



Arthrex Presents:

Breakthroughs in Foot and Ankle Technology

Summer 2019

Welcome to the 50th anniversary of the AOFAS Annual Meeting. Arthrex remains committed to servicing all of your metal, soft-tissue, and arthroscopic solutions for foot and ankle pathologies. Come to the booth and meet our staff of product managers and engineers, all here to help you experience what we can offer in support of our mission of Helping Surgeons Treat Their Patients Better™. Take special note of our advances in MIS techniques and less invasive surgery with the launch of our Nano Arthroscopy Platform which will completely change orthopedic arthroscopic visualization as we know it today. Courses and information are listed on our website. We hope to see you in Naples soon. Have a great meeting!

Pete Denove

Senior Director, Product Management

MIS Ankle Fusion Plating System*

Small Footprint, Huge Impact

The titanium Ankle Fusion Plating System provides a complete solution for ankle fusion management with a comprehensive offering of anatomy-specific plates available for both tibiotalar and tibiotalocalcaneal arthrodeses. With 7.0 mm Compression FT screws and the new Minimally Invasive Ankle Fusion Plate, you now have a “mini open” option to approaching anterior tibiotalar arthrodesis. Compared to the standard three-screw fusion construct, the addition of an anterior plate increases construct rigidity and decreases micromotion at the ankle fusion interface without the need for a standard open incision.¹

See the updated Ankle Fusion Plating System on page 15.

Arthrex **IS** Minimally Invasive Surgery

Arthrex offers a comprehensive platform for minimally invasive surgery (MIS) complete with a dedicated power unit, specialized percutaneous burrs, a compact and versatile MIS instrument set, and finally a comprehensive array of Compression FT screws to provide stable fixation in all MIS applications.

Combining the entire Arthrex MIS portfolio and our company's unrivaled dedication to medical education, partnering with Arthrex is the clear choice to make. We are committed to MIS techniques now and in the long term to help surgeons treat their patients better! We hope to see you at an Arthrex-led MIS course soon.



*FDA clearance pending

Reference

1. Tarkin IS, Mormino MA, Clare MP, Haider H, Walling AK, Sanders RW. Anterior plate supplementation increases ankle arthrodesis construct rigidity. *Foot Ankle Int.* 2007;28(2):219-223. doi:10.3113/FAI.2007.0219.



Arthrex®

Surgical Tips and Pearls

FibuLock® Fibular Nail



Fibula Nail



Chris Hodgkins, MD

Fracture Reduction Options

The FibuLock system allows minimally invasive fixation, but anatomic fracture reduction of the fibula is still required to restore length and rotation.

Percutaneous Reduction

- Often possible for very recent fractures
- Easier for minimally displaced fractures
- Difficult for delayed presentation fractures or if the fracture is very short and malrotated
- Don't hesitate to make a mini-open incision if anatomic reduction is not possible percutaneously



Mini-Open Reduction

- Use fluoroscopy to mark the proximal and distal extent of the fracture.
- Begin with a 3 cm incision. Bias the incision more distal and anterior on the fibula to allow placement of the distal interlocking screws and palpation or visualization of the fibula in the incisura for anatomic syndesmotic reduction.



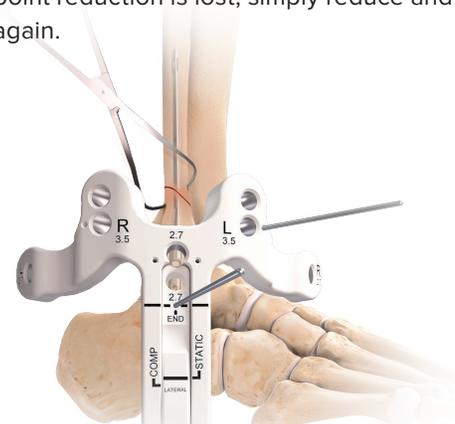
Formal Open Reduction

- The mini-open incision can be extended as necessary in more complex fractures of the fibula or when there is significant syndesmotic instability.
- Whatever incision is used, it will always be smaller and result in less stripping of vital blood supply than a formal plate ORIF incision.



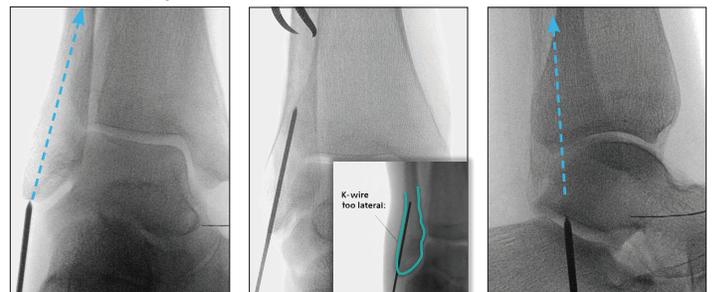
Clamping the Fracture

- The clamp handles must be placed proximal to the fracture to avoid blocking the nail jig.
- Most surgeons prefer to provisionally clamp the fracture with the handles placed distally and then add additional clamps (normally two are required) oriented correctly before releasing the original provisional clamp.
- Recheck the fracture reduction and clamp grip after every step of canal preparation and nail insertion.
- If at any point reduction is lost, simply reduce and clamp the fracture again.



Entry Point and Trajectory

AP: Lateral to the edge of the malleolar fossa Lateral: In line with the center of the canal



Take multiple AP and lateral fluoroscopy views to ensure the guidewire is angled towards the center of the canal.

Note: Avoid placing the guidewire too lateral as reaming will violate the lateral cortex of the fibula. Once a good entry point and trajectory are established, advance the guidewire further into the fibula.



Tensioning Handles

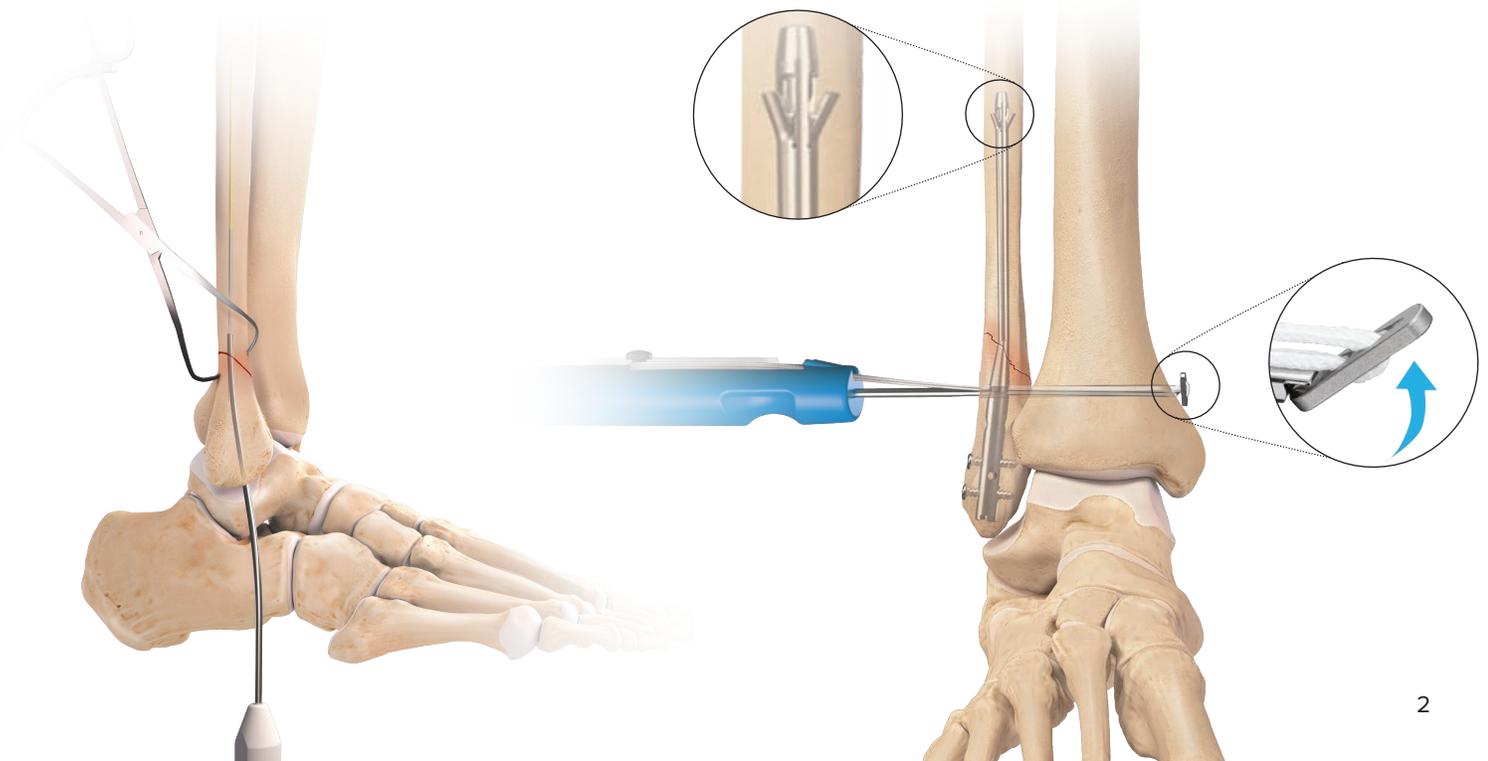


Entry Point and Trajectory (Cont.)

- Entry point and trajectory are key to a successful case. Spend time examining the radiographic anatomy of the distal fibula in different degrees of rotation before you introduce a wire.
- The tendency is to be too lateral. Inverting the hindfoot can help establish a more medial start point.
- Check your start point on both AP and lateral fluoroscopic views before advancing the guidewire.
- If you have a good start point but have too medial of a trajectory and hit the medial fibula wall with the wire, this can be easily fixed with the fracture finger:
 - Perforate the start point on the distal fibula with a 6.2 mm reamer. Remove the reamer and wire and insert the fracture finger. This will allow you to manipulate your trajectory within the fibula canal.
 - The gold guidewire can now be passed through the fracture finger.
 - Remember to pass the reamer again to complete preparation of the distal canal.

Syndesmosis TightRope® XP Fixation

- Syndesmotic stability can still be tested, with the jig in situ, using a traditional external rotation stress test or the Cotton test, or by direct visualization through your mini-incision or an accessory incision.
- Similarly, the reduction can be visualized and palpated through the mini-open incision or it can be examined with fluoroscopy and/or using an arthroscope.
- There are two syndesmotic fixation options using the FibuLock® system that accept TightRope XP fixation.
- If two TightRope XP implants are desired, drill both pilot holes (with the syndesmosis reduced) before the jig is removed. Once the jig is removed, the TightRope XP implants can be placed and tensioned.
- The TightRope XP design eliminates the need for a medial incision, allowing the button to sit underneath the medial soft tissues and periosteum.
- This design may reduce operative time and possible risk to the saphenous nerve and vein by eliminating the need for a medial incision.



What's in My Bag?

Minimally Invasive Surgery



Jorge I. Acevedo, MD

Q. Considering the negative connotations with early-generation minimally invasive surgery, what motivated you to begin implementing MIS into your practice?

A. As with any new technology, minimally invasive surgery has gone through a substantial growth period since its inception over 30 years ago. Initial first- and second-generation techniques used inadequate or no fixation and high-speed power systems without irrigation. This combination led to several avenues for potential failures and subsequently poor outcomes. Approximately 5 years ago I became very interested in MIS after serving as faculty for an advanced arthroscopy and MIS course. My European mentors introduced me to the current third-generation techniques, which apply AO principles to many of the MIS procedures. Technological improvements, such as Arthrex's high-torque/low-velocity power system that includes a "built-in" irrigation component, consummated the ideal pairing of technology with the newer techniques.

Q. How long have you been performing MIS surgery with the upgraded power units and techniques? What advice can you lend to a potential new surgeon user that could help them implement these techniques?

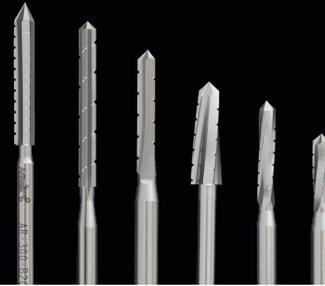
A. I received my first training with the current technology approximately 4 years ago and have been performing it in my practice for approximately 2 years. I would strongly advise anyone starting in MIS to attend an Arthrex cadaver course taught by their expert faculty. These courses teach proper patient selection and technique as well as guidance on how to safely start in the field of MIS. It is critical to practice in a cadaver and sawbones lab setting to develop the necessary tactile skillset.

Q. Since the inception of third-generation MIS, many new techniques have been described from bunion corrections, to medializing calcaneal osteotomies, to cheilectomies and more. Which techniques would you recommend a new surgeon to adopt initially?

A. The minimally invasive medial calcaneal osteotomy is a great entry-level procedure due to its larger surface area and more forgiving osteotomy in terms of safe zones and acceptable variance. Starting with the calcaneal osteotomy allows the new MIS surgeon to better master the instrumentation and establish confidence in their technique. Once competent with the procedure and driver/burr system, surgeons can rather quickly adopt cheilectomies and Akin osteotomies to their practice using the smaller Shannon and conical burrs. Mastery of these simpler techniques provides a good framework for progressing to the minimally invasive bunion and other more advanced techniques.



2018 Minimally Invasive Surgery Foot and Ankle Course



Q. There has been quite a lot of positive clinical data recently in support of MIS compared to open techniques. In your hands how would you compare your MIS outcomes to your open outcomes?

A. MIS has been a complete game changer for my practice. Elderly patients in whom I once prolonged conservative care indefinitely due to surgical risks are now able to take advantage of procedures that can significantly improve their quality of life. My bunion patients no longer fear the pain involved with traditional open bunion surgery. Although swelling may still be prolonged, patient satisfaction and return to activities have improved remarkably. MIS also diminishes concerns of wound problems when performing calcaneal osteotomies along with other procedures requiring adjacent incisions. Similarly, MIS has diminished wound issues when performing reconstructive procedures in the diabetic population.

Q. If you had to choose your favorite MIS procedure or case to date, what would it be and why?

A. Difficult to select a favorite procedure using a technology that has greatly facilitated many of my traditional open procedures. There is great satisfaction in treating patients who have had a traditional open bunion on one foot and then experience diminished pain and a quicker recovery with an MIS bunion on the contralateral side. In addition, it is reassuring to have the flexibility and ease of adding an MIS calcaneal osteotomy to “fine tune” deformity correction when performing more complex procedures such as total ankle replacement or cavus reconstruction.

40 Year Old With Mod HV (Bunion Deformity)



Pre-op

8 Weeks Post-op

40 Year Old With Mod HV (Bunion Deformity)



Case Review

Minimally Invasive Surgery – Bunion Correction



Jesse Doty, MD

Q. How many MIS bunion correction procedures have you performed to date? In your hands, how many cases did it take for you to feel 100% confident in the techniques?

A. At this point, I have performed nearly 50 MIS hallux valgus corrections. I performed the procedure in the lab multiple times on cadaver feet to make sure I had 100% confidence in the equipment and surgical algorithm prior to performing the technique on a patient. The first patient case, in some ways, was much easier than operating on the cadaver. I planned the surgery on a day where I had no pressure for time and I could take ample fluoroscopy images to confirm the accuracy of my osteotomies and implant placement.

Q. Compared to open bunion procedures, would you say the minimally invasive techniques have lengthened or shortened your overall time in the operating room?

A. One of my original hesitations to embrace MIS was my fear that a steep learning curve would significantly lengthen patient anesthesia. For this reason, I timed my first 10 hallux valgus corrections. Surprisingly, the initial few corrections I performed were not substantially longer than a typical bunion procedure. This was because I was able to omit the surgical approach, capsulotomy, lateral release, and closure. Now that this is my "go to" procedure for nearly all bunion corrections, my operative times are predictably less than with a traditional open bunion procedure.

Q. How large of a shift of the metatarsal are you able to obtain with the MIS techniques? Have you had any issues with nonunions or instability after the large shifts?

A. I will never forget Dr. Myerson showing me a crazy aggressive shift and telling me it would reliably heal when I attended his course as a fellow. I'm now a believer, as I've seen incredible bone reconstitution over and over again in my own practice. I try to shift as far as I can, even if it's nearly 100%. It's probably good to have at least some bone contact, so the capital fragment isn't just an "air ball." I have had no nonunions, and I have had only a couple that were unstable early on. Patients that exhibited early on radiographic instability did well clinically and did not require revision of the osteotomy, but one required hardware removal after the bony union. Instability does not seem to correlate with the degree of shift, but rather with inaccurate implant placement and premature aggressive weightbearing on the forefoot.



Pre-op AP (1)



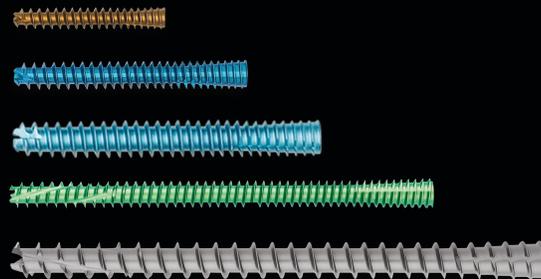
Post-op AP (1)



Pre-op AP (2)



Post-op AP (2)



Q. What advice would you lend to a new MIS bunion surgeon to help get them over the initial learning curve? Any technique pitfalls to avoid?

A. Operating room setup is imperative.

As a surgeon you have to be comfortable and also have direct access to the osteotomy sites. For a hallux valgus correction, I have the C-arm on the ipsilateral side of the operative foot with the foot elevated on bone foam or blankets. I sit on the contralateral side of the patient and reach across the nonoperative leg to access the medial side of the operative foot. The image monitor can be at either the head or foot of the patient.

Technique Pearls

Planning and mental "play through" immediately prior to performing the procedures will increase success early on in the learning curve. Osteotomy location and implant accuracy are imperative because implant options are more limited for MIS techniques. I recommend always using two screws to control rotation and to avoid shortening. The most proximal screw should have bicortical purchase in the lateral metatarsal shaft as it exits the diaphysis prior to entering the capital fragment. These techniques are new to most surgeons, so allow extra time to decrease pressure on yourself as a surgeon and the operating room staff. Have a bailout plan, such as adding a K-wire for stability, or converting to a traditional open procedure if you are struggling to perform the operation percutaneously.

Don't do this

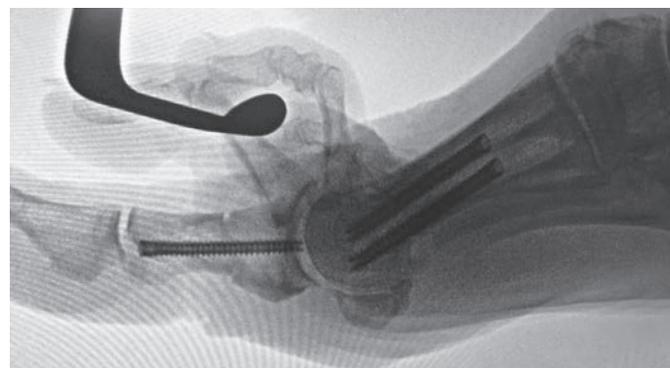
Early on the procedures may go exceptionally well if you are thoughtful and methodical. As I became more comfortable, I was cavalier on some of the subsequent operations. Omitting steps and rushing through the technique can increase the frustration level if things don't go perfect. Frustration will serve as a catalyst for more errors in judgment. This may lead to radiographs in which a more aggressive correction could have been obtained, or more optimal implant positioning would have provided additional stability.

Q. Could you please describe your post-op protocol for MIS bunion corrections? What role if any does bandaging or taping play with these procedures?

A. In the OR, I place a CAM boot with a loose dressing to allow swelling. We also use 4x4s located between the first and second toes to promote a varus force on the hallux. Postoperative patients are requested to remain sedentary the first week with the foot elevated allowing for weightbearing on the heel only when necessary to go to the bathroom etc. At 2 weeks, the stitches are removed and the patients are allowed to be more liberal with their weightbearing in the boot. I recommend that they try to avoid pressure on their toes while attempting to load only on the heel and lateral column of the foot. Patients are instructed to perform toe strapping at their 2-week follow-up and they do this while they are weightbearing in the boot. Transition into a standard athletic shoe generally occurs around 6 to 8 weeks. Although compliance is questionable, a hallux valgus night splint is suggested for the first 6 months postoperatively.

Q. Compared to your open bunion outcomes, what would you say has surprised you the most about your MIS bunion outcomes?

A. The patients seemed predictably much happier. Although they are unanimously impressed by the lack of scarring, I think most of their satisfaction comes from less pain and a quicker recovery. There seems to be much less stiffness, which has decreased the time required for postoperative discussions rationalizing a typical recovery and managing appropriate expectations.



Post-op lateral (2)

NanoScope

Nano Operative Arthroscopy System



a small size with a big vision

(2.2 mm)

High-Definition, Chip-on-Tip Image Sensor Technology Provides Surgeons with a Needle-Sized, Single-Use Camera System to navigate joint space like never before.



NanoScope™ micro arthroscopy system - 1.9 mm diameter with 2.2 mm inflow sheath



Arthroscope - 4.0 mm diameter with 5.9 mm inflow sheath

New Product Highlight

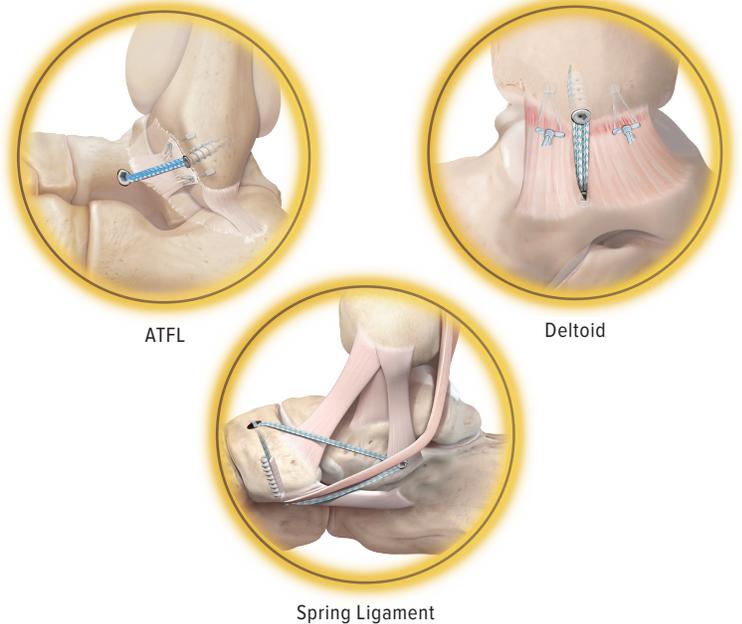
InternalBrace™ Ligament Augmentation 2.0 System and Tension-Slide Tenodesis

InternalBrace Ligament Augmentation System

2.0

Drill, Tap, Implant Through the NEW Talus Offset Guide

- Surgical versatility - increased size and material options
- Radiopaque marker and laser line window - determine SwiveLock® implant location
- Percutaneous/minimally invasive - cannulated drills/ taps with ability to implant SwiveLock anchor through the guide
- Biologically advantageous - collagen-coated FiberTape® suture and JumpStart® antimicrobial dressing

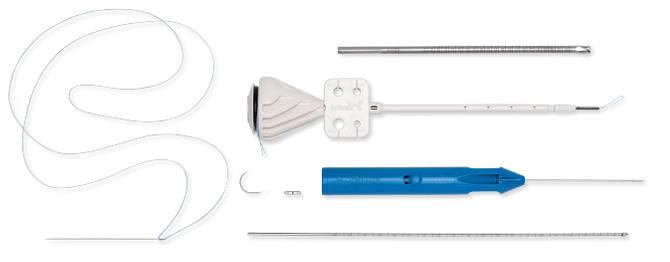


Tension-Slide Tenodesis

- Maximize tendon to bone contact with the tension-slide technique
- Strong cortical button fixation with aperture BioComposite Tenodesis screw fixation¹
- Multiple options for broad range of pathologies (FHL, FDL, posterior tibialis tendon, anterior tibialis tendon)
- Low-profile fixation

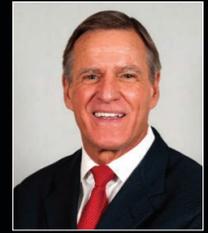
Reference

1. Arthrex, Inc. APT 04032. Naples, FL; 2018.



What's in My Bag?

Foot and Ankle Tendon Transfers Using the Tension-Slide Technique



Thomas Clanton, MD

Q. With your considerable experience and success with tenodesis screw fixation since 1982, what compelled you to consider the tension-slide technique for tendon transfers?

A. Having been trained in both a knee and sports medicine fellowship and a foot and ankle fellowship, I was introduced to the use of interference screw fixation for tendon transfers quite early by one of the originators of that technique, Ken Lambert.¹ He collaborated with renowned Biomechanics Professor Stephan M. Perren in Davos, Switzerland in 1981 to develop the method for fixation of patellar tendon grafts in reconstruction of anterior cruciate instability. The difference in this case was the use of bone plugs on each end of the patellar tendon graft. As hamstring tendon grafts became more common for the ACL, Leo Pinczewski, in Australia, along with Don Joy, developed a metal soft-tissue screw for fixation of hamstring tendons within a bone tunnel, originally used in 1991.² By the mid 90s, bioabsorbable screws were being used for fixation of ACL grafts, and we reported two biomechanical studies related to this fixation method for foot and ankle^{3,4} and followed that with four publications on the subject.⁵⁻⁸ Certainly, this was an improvement in tendon graft fixation at the time.

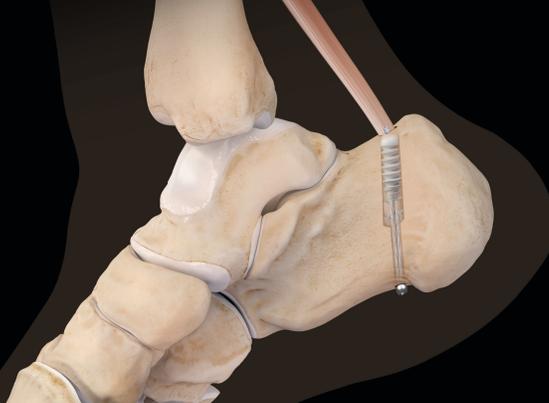
My lecture on this topic, related to my use of the Arthrex BioTenodesis System for ACL graft fixation and translated to tendon fixation in the foot and ankle, was first presented at the AOFAS Summer Meeting in Traverse City, Michigan in 2002. Pete Denove (Senior Director Distal Extremities) was the solo person occupying the Arthrex booth at that meeting.

In 2019, there is evidence for an improved method of fixation for tendon transfers as demonstrated by the technique utilized for distal biceps tendon repairs at the elbow, which includes both cortical bone fixation with a button backed up with a tenodesis screw. This has rapidly become the gold standard for that procedure due to increased load to failure and decreased gap formation.⁹ Certainly, we have learned in the foot and ankle that there are circumstances, particularly in softer bone or certain bone tunnel situations, where an interference screw doesn't provide optimal fixation. Given this, I have begun applying the tension-slide technique for tendon transfers and found it to be very effective and reliable.

Q. For which foot and ankle pathologies are you able to apply the tension-slide technique?

A. The most common situation where I have seen this tension-slide technique work well has been in the drop foot where I am transferring the posterior tibial tendon into the lateral cuneiform bone. Particularly in a smaller bone, a large tunnel with a graft plus a large screw can be troubling. Therefore, the cortical button on the plantar side of the bone holding the tendon transfer in the bone tunnel can then be safely followed with a smaller screw that still gives an interference fit without overstressing and relying on solely the bone tunnel.

The cortical button with the tension-slide method gives the ability to turn the button so it lies flat on the plantar surface of the bone without creating symptoms there. I have also used the cortical button method on the posterior fibula when doing a revision lateral ankle ligament reconstruction in the face of preexisting bone tunnels in the fibula. Further usages are for FHL transfer in an Achilles tendon reconstruction or a severe insertional Achilles tendinosis, particularly in softer calcaneal bone. This is also useful for FDL transfers for posterior tibial substitution in flatfoot reconstruction cases and anterior tibial tendon reconstructions when a tendon transfer is necessary.



Q. Do you feel the tension-slide technique will help you treat your patients better?

A. This is a great question and one that can be viewed from several perspectives. All surgeons want the best fixation possible for their tendon transfers. This implies a very strong fixation, which the tension slide method offers, especially when combined with interference screw fixation. Creep in the tendon fixation is minimized, so the graft should function with greater strength transmission to the bone. If we also believe that early motion improves the outcome in tendon transfers, then the greater strength of fixation with this technique should produce a better outcome with earlier institution of range of motion and weightbearing than is typically utilized in these tendon transfer procedures. While there are certainly financial considerations in the use of multiple fixation tools, that would certainly be outweighed by a failed graft.

Q. What technical pearls can you offer with your experience using the tension-slide technique?

A. First, I would suggest practicing the technique on a sawbones of the foot in order to become very familiar with the method of inserting the sutures into the cortical button and maintaining the tension on the sutures to keep the button engaged on the inserter. Next is the feel of the penetration through the inferior cortex of the bone in which you are inserting the graft. Once you've penetrated the inferior cortex, you want to push the button slightly deeper so then you can undo the sutures and flip the button before drawing it back against the cortex. Note, leaving the button inserter in place while flipping the button will keep it from backing up into the tunnel. Then, you can toggle the sutures on the insertion side of the foot to tension the construct, suture one of your two graft sutures back through the insertional side of the tendon graft, tie three or four knots next to the tendon insertion using the free arm of the graft sutures, and insert an interference fit screw. Each step is important for ultimate success of the method, and practice makes perfect!

Q. Would the postoperative protocol change with this stronger construct?

A. I feel much more comfortable starting early range of motion and weight-bearing progression with this method. According to testing, the ultimate load to failure averages 136% of that of an interference screw alone and the stiffness is 115% with plastic displacement, essentially the same.¹⁰ In most circumstances, I still immobilize the patient for 10 to 14 days to get the incision healed and the swelling reduced, but in a "scar former" or an individual more likely to have difficulty with range of motion, I am comfortable starting motion earlier. This essentially means that the tendon fixation is no longer my consideration point for rehabilitation timing and the initiation of weightbearing, but it becomes an issue related more to the other pathology that is present (eg, an osteochondral lesion on a weight-bearing surface that was treated).

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10. Arthrex, Inc. APT 04032. Naples, FL; 2018.

Surgical Tips and Pearls

Bunion *InternalBrace*™ Ligament Augmentation



Anish R. Kadakia, MD



Chris Kreulen, MD



Eric Giza, MD

Q. Can you explain your thought process for consideration of applying *InternalBrace* ligament augmentation to your bunion pathologies?

A. Anish Kadakia (AK): When considering a bunion, there are multiple components to the pathology that allows the proximal phalanx to deviate laterally. One key component is laxity of the medial collateral ligament of the hallux. Obtaining appropriate bony correction is imperative and soft-tissue imbrication cannot compensate for a poor bony correction; however, in some cases, an excellent bony correction even with the lapidus can still result in recurrence of hallux deviation secondary to insufficient tension on the medial collateral ligament.

The *InternalBrace* augmentation allows one to perform the bony correction as needed and imbricate the soft tissue, but then allow for a static restraint to prevent recurrent valgus while allowing for dorsiflexion and plantar flexion range of motion, which is important in the immediate postoperative period. This avoids the need for the time-consuming strapping that is done by many surgeons in the post-op period and minimizes time wasted for both the patient and the surgeon while ensuring that the correction is maintained.

Chris Kreulen (CK): I want to reinforce the capsular repair to reduce the risk of soft-tissue failure of my repair. Having this augmentation allows me to be more aggressive with who can have a bunion repair and allows patients to maintain their motion and stability with confidence. In the past I was left wondering if the repair would hold and if a patient would be better served with a fusion.

Q. Have you performed any scientific research to better understand the pathology?

A. Eric Giza (EG): Yes. Using a cadaver model, we compared matched pairs of the *InternalBrace* augmentation to native (intact) capsule and to capsular repair alone. The *InternalBrace* augmentation was about 10 times stronger than capsular closure alone.

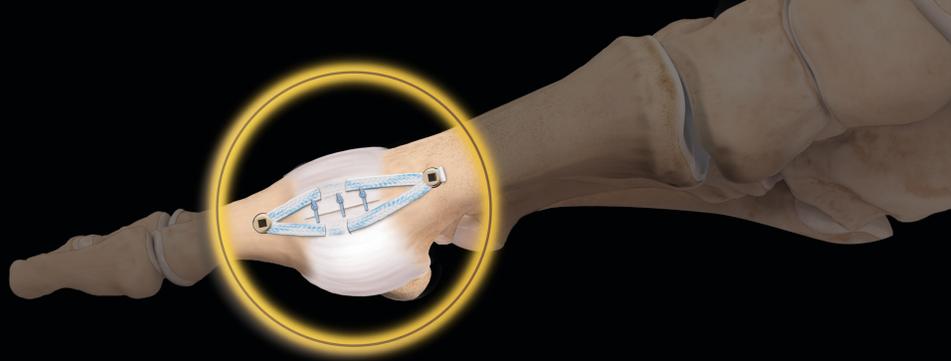
CK: I have evaluated the strength of the repair with and without the *InternalBrace* augmentation reinforcement. The *InternalBrace* augmentation provides significant improvement in strength.

Q. What have you learned and are there any technical pearls you can offer with your experience using the bunion *InternalBrace* technique? What bunion procedures have you included this with (chevron, lapidus, etc)?

A. EG: I have used this technique to enhance my capsule repair for distal chevron, lapidus, proximal opening wedge, and proximal phalanx closing osteotomies. The capsule must be closed prior to placing the *InternalBrace* implant and a longitudinal incision works best. It is also easier to place the DX SutureTape FiberTak® anchor in the proximal phalanx first and drill the hole for the SwiveLock® anchor prior to performing whichever osteotomy one chooses to use.

AK: I primarily use this correction with my lapidus procedures; however, I have also done it with a chevron and proximal opening wedge. With the lapidus it is quite easy to do and is done after the bony correction. One trick that I use is that the limb within the phalanx is started slightly more plantar to allow for supination correction when tensioning the *InternalBrace* implant. I initially used only one limb from the phalanx to the metatarsal; however, after discussion with the other surgeons, two limbs is superior taking it through the medial capsule to prevent the windshield wiper effect. This method allows the dorsiflexion/plantar flexion range of motion without allowing the SutureTape to move and theoretically minimizes the risk of correction loss. With a chevron it can be more tricky on the metatarsal, but as long as the proximal limb is placed proximal to the osteotomy it has not been a major issue.

CK: I have performed this with chevron, BOAT, and lapidus. You may need to place the DX FiberTak anchor in phalanx just plantar to midline to aid in rotational support. Have an assistant place the thumb and index finger on the lateral side of the great toe to allow for a pinching motion to stabilize the toe and retract the skin.



Q. Can you describe the technique and implants you use?

A. EG: After completion of the bunion procedure, the capsule is closed using 2-0 FiberWire® suture with the hallux at 0° (reduced). I then place a DX SutureTape FiberTak® anchor in the proximal phalanx. The two limbs of the SutureTape are passed through the capsule from the proximal phalanx to the metatarsal. One limb is placed 3 mm to 5 mm dorsal to the capsular repair site and the other is passed 3 mm to 5 mm plantar to the repair site. Care is taken not to overtighten the construct. I lock in the position of the tape with a 3.5 mm × 13.5 mm DX SwiveLock® anchor. Passing the limbs plantar and dorsal prevents windshield wiper.

Q. Will this technique help you treat your patients better?

A. CK: I believe this allows me to prevent recurrence by strengthening the capsular repair, which in turn can maintain ROM and stability, even in severe cases.

EG: Yes. Currently we are prospectively collecting data on patients using the Arthrex SOS™ global registry.

AK: There is no question. Recurrence is a difficult and common problem no matter what the technique and this technique modification should minimize this complication, improving patient outcome.

Q. Can you explain the postoperative protocol with this stronger construct?

A. EG: Most patients are discharged the same day and allowed to be heel-weightbearing in a post-op shoe. A bunion wrap is placed in the OR but is removed at the first postoperative visit. The patient is encouraged to start range of motion by 10 to 14 days after surgery and they use a gel toe spacer. At 6 weeks, once the osteotomies are healed, the patient increases activity in a wide shoe with the expectation of normal activities by about 10 to 12 weeks.

AK: With the *InternalBrace* augmentation I no longer need to strap the patient every other week or use a toe spacer. I am confident that the soft tissue is held with the *InternalBrace* augmentation. This allows for earlier range of motion with the security that I am not go have excess strain on the medial soft tissues. This saves time for both the patient and myself in the short term and improves outcomes in the long term.

Anish R. Kadakia Case Review

Pre-op



4 Months Post-op



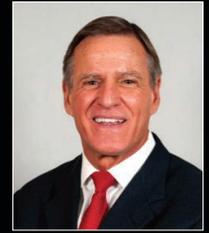
- Loss of correction of HVA
- Intermetatarsal angle is corrected to 5°
- Large improvement, but patient dissatisfied

14 Months post-op revision corrected only with *InternalBrace* ligament augmentation – *InternalBrace* augmentation saved the day



What's in My Bag?

PARS Midsubstance SpeedBridge™ Repair



Thomas O. Clanton, MD

Q. Can you describe your post-op protocol for PARS/PARS and now PARS + Achilles Midsubstance SpeedBridge repair?

A.

	PARS to PARS	PARS to AMS
Post-op	Splinter in plantar flexion (slight tension on repair)	
2 Weeks	Short-leg cast in plantar flexion	<ul style="list-style-type: none"> ■ Walking boot (3 heel lifts) ■ Progress weightbearing as tolerated
2-6 Weeks	Non-weightbearing	Initiate physical therapy: <ul style="list-style-type: none"> ■ Active plantar flexion (not passive) ■ No dorsiflexion
6 Weeks	<ul style="list-style-type: none"> ■ Walking boot (2-3 heel lifts) ■ Initiate physical therapy, partial weightbearing 	<ul style="list-style-type: none"> ■ Remove 1 heel lift/week ■ Goal: weightbearing as tolerated in boot w/o lift at 4-5 weeks, then wean boot to regular shoe
10-12 Weeks	Wean boot to regular shoe	

PARS to PARS: Splint for 10 to 14 days in plantar flexion but with slight tension on the repair, ie, before the splint is applied, the repaired ankle is dorsiflexed from its original full plantar-flexed position until there is slight tension on the repaired Achilles tendon. This typically puts it in about 15° to 20° of plantar flexion. Tension on the repair site helps the healing collagen fibers line up better and get stronger. At first post-op appointment (10 to 14 days), the splint was removed, sutures were removed, and the patient was put in a cast in the same plantar-flexed position. The cast was modified by cutting out the bottom of the cast in a way that the patient could remove it for doing plantar flexion movement 4 times a day and then the bottom was reapplied. The patient was kept non-weightbearing (NWB) for 6 weeks total and then placed in a boot with heel lifts (usually 2-3) and started partial weightbearing (PWB) progressing to full weightbearing (FWB). FWB was usually achieved at 10 to 12 weeks.

PARS to Midsubstance SpeedBridge repair: Splint for 10 to 14 days to let wound heal and post-op pain and inflammation resolve. At first post-op visit, the patient is put into a walking boot with 3 heel lifts and begins progression from PWB to FWB as quickly as patient is comfortable to do so (usually 2 weeks). Physical therapy starts at this point and works with bands for plantar flexion exercise and does active and active-assisted (but not passive) range of motion with the patient. Patient is kept from dorsiflexing above neutral for 6 weeks to avoid overstretching the repair. Patients remove 1 heel lift each week after going into the boot and are FWB in the boot at 4-5 weeks without a lift and then wean out of their boot to a regular shoe (initially with 1 heel lift for 1 week).

Q. Can you explain your rationale for transitioning from a PARS/PARS technique to the PARS + Midsubstance SpeedBridge repair?

A. The main reason that I did this was because I don't like having large, nonabsorbable knots at the repair site. Also, I like the consistent strength of fixation from anchoring into bone. It's important to explain the procedure to the patient so they understand that there will be some pain in the heel initially just from drilling the anchor holes in the calcaneus. They also need to have an idea of the rehab process and understand that their rehab progresses as they reach certain goals in the process (balance, strength, range of motion, endurance, etc). They are also given a general timeline for recovery and advised not to stretch out their Achilles repair by forcing dorsiflexion early.



Q. Can you explain any tips and pearls you have learned along the way?

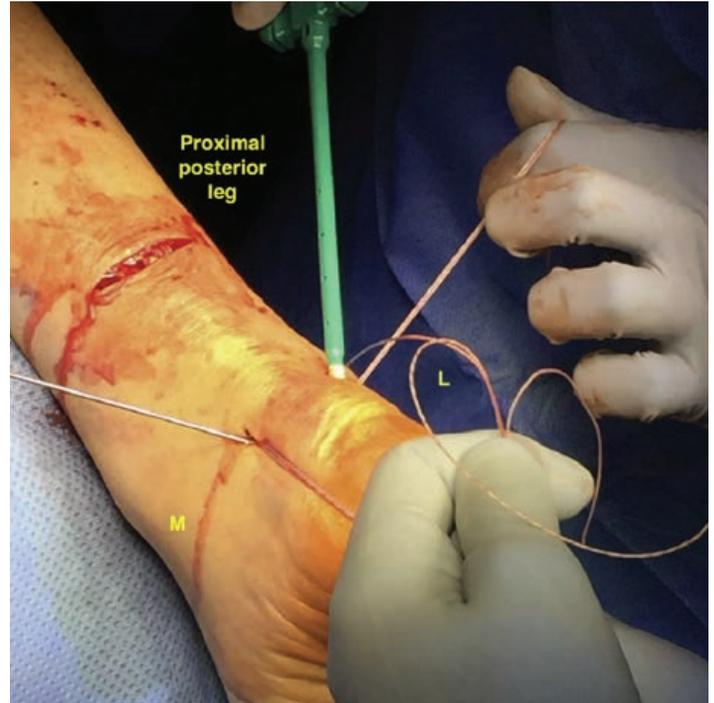
- A.**
- **Research shows natural elongation** – After passing PARS SutureTape sutures within proximal tendon, you must pull all 3 sutures from proximal tendon distally to cycle suture and remove suture creep.
 - **SwiveLock® anchor fixation** – Incisions both medial and lateral are made at the edge of the Achilles medially and laterally attached to the calcaneus on the posterior calcaneal tuberosity approximately 5 mm to 10 mm below the superior aspect.
 - Anchor angle 30° to 40° to centerline of Achilles (coronal plane) and aimed approximately 15° to 20° into calcaneus from posterior to anterior. Tunnels need to start into the calcaneus at the same vertical height and are aimed at a slightly different angle so they don't converge.
 - Place needle into each tunnel to mark location and show trajectory.
 - Place ankle in 15° more plantar flexion than normal ankle position; this is typical amount of change in elongation.

Q. Can you explain the angle of the SwiveLock anchor insertion into the calcaneus and if you have seen heel pain?

- A.** I have not seen a problem with heel pain in my patients who have this procedure. I am careful to seat the anchor fully within the bone tunnel and this can be measured from the number of threads visible after inserting the SwiveLock anchor and I also visually inspect the position of the SwiveLock anchor with a Freer elevator.

Q. On how many patients have you performed PARS + AMSS? How many of them have complained of heel pain and when does it go away? Have you had to revise any?

- A.** We are somewhere between 35 and 40 patients. I would say that some have a little to moderate heel pain through the first 2 weeks and it generally resolves around 3 to 4 weeks. I have not had to revise any personally.



Q. Do you have any additional information from your biomechanical research or clinical experience with PARS + AMSS?

- A.** I think that our research speaks for itself: the method is strong, anchors to bone, doesn't rely on suture integrity within both stumps of the tendon for its strength, has no suture knots at the repair site, and has been supported by clinical use by those of us who use it regularly.

New Product Highlight

Ankle Fusion Plating System



J. Chris Coetzee, MD, MBChB

Ankle Fusion Plating System Updates

- **Minimally Invasive Ankle Fusion Plate*** – Mini-open approach for added stability to an arthroscopic tibiotalar fusion
- **Universal Short Talar Neck Plate** – Allows for robust fixation when patients have a short talar neck and TN joint impingement is a concern
- **Anterolateral Ankle Fusion Plate** – Anatomically contoured with added points of fixation in the tibia for total ankle revisions or spanning large bone voids
- **Longer Lateral TT and TTC Plates** – Additional plate lengths added for difficult revisions
- **Updated Mini Joint Distractor** – Hands-free distraction for joint preparation and reduction for joint compression during plate or screw insertion
- **One Comprehensive System** – 7.0 mm Compression FT screws are now compatible with the Ankle Fusion Plating System

*FDA clearance pending



Minimally Invasive TT Plate*



Short Talar Neck TT Plate



Anterolateral TT Plate



New Mini Joint Distractor

Algorithm for Internal Fixation Options for Ankle Fusions

■ Screws Only

- Well-aligned “easy” ankle with good bone quality
- Arthroscopic fusions with percutaneous fixation
- Ability to be non-weightbearing



■ Screws and Minimally Invasive Plate*

- Mini-open approach
- Reasonable bone quality but concerns about rigidity
 - Especially if there is a concern about drifting into equinus
 - Questionable ability to be non-weightbearing
- Added stability when only two medial screws are placed in anticipation of future conversion to a TAA (posterior “home run” screw can be very difficult to remove)



■ Large Ankle Fusion Plate

- Correction of severe deformity
- Spanning of gap
 - Conversion of a failed TAA to a fusion
 - AVN
- Inability to be non-weightbearing
 - Obesity
 - Old age
 - Poor balance



Whatever the approach, the Arthrex Ankle Fusion Plating System has you covered.

New Product Highlight

DynaNite® SuperMX™ Staples

Newly Released DynaNite SuperMX staples

Arthrex is excited to announce the release of the DynaNite SuperMX continuous compression staples. Offering the same benefits of continuous compression as the DynaNite Nitinol staples, the SuperMX Nitinol staples can be inserted quickly with the easy-to-use, reloadable delivery device.

- Wider bridge (4.5 mm) provides better rotational stability in midfoot and hindfoot procedures.
- 50% more compression than the same size DynaNite staple¹
- DynaNite SuperMX is available in the following sizes:
15 mm × 15 mm, 18 mm × 15 mm, 18 mm × 18 mm,
20 mm × 15 mm, 20 mm × 20 mm, 25 mm × 20 mm

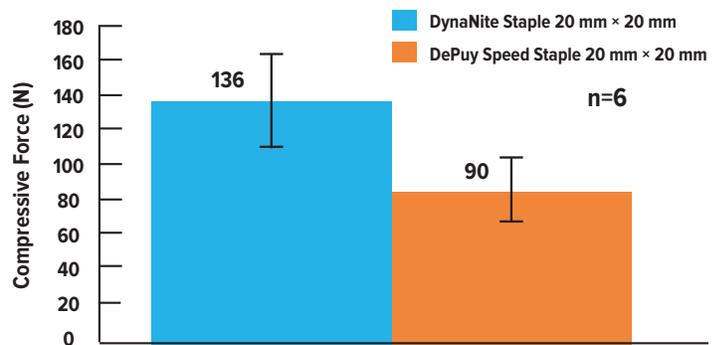
Reference

1. Arthrex, Inc. Data on file (APT-03322). Naples, FL; 2017.



Image depicts a DynaNite low-profile staple, available in sizes: 9 mm × 7 mm, 9 mm × 10 mm, 11 mm × 10 mm, 11 mm × 12 mm, and 11 mm × 15 mm

DynaNite 20 mm × 20 mm Staple Exhibits 51% More Compressive Force Than DePuy Synthes Speed 20 mm × 20 mm Staple¹



Talonavicular Arthrodesis



Lapidus Arthrodesis



Calcaneal Osteotomy



Naviculocuneiform Arthrodesis



Calcaneal Cuboid Arthrodesis



TMT Arthrodesis

What's in My Bag?

InternalBrace™ Ligament Augmentation



Kevin Martin, DO

Q. Can you explain your practice and the types of patients you treat with ankle instability?

A. In my current practice, I'm privileged to care for an active-duty military population and their families. These warriors frequently sustain severe ankle injuries while wearing heavy combat gear, furthering the extent of their injuries.

Q. What has been the biggest difference you have now versus prior to using *InternalBrace* augmentation for these patients?

A. One word – confidence! The *InternalBrace* augmentation allows my patients to rehab and progress with confidence. Confidence to return to work and a busy, active lifestyle. The *InternalBrace* augmentation is not only for superstar athletes it's for the super dad, mom, or soldier next door. Returning my patients back to duty/work sooner with confidence has been a huge paradigm shift in my practice.

Q. What intrigued you or how did you start considering *InternalBrace* augmentation for your patients?

A. I initially “saved” the *InternalBrace* augmentation for revisions, high-demand patients and those with hyperlaxity. After I began to see the postoperative success and how quickly they returned to duty/work, I widened the indications tremendously.

Q. What have been the results of your *InternalBrace* ligament augmentations in your practice and to your patients?

A. As a result of using the *InternalBrace* augmentation, my patients return to work weeks sooner. The quick rehabilitation preserves muscle tone and the proprioception needed for a quick recovery.

The *InternalBrace* augmentation has also completely eliminated my use of allograft and the inherent complications associated with it.

Q. Lastly, you mention you sometimes treat the ATFL and AITFL through the same construct (“the flying V”); can you explain your rationale, which patients you feel this adds value to, and the outcomes?

A. Performing a couple Broströms a week, I truly have gained an appreciation for the 18% of patients that have an associated high ankle sprain (AITFL/IOM). In these cases, historically, the options have been very limited, but *InternalBrace* augmentation gives you a great option. I complete my standard *InternalBrace* augmented Broström but then extend a second limb up to the anatomic footprint of the AITFL. This creates an anatomic reconstruction of both the AITFL and the ATFL in the shape of a (V), thus the “flying V” was born.



One of Dr. Martin's patients participating in military freefall school.

Scientific Update

Syndesmosis TightRope® XP Implant



Shimozono Y, Hurley ET, Myerson CL, Murawski CD, Kennedy JG. Suture button versus syndesmotic screw for syndesmosis injuries: a meta-analysis of randomized controlled trials [published online Nov 26, 2018]. *Am J Sports Med.* doi:10.1177/0363546518804804.

- The Syndesmosis TightRope implant technique results in improved functional outcomes and lower rates of broken implant and joint malreduction as compared with the syndesmotic screw technique.
- The primary advantage is that the Syndesmosis TightRope implant allows for anatomic healing of the syndesmosis and avoids implant removal.
- The Syndesmosis TightRope implant technique warrants a grade A recommendation in the treatment of syndesmosis injuries.



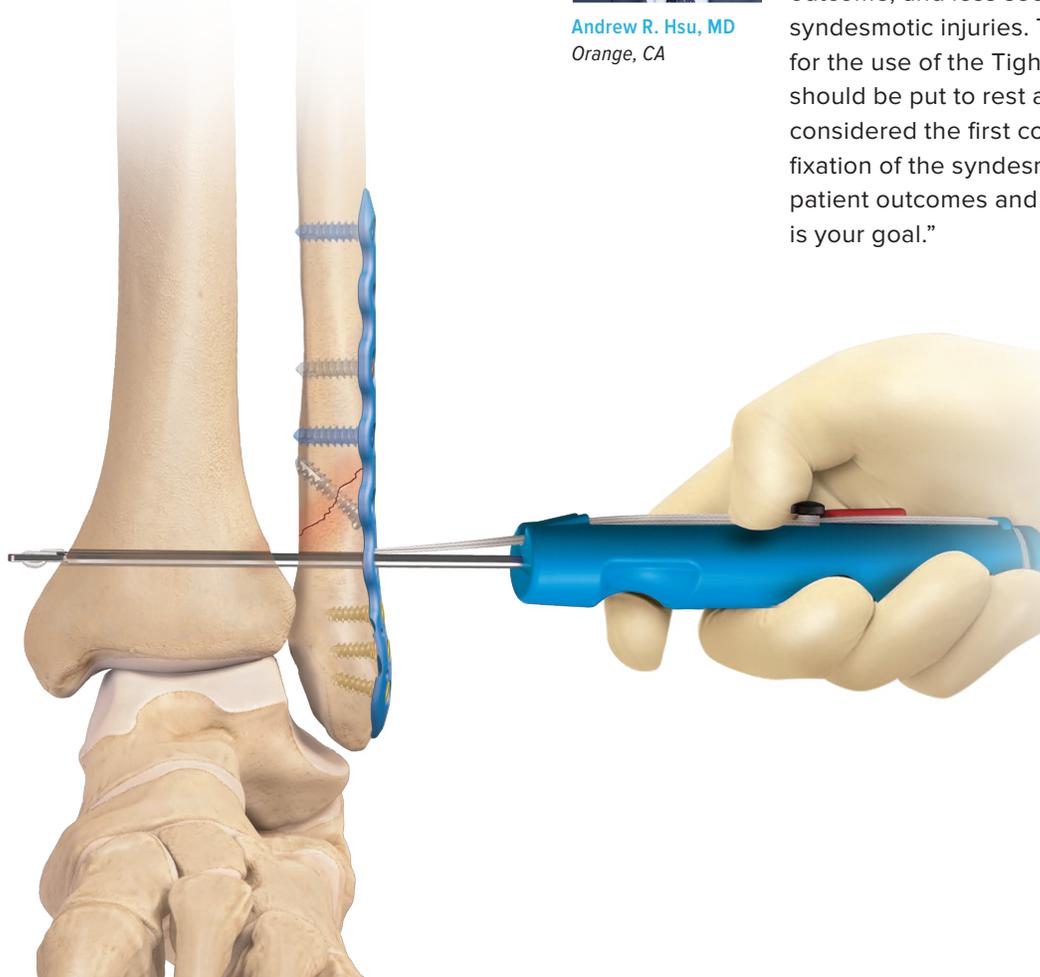
Anish R. Kadakia, MD
Chicago, IL

“As modern health care strives to follow evidence-based medicine to improve clinical outcomes, I think the evidence is clear that TightRope [implant] is the current gold standard for syndesmotic injuries. I treat my syndesmotic injuries with TightRope [implant] and I’m continually impressed by the outcomes I have seen across a diverse demographic of patients.”



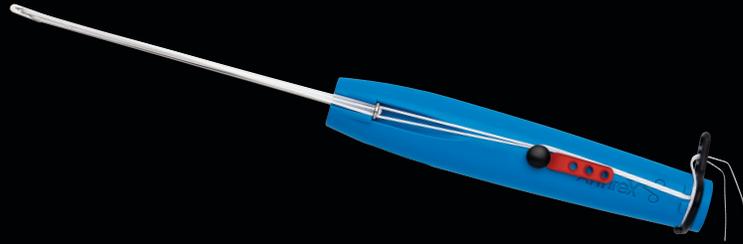
Andrew R. Hsu, MD
Orange, CA

“This meta-analysis supports my clinical experience and that of many surgeons who have used the TightRope. The level 1 evidence is clear that the TightRope [implant] allows for a significantly superior anatomic reduction, functional outcome, and less secondary surgery for syndesmotic injuries. The initial controversy for the use of the TightRope [implant] should be put to rest and it should be considered the first consideration for fixation of the syndesmosis if superior patient outcomes and anatomic reduction is your goal.”



Case Review

Syndesmosis Injury



Norman E. Waldrop III, MD

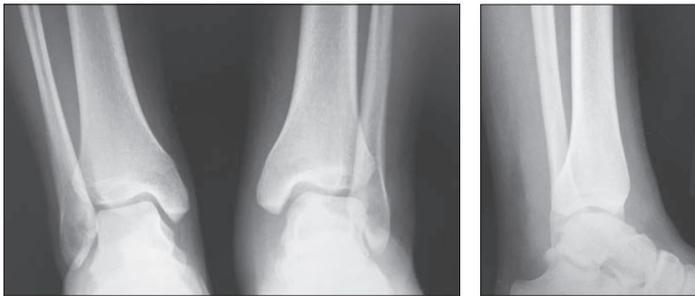
Surgical Stabilization Using Syndesmosis TightRope® XP Buttress Plate System

Presentation

A 20-year-old football player presented with an external rotational injury of the ankle around a planted foot. Pain with weightbearing was observed.

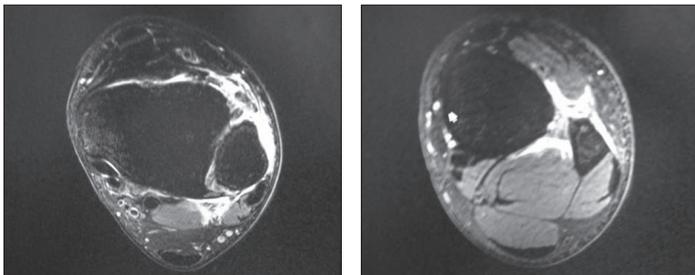
Physical Exam

The patient had pain over the anterior inferior tibiofibular ligament (AITFL). The tenderness extended 8 cm above the ankle. The ankle was tender to midshaft fibular squeeze test and there was significant discomfort with external rotation stress testing.



X-rays

Three views of the ankle, which included weight-bearing contralateral comparison views, did not reveal any fracture or widening of the ankle mortise. No fracture of the fibula around the knee was noted.

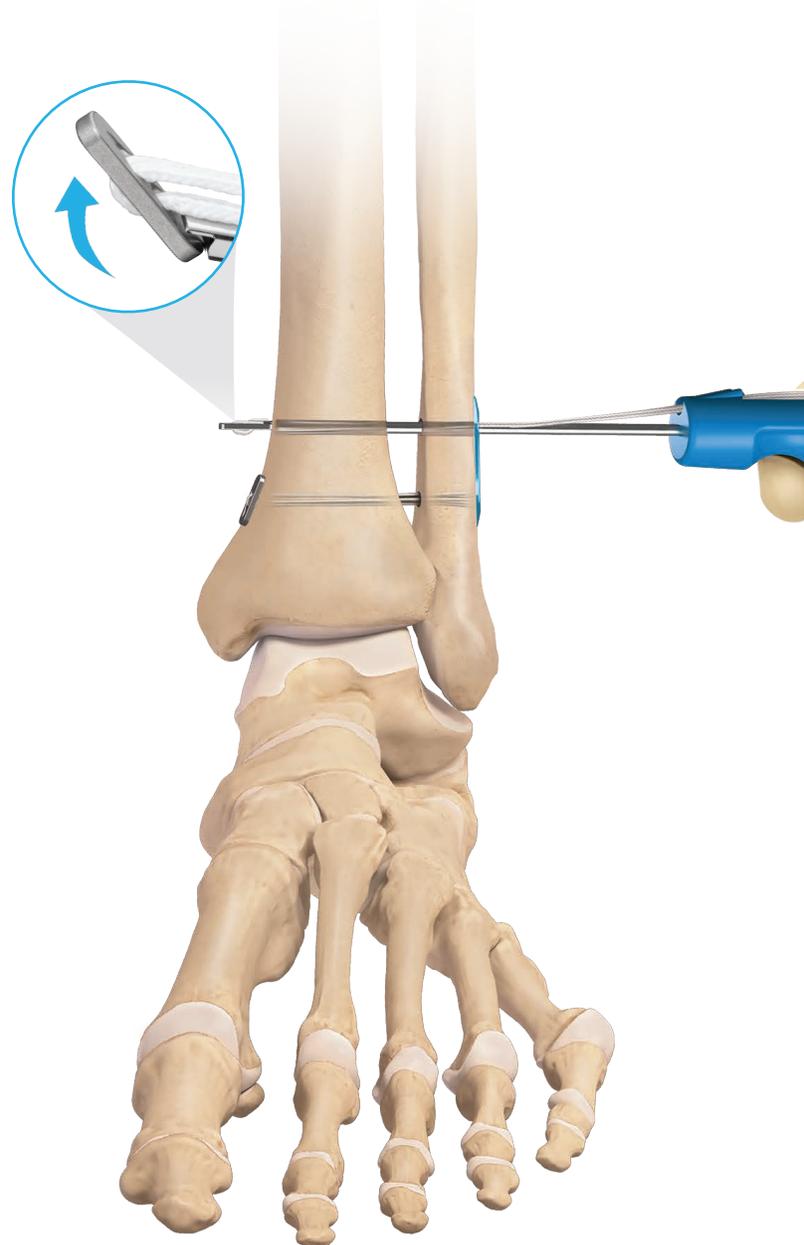


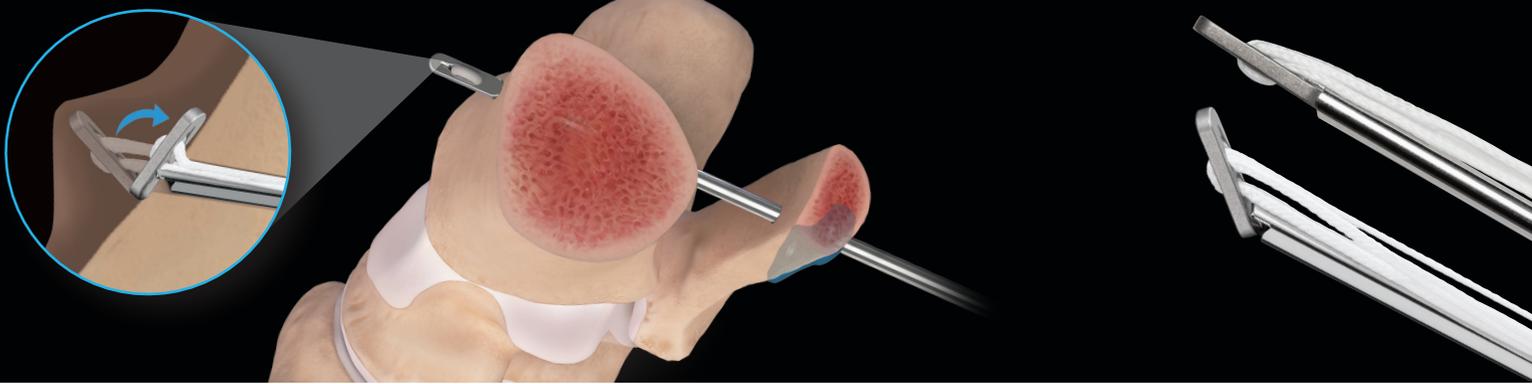
MRI

MRI was ordered due to a positive external rotation stress test and tenderness to palpation extending much greater than 5 cm above the ankle. MRI showed a complete tear of the AITFL, with significant injury posteriorly to the PITFL. There was also injury to the interosseous membrane, with edema and tearing extending to the top cuts of the MRI.

Decision Making

The literature has shown that dynamic instability occurs with two or more of the ligaments torn, which has occurred in this case. Given these findings, my recommendation was for stress fluoroscopy, examination under anesthesia, ankle arthroscopy, and repair of the syndesmosis.

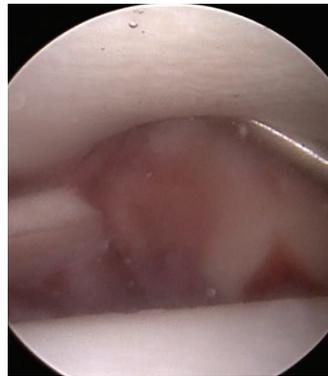




Surgical Stabilization Using Syndesmosis TightRope® XP Buttress Plate System (Cont.)



Stress fluoroscopy showed widening of the mortise with loss of the normal tibiofibular overlap and, in particular, increased posterior translation of the fibula with the external rotation stress test.



Ankle arthroscopy showed a torn AITFL and PITFL.

Syndesmosis TightRope XP Implant Technique

A small incision is made over the fibula. A Syndesmosis TightRope XP two-hole buttress plate is used. The two-hole plate serves as stress dissipater to spread the forces of lateral button out, decreasing the risk of fibular fracture through the drill hole. The incision is made to match the size of the plate. The position of the plate is based on the inferior TightRope implant placement. This Syndesmosis TightRope XP implant is placed about 1.5 cm proximal to the tibio-talar joint. The second, more proximal, Syndesmosis TightRope XP implant, is placed in a slightly divergent manner. The reduction, which is often performed with manual reduction, can be assessed with reintroduction of the arthroscopic camera.

Stress fluoroscopy is then performed after the repair to confirm stability of the joint. After closure, a JumpStart® dressing is placed over the wound.

Postoperative Protocol

The patient is given an intravenous dose of NSAID prior to discharge and placed in a cold compressive device. They are kept non-weight bearing for 3 days postsurgery with strict elevation. The patient is allowed to do active range-of-motion exercises to tolerance.

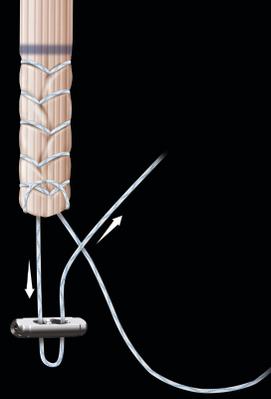
After 3 days, a weight-bearing progression is initiated in a CAM walker boot. The athlete is allowed to progress at their own rate, which typically takes another 3 to 4 days to become reasonably comfortable with a full weight-bearing gait. During this period, the patient is allowed to transition to an antigravity treadmill or underwater exercises with impervious dressings placed over the incisions. Once the gait has normalized, and there is no evidence of offloading the ankle, a transition to on-land activities may commence. It is vital for the surgeon to communicate with the physical therapists and athletic trainers during this transition.

This timeframe can vary widely with each case, so communication with patient and therapists is critical to avoid setbacks. A progression to cutting exercises and more explosive type activities with return-to-sport exercises can begin when there are minimal to no symptoms occurring with straight-ahead exercises. Typically, between weeks 3 to 5, the patient is safe to return to the field. When the patient can do 15 consecutive single-leg hops and pass a validated return-to-sport test, they can safely return to play.

It is important to understand that in order to maximize the outcome, treatment must continue even after the athlete has returned to the field. It is also important to remember that early return to play is secondary to the real benefit of the procedure, which is stabilization and restoration of the normal biomechanics of the ankle.

Case Review

Tension Slide Technique



David I. Pedowitz, MD

Tibialis Anterior Reconstruction

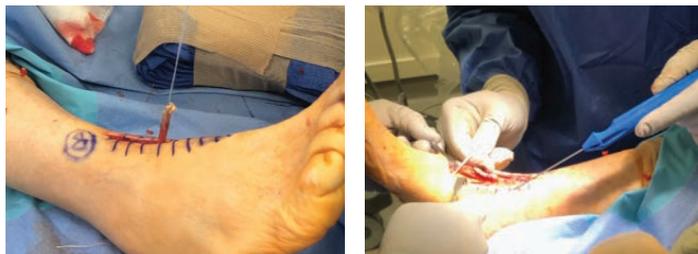
Presentation

A 64-year-old male tennis player felt a strain in his leg playing a match 6 weeks ago. Clinical exam and an MRI confirmed a tibialis anterior tendon rupture with retraction. With a desire to return to tennis and hopefully avoid long-term reliance on a brace, he elected to undergo a reconstruction with a tibialis anterior allograft.

Technique

The intention of the tension slide technique used here was to achieve a high time-zero strength to allow early weightbearing and prevent the stiffness and scar formation often seen with strict non-weightbearing and immobilization, which can limit ones functional return to sports.¹

Once debrided and sutured to the desired allograft, the ankle is dorsiflexed and the appropriate length of the graft is determined and cut to length. Using the tension-slide technique, the medial cuneiform is reamed to the size of the fashioned graft, just up to but not through the plantar cortex. Only the metal tab is advanced beyond the plantar cortex, which otherwise remains intact. The graft sutures are then threaded through the metal DXL button, which is inserted through the plantar cortex of the medial cuneiform. The graft is then tensioned into the cuneiform tunnel and fixed with a BioComposite Tenodesis screw. This allows the repair to hold against gravity and physiologic tension.



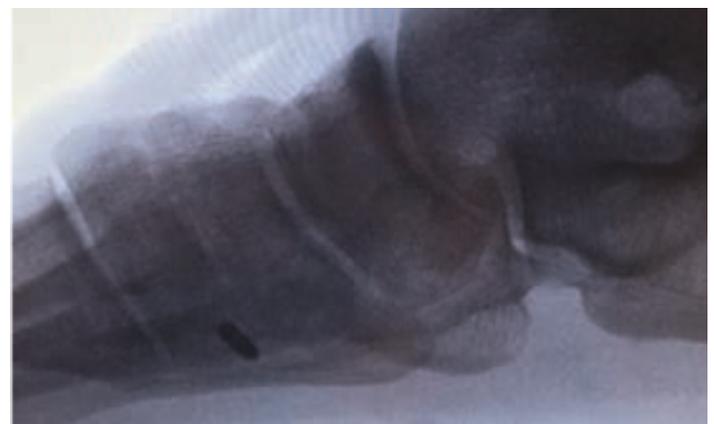
Postoperative Protocol

This patient was made non-weightbearing for 2 weeks, then weightbearing as tolerated in a boot until the 6th week, at which time physical therapy was initiated. He was back playing tennis at 3 months.

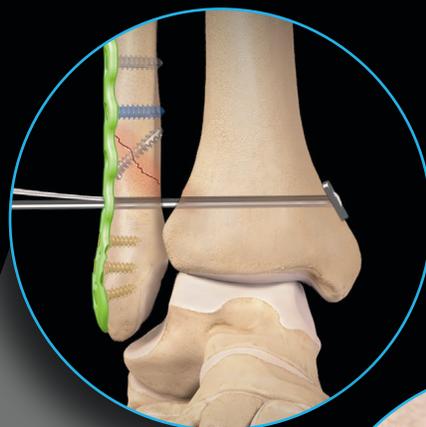
While these are not common injuries in the general population, they are seen with some regularity by all foot and ankle specialists. Compared to historical treatment, the tension-slide technique gives me the confidence that I have achieved as strong of a repair as possible. This allows my patients to bear weight early and to return to their desired activities sooner.

Reference

1. Sethi P, Obopilwe E, Rincon L, Miller S, Mazzoca A. Biomechanical evaluation of distal biceps reconstruction with cortical button and interference screw fixation. *J Shoulder Elbow Surg.* 2009;19(1):53-57. doi:10.1016/j.jse.2009.05.007



When You Treat Ankle Fractures . . .



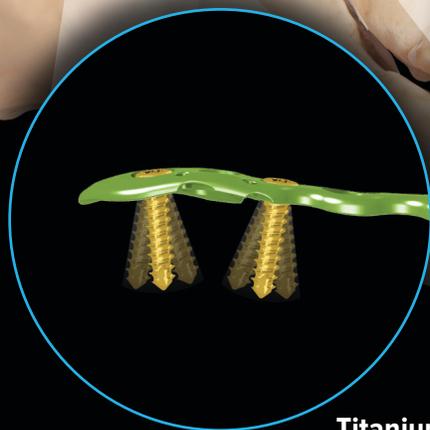
Syndesmosis
TightRope[®] XP
Implant System



DX FiberTak[®]
Anchor



AITFL *InternalBrace*[™]
Ligament
Augmentation



Titanium Ankle
Fracture Plate With
Variable Angle Locking

Think Arthrex.



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Distal Extremities Medical Education

Course Schedule

Upcoming Medical Education Events

Date	Course Name	Location
2019		
September 21	Foot and Ankle Minimally Invasive Surgery Course Level III (Morning Course)	Naples, FL
October 11-12	Foot and Ankle Orthopedic Technology and Innovation Forum	Naples, FL
October 18-19	Foot and Ankle Residents Symposium	Naples, FL
October 28	Foot and Ankle Minimally Invasive Surgery Course Level III (Morning Course)	Naples, FL
October 28	Foot and Ankle Minimally Invasive Surgery Course Level III (Afternoon Course)	Naples, FL
November 1-2	Foot and Ankle Symposium Level III	Naples, FL
November 11	Foot and Ankle Minimally Invasive Surgery Course Level III (Morning Course)	Naples, FL
November 11	Foot and Ankle Minimally Invasive Surgery Course Level III (Afternoon Course)	Naples, FL
December 6-7	Foot and Ankle Symposium Level III	Naples, FL
2020		
January 13	Foot and Ankle Minimally Invasive Surgery Course Level III (Morning Course)	Naples, FL
January 13	Foot and Ankle Minimally Invasive Surgery Course Level III (Afternoon Course)	Naples, FL
January 24-25	Foot and Ankle Summit Level III	Naples, FL
February 7-8	Foot and Ankle Trauma Course Level III	San Diego, CA
February 14	Foot and Ankle Cartilage Preservation Course Level III	Naples, FL
March 6-7	Foot and Ankle Revisions Summit Level III (MD/DO Only)	Naples, FL
March 13	Foot and Ankle Trauma Course Level III	Naples, FL



2018 Colorado Foot and Ankle Symposium



2019 Minimally Invasive Surgery Course Foot and Ankle Level III



2019 Foot and Ankle Revisions Summit Level III

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