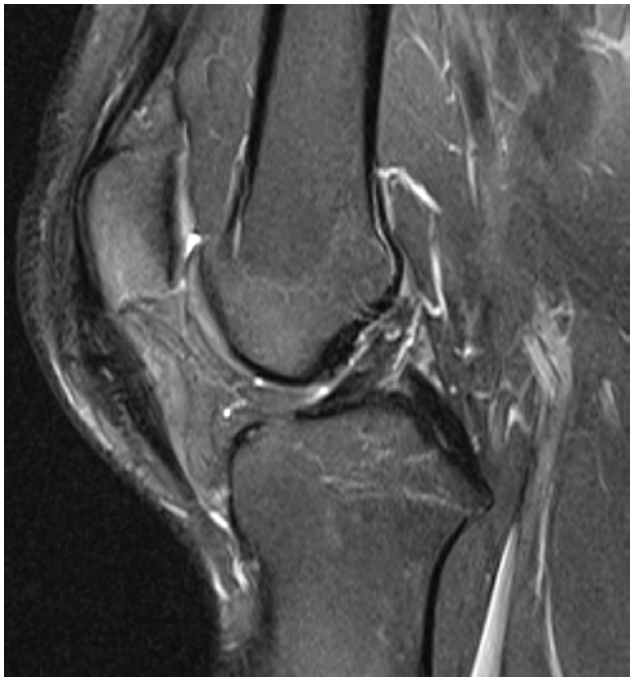

Figure 7. A T-2 sagittal MRI image 10 months post patellar tendon defect repair utilizing a bio-inductive implant demonstrating improved tissue integrity. Improved tendon thickness and absence of the previous tendonosis was also noted.

was evidence of increased thickness of the tendon at the location of the repair and augmentation using the bio-inductive implant.

Discussion

The management of recalcitrant patellar tendonitis and partial thickness tears can be difficult for both surgeons and the patient. Traditionally high grade injuries that have failed conservative measures have required surgical debridement, however the fibrotic tendonotic tissue oftentimes was extensive and required formal takedown and repair of the tendon.

In our case report, the diseased tissue was identified and debrided in a manner similar to excision of a calcific deposit is removed from a rotator cuff. As has been previously reported, the Rotation Medical Bio-Inductive Implant has been shown clinically to be effective in addressed the resultant underlying high grade tissue defect. As such, this can obviate the need for formal takedown and repair, leading to an overall faster patient recovery and maintenance of the normal resting tension of the native tissue.

We believe that applications for use of the bio-inductive implant may exist outside of the rotator cuff for treatment of high grade tendon lesions elsewhere within the body. Proper identification of patient candidates and surgical technique can lead to successful outcomes and accelerated rehabilitation of tendon injuries for the patient. These include patients who have failed conservative treatment, have pain and symptomatic weakness associated with the disease pathology, and have MRI or ultrasound evidence of high grade tendinopathy.

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