

TOPAZ COBLATION OF ACHILLES TENDON PATHOLOGY

Thomas A. Brosky II, DPM

Jeremy Thomas, DPM

INTRODUCTION

Most patients that present with chronic Achilles tendon pain have been labeled with the term, tendinitis. It has been demonstrated through the literature that repetitive overload with or without biomechanical faulting can lead to an inflammatory process within tendons. This localized tendon fiber damage can lead to ischemic changes within a tendon that predisposed the tendon to rupture and further biomechanical faulting.¹ When patients present with longstanding Achilles tendon pain or all conservative measures fail, a more appropriate term would be labeled tendinosis. Tendinosis implies a degenerative condition within tendons whereas tendinitis implies an inflammatory condition. These 2 conditions respond differently to conservative measures and surgical approaches. Currently, the surgical management of Achilles tendinosis has included tendon debridement with or without Achilles detachment and debridement of degenerative sites with the application of biologic or autologous grafts. It has been the authors' experience that partial or complete detachment of the Achilles tendon requires a significant increased post-operative course in order for full healing to occur.

Tendon healing occurs in 3 stages beginning with the inflammatory stage. Within the first 24 hours, macrophages and monocytes invade the area of pathology and phagocytosis of debris occurs. During this stage, angiogenesis and tenocytes begin to accumulate in the wound. After a few days the proliferative phase begins where type-III collagen dominates the wound. After about 6 weeks the remodeling phase begins and cellular modalities change to fibrous structures. During this time a larger number of type-I collagen begins to take over at the wound site. Also, during this final stage of healing, an increase in scar tissue and a decrease in vascularity to the tendon occur. Radio-frequency coblation offers the ability to produce a

controlled inflammatory response within the tendons, whereby healing can occur.

Tasto et al demonstrated that by using bipolar radio-frequency, there was a stimulation of angiogenesis and a variety of growth factors such as vascular endothelial growth factor (VEGF) and alpha-V-integrin.² Another study by Carmeliet utilized bipolar radio-frequency coblation on New Zealand rabbit Achilles tendons. Seventeen rabbit Achilles tendons were coblated using this technology and he concluded that at 28 days neovascularization occurred and at 90 days no inflammation, edema, or effusion histologically was present.³ One commonly raised question regarding tendinosis is: Why does the patient have pain if this is not an inflammatory response? Numerous authors have demonstrated that there are increased levels of chemical irritants and neuro-transmitters associated with tendonopathy upon micro-dialysis sampling.⁴ These chemical irritants and neuro-transmitters may play a significant role in the production of pain sensation within these chronic tendonopathy cases. Ljung et al demonstrated increased levels of substance-P in biopsied Achilles tendinosis and medial and lateral epicondylopathy cases. Sensory nerves transmit nociceptive information to the spinal cord, and increased levels of substance-P has correlated with pain levels in rotator cuff disease.⁶

The purpose of this pilot study was to examine the effectiveness of Topaz Coblation (Arthrocare Sunnyvale, CA) on Achilles tendon pathology. We believe this technology will advance the rate at which tendons heal and patients are able to resume normal activities.

TOPAZ THERAPY

Most radio-frequency-based surgical products such as laser and electrosurgical devices utilize a heat driven process, whereas coblation based technology

operates at low temperature (40° to 70° Celsius) Instead of exploding tissue structures under high temperatures, coblation technology gently dissolves target tissue, minimizing damage to surrounding healthy tissue structures. Coblation technology is a controlled, non-heat driven process that uses radio-frequency energy to excite the electrolytes in a conductive medium, such as saline solution creating a precisely focused charged plasma gas. The energized particles in plasma have sufficient energy to break the molecular bonds within tissue, causing tissue to dissolve at relatively low temperatures. Because radio-frequency current does not pass directly through tissue during the coblation process, tissue heating is minimal. The result is volumetric removal of the target tissue with minimal damage to the surrounding healthy tissues.

PERIOPERATIVE MANAGEMENT

The premise behind radio-frequency coblation technology is the production of a controlled inflammatory response. Therefore, the administration of nonsteroidal-antiinflammatory medications are discontinued 2 weeks prior to surgery and 6 weeks postoperatively. The authors also recommend that no steroid injections be administered 1 month prior to this procedure.

OPERATIVE PROCEDURE

The procedure involves utilizing a 4 to 5 cm linear incision centrally over the Achilles tendon pathologic region. Anatomic dissection is carried down through the subcutaneous tissue and deep fascia to the site of the paratenon (Figure 1). The paratenon is transected and later closed in anatomic position (Figure 2). This will aid in future angiogenesis and healing. Utilizing the Topaz micro-debrider wand, approximately 18 to 24 perforations are made in a grid-like pattern within the tendinosis region 5 mm apart (Figure 3). The depth of the perforation is controlled and buried along the grid pattern. Once the coblations (perforations) have been completed the site is irrigated with copious amounts of sterile saline. The wound is closed with subcuticular suture, no deep suture is utilized to prevent scar formation at the posterior insertion sites.

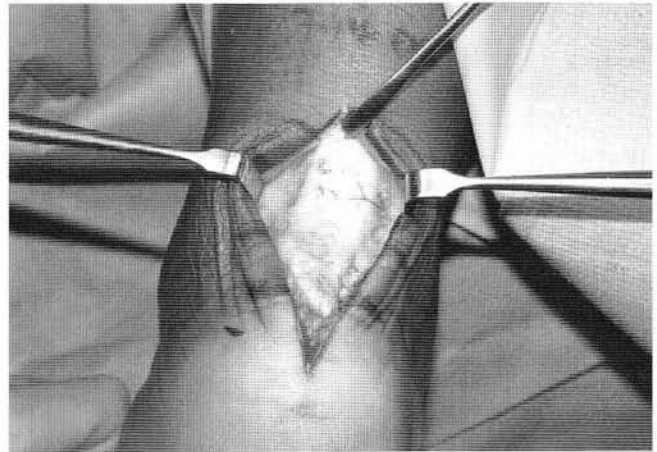


Figure 1. Paratenon exposed.



Figure 2. Anatomic closure of paratenon.

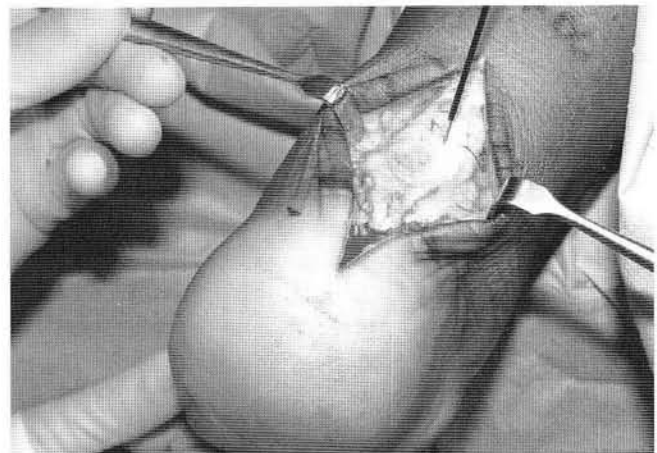


Figure 3. Grid-pattern.

POSTOPERATIVE MANAGEMENT

The authors currently recommend 3 weeks non-weightbearing in a posterior splint or fiberglass cast. This will be followed by 3 to 6 weeks weight bearing in a pneumatic CAM walker. The patient is able to begin range of motion (ROM) exercises or physical therapy at 6 weeks postoperatively. With our experience, the patients undergoing this technique typically will begin ambulating in their normal shoe gear at about 6 to 8 weeks postoperatively.

PILOT STUDY

Fifteen patients with the diagnosis of Achilles tendonopathy were treated with this bipolar radio-frequency coblation technology. The technique utilized approximately 18-25 coblations (perforations) with the coblation wand within each tendon site. Eleven patients were diagnosed with retrocalcaneal spur formation and 6 patients were diagnosed with equinus deformity bilateral. No spur resection or tendo-Achilles lengthening procedures were utilized in any of the cases. The authors do recommend gastrocnemius recession or tendo-Achilles lengthening for unilateral equinus deformity with this coblation technique. Magnetic resonance imaging was obtained on each patient, which confirmed the diagnosis of Achilles tendinosis by hypertrophy and abnormal insertional mucoid degeneration within the Achilles tendon. All patients had failed conservative treatment, which ranged from 4 months to 2.5 years, (average 7 months). All patients reported their preoperative pain as 7/10 to 10/10, (average 8/10 daily). Immediate post-

operative pain scale reported within 24 hours after this technique was 0/10 to 6/10, (average 3/10). This is an example of the early anti-nociceptor effect early on after this technology has been utilized. Follow-up ranged from 15 weeks to 1.5 years, (average 8.5 months). All patients rated the success of their surgery as good, or excellent. There were no poor results within this pilot study. Two patients reported good results while 13 patients reported excellent results. All patients stated they would suggest this surgical technique to a family member.

Radio-frequency coblation technology (TOPAZ) offers a minimally invasive surgical technique with a strong anti-nociceptor effect early after the procedure. The stimulation of angiogenesis and the restoration of the normal tendon physiology and function is the ultimate goal. This technique has been utilized with success within the orthopedic literature and is currently under a multi-centered evaluation for its use in lower extremity surgery.

REFERENCES

1. Benazzo F, Maffulli N, et al. An operative approach to Achilles tendinopathy. *Sports Med Arthroscopy Rev* 2000;8:96-101.
2. Tasto J, Cummings J, Medlock V, et al. The tendon treatment center: New horizons in the treatment of tendinosis. *Arthroscopy* 2003;19:213-23.
3. Carmeliet P, Ferreira V, Breier G, et al. Abnormal blood vessel development and lethality in embryos lacking a single VEGF allele. *Nature* 1996;280:435-9.
4. Alfredson H, Bjur D, Thorsen K, et al. High intratendinous lactate levels in painful chronic Achilles tendinosis. An investigation using microdialysis technique. *J Orthop Res* 2002;20:934-8.
5. Ljung BO, Forsgren S, Friden J. Sympathetic and sensory innervations are heterogeneously distributed in relation to the blood vessels at the extensor carpi radialis brevis muscle origin of man. *Cells Tissues Organs* 1999;165:45-54.
6. Ljung BO, Alfredson H, Forsgren S, et al. Neurokinin 1-receptors and sensory neuropeptides in tendon insertions at the medial and lateral epicondyles of the humerus. Studies on tennis elbow and medial epicondylalgia. *J Ortho Res*. 2004;22:321-7.