Arthrex is pleased to announce that we have attended and sponsored the ACFAS national meeting for over 15 consecutive years and, again, we are proud sponsors of the American College of Foot and Ankle Surgeons. If you know Arthrex, you know Helping Surgeons Treat Their Patients Better™ is at the core of what we strive to accomplish every day. Just last year we had over 2861 DPM training days at Arthrex facilities, offering hands-on cadaveric and didactic training at one of our many state-of-the-art facilities. Arthrex has never been more supportive of the work you are doing and we are investing in growing foot and ankle as a surgical discipline.

Please come by Booth #601 and check in on whats new with Arthrex Distal Extremities. We look forward to seeing you at our new facilities when completed in 2019.

Pete Denove
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Arthrex, Inc.
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**FibuLock® Fibula Nail**

Combined with the TightRope® fixation system for the first all-inside ankle fracture repair.

- Innovative proximal talon fixation
- Compatible with the TightRope implant
- Minimally invasive

*FDA clearance pending

The views expressed in this handout reflect the experience and opinions of the presenting surgeons and do not necessarily reflect those of Arthrex, Inc. This is not medical advice and Arthrex recommends that surgeons be trained in the use of a particular product before using it in surgery. A surgeon must always rely on his or her own professional judgment when deciding whether to use a particular product when treating a particular patient. A surgeon must always refer to the package insert, product label and/or Directions For Use before using any Arthrex product. Postoperative management is patient specific and dependent on the treating professional’s assessment. Individual results will vary and not all patients will experience the same postoperative activity level or outcomes. Products may not be available in all markets because product availability is subject to the regulatory or medical practices in individual markets. Please contact your Arthrex representative if you have questions about availability of products in your area.
**DynaNite™ Compression Staple**

The DynaNite staple provides low-profile compressive fixation specifically engineered for Akin osteotomies. The DynaNite staple features:

- Low-profile, 1.0 mm bridge height
- Greater compression than competitor staples
- Staple is preloaded and is also reloadable for simple insertion
- Single-use disposable instrumentation
- Fourteen (14) sizes

DynaNite 20 mm x 20 mm Staple Exhibits 51% More Compressive Force Than DePuy Synthes SPEED™ 20 mm x 20 mm Staple

![Graph showing compressive force comparison between DynaNite and DePuy Synthes SPEED staples](image)

"SPEED™ is a trademark of DePuy Synthes"
Titanium Ankle Fracture System

- Comprehensive system combines anatomically contoured low-profile plates and screws and fracture-specific instrumentation
- Scalloped cutouts in the shaft to allow TightRope® button placement
- Fibula plates allow 30° of anatomic drilling for TightRope syndesmotic stabilization
- SutureTape eyelets incorporate the AITFL Internal Brace™ ligament augmentation repair
NEW PRODUCT HIGHLIGHT

**Syndesmosis TightRope® XP Implant**

The Syndesmosis TightRope XP implant system features a unique delivery mechanism that allows the user to insert a Syndesmosis TightRope implant without pulling a needle through the medial skin. The XP gives the user control to flip the medial oblong button below the skin for less soft-tissue interposition.
DX FiberTak® Suture Anchor

The DX FiberTak soft anchor offers several advantages compared to other suture anchor options. This anchor requires minimal bone removal prior to implantation using a 1.35 mm or 1.6 mm bone socket. This anchor is ideal for any soft-tissue repair about the foot and ankle and maintains a very high pullout strength considering the small profile of the anchor itself.²

5.0 mm/7.0 mm Compression FT Screws

*Compression when it counts*

- Headless, cannulated and titanium
- Continuous compression
- Completes the Compression FT family (total of 5 diameters and 91 lengths offered)
NEW PRODUCT HIGHLIGHT

Lisfranc InternalBrace™ Ligament Augmentation Implant System

Reduce and eliminate instability of the Lisfranc joint by augmenting the interosseous ligament with 2 mm collagen-coated FiberTape® suture fixed to the 2nd metatarsal base with button fixation and a knotless 4.75 mm SwiveLock® anchor in the medial cuneiform.³

- No second surgery for hardware removal
- Minimally invasive procedure
- Less joint disruption compared to screw fixation
- Knotless technique

Lisfranc InternalBrace Ligament Augmentation Implant System (AR-1698-CP) includes:

- 4.75 x 15 mm PEEK SwiveLock Anchor
- Collagen-Coated FiberTape Suture with Titanium Oblong Button
- Two 1.6 mm Suture Passing Guidewires
- 3.5 mm Cannulated Drill Bit
- Drill Guide with Metal Insert
Crossover toe, hammertoe deformity and second MTP joint capsulitis are a very common occurrence in a foot and ankle surgeon’s practice. Addressing the plantar plate pathology is paramount for successful treatment. I chose to use the Forefoot Internal Brace ligament augmentation for crossover toe due to the reproducibility of the procedure, as well as the stability afforded by the LabralTape™ suture. I feel reoccurrence of the deformity would be less likely. Internal Brace ligament augmentation repair has been very successful in other applications performed on my patients, such as spring ligament and ATFL augmentation. Utilization of the Forefoot Internal Brace ligament augmentation offers a stable construct in recreating the plantar plate. I am currently using the Forefoot Internal Brace ligament augmentation in patients with known plantar plate disruption, where using the native plantar plate would be less than optimal. Prior to Forefoot Internal Brace ligament augmentation, one would perform a flexor tendon transfer with marginal results.

I perform this procedure using the 3 mm x 8 mm PEEK Tenodesis screws for fixation on the proximal phalanx, as well as the metatarsal. Where the bone stock may be questionable, I will use a button on the proximal phalanx side. I opine at this time that a Weil osteotomy may not be necessary since the LabralTape™ suture would be less likely to fail as opposed to the native plantar plate due to 2nd metatarsal head pressure.

The innovation of plantar plate repair with the Scorpion™ suture-passer technique was a revolutionary augmentation to my practice with respect to crossover/hammertoe treatment. Presently, the Forefoot Internal Brace ligament augmentation repair will further strengthen treatment protocols for surgical correction of this very common foot deformity.

First Case

56-year-old female with long-standing second MTPJ pain in the left foot. The patient was treated by another physician for capsulitis vs neuroma; she received several injections, as well as immobilization. The patient continued with severe second MTPJ pain left foot.

Physical exam reveals a healthy female with second hammertoe deformity, severe contracture of the PIPJ left second toe with dislocation of the second MTPJ. Radiographs reveal severe hammertoe with dislocation of the second MTPJ.

On January 4, 2018, the patient underwent plantar plate repair with Internal Brace ligament augmentation with two 3 mm x 8 mm PEEK screws and LabralTape suture. The patient also had fusion of the PIPJ with the RetroFusion™ implant. See pre-op and post-op X-rays above (Fig. 1 and Fig. 2).

Second Case

64-year-old female with hallux valgus, hammertoe deformity of the second toe and subluxation of the second MTPJ right foot. Conservative treatment failed so the patient underwent an osteotomy of the 1st metatarsal, repair of the second MTPJ, plantar plate repair with Internal Brace ligament augmentation using LabralTape™ suture, one 3 mm x 8 mm PEEK screw and a cortical button. The patient also underwent arthrodesis of the second toe with a RetroFusion implant. See pre-op and post-op X-rays below (Fig. 3 and Fig. 4).
**SURGICAL TIPS AND PEARLS**

**Ankle Fusion**

The titanium ankle fusion plating system provides a complete solution for ankle fusion management with a comprehensive offering of anatomic-specific plates available for either tibiotalar or tibiotalocalcaneal arthrodesis. A variety of screw options, including locking, nonlocking, cortical, cancellous and hybrid designs are provided to address all fixation needs.

**Q. How do you determine your patient selection for arthroscopic procedures vs plating?**

**A.** I prefer arthroscopic ankle fusion for many of my patients with severe ankle arthrosis. However, patients with obesity, osteopenic bone, questionable compliance level, rigid or severe deformity, presence of large periarticular cystic lesions, severe neuropathy, and revisions are not typically candidates. Fortunately, the Arthrex plating system is designed for these more difficult patients. My most common approach for an isolated open ankle fusion is to use the anterior plate. If the anterior soft tissues are compromised, I use a lateral plate. I typically use a combination of compression screws with a low-profile anterior plate to facilitate earlier weightbearing and fusion.

**Q. How do you determine your patient selection for arthroscopic procedures vs plating?**

**A.** When ankle fusions fail using plate fixation, it is often the talus fixation which is compromised. One of the unique features of the anterior plate is the ability to adequately fixate the talus using 4 screws. The plate is designed to provide compression across the joint via eccentric proximal drilling and the robust 5.5 mm compression screw through the plate.

**Q. What are some of your technique tips for deformity correction on both arthroscopic and open procedures?**

**A.** We all like to see an arthritic ankle with no deformity. Unfortunately, this is not always the case. The ability to correct deformity is an important part of performing ankle fusions as under- or overcorrected fusions are not tolerated well. One pearl I’ve found helpful when deciding if a deformed ankle is a candidate for arthroscopic fusion is to stress the patient preoperatively under live fluoro. If I’m able to manually reduce the ankle into a neutral position, an arthroscopic fusion is a viable option.

**Example above demonstrates manual reduction of frontal plane deformity to neutral position under fluoroscopy.**

Frontal plane deformity is more amenable to arthroscopic correction and fusion than sagittal plane deformity. If the deformity is within the talus, I can address this arthroscopically using power instrumentation. However; distal tibial deformity is better corrected via an open approach. I always use several instruments in preparing the joint arthroscopically. Some of my favorites are the arthroscopic PoweRasp™ bone cutter, Torpedo™ shaver blades, PowerPick™ device and the instruments in the arthroscopic tray such as the currettes and small angled osteotomes. I also find using the GPS targeting guide helps to seat the guidewires across the fusion correctly the first time. After prepping the joint arthroscopically, I manually reduce the deformity back to a neutral position and hold this position using K-wires.
WHAT’S IN MY BAG?

5.0 mm Large and 7.0 mm X-Large Compression FT Screws

Q. You have many options for fixation of your hindfoot fusions. Can you explain what you chose and why?

A. I have been using the 2.5 Micro Compression FT™, 3.5 Mini Compression FT™ and 4.0 Standard Compression FT headless screws for 3+ years. I was impressed with the amount of compression in my midfoot fusions and other forefoot procedures. I loved the fact that I was not having patients complain of painful hardware and my union rate for difficult fusions improved. I was waiting for a larger diameter screw to assist me with my hindfoot procedures. For example, there were circumstances where I would consider using a plate to fixate calcaneal osteotomies because I did not want to violate the heel pad and have a prominent screw head. The 5.0 mm Large and 7.0 mm X-Large Compression FT screws allow me to fixate larger osteotomies and fusions and not worry about prominent hardware thus leading to improved surgical results.

Q. What are some indications for which you would use headless Compression FT Screws?

A. My primary procedures that I use the 5.0 mm Large and 7.0 mm X-Large Compression FT screws are listed below.

1. Medial or lateralizing calcaneal osteotomy: I generally use (2) 5.0 mm Large headless Compression FT screws (depending on patient size)
2. Subtalar joint fusion: (2) 7.0 mm X-Large headless Compression FT screws
3. Ankle fusion: (3) 7.0 mm X-Large headless Compression FT screws (arthroscopic ankle arthrodesis)
4. Ankle fusion with deformity: Arthrex anterior ankle fusion plate with (1) 7.0 mm X-Large headless Compression FT screws
5. Talonavicular Fusions: (1) 5.0 mm Large headless Compression FT screws and (2) 4.0 mm Standard headless Compression FT screws

Q. What are some technical pearls you have learned and can share with your peers?

A. One of the best things about these screws is the surgical technique is very straightforward and easy. That being said, there are a couple of learning points that have improved my efficiency in the OR. First, one must understand that the cannulated depth gauge measures the length of the K-wire in the bone and does not account for compression or any countersinking. The surgeon needs to take that into account and often subtract approximately 3 mm-5 mm. This ensures that the screw head will be below the surface of the bone. Second, in hard bone you should always use the profile drill. The profile drill helps lower insertion torque and allows the head to sit flush to the bone. I do not use the profile drill when I am fixating a calcaneal osteotomy or subtalar joint fusions. My concern is that the profile drill will plunge into the cancellous bone of the calcaneus but using the drill guide will prevent this from happening as well. I have placed numerous screws without using the profile drill for these 2 procedures with great success. Lastly surgeons should prepare the bone with the straight drill and drill the entire length of the screw. The screw will advance much easier and there will not be as much torque on the bone thus allowing for optimal compression.

Q. Can you discuss how the 7.0 mm X-Large headless Compression FT screw has changed your constructs for ankle fusions?

A. When it comes to fusion of the tibiotalar joint, I approach with 2 different constructs. If there is not much deformity I believe in arthroscopic ankle fusions. Before the launch of the 7.0 mm X-Large Compression FT screw, I would use three (3) 6.7 mm headed cannulated screws and inevitably there would sometimes be prominent hardware issues leading to a second surgery. With the 7.0 mm X-Large headless Compression FT screws, I am much happier with the added compression and there is virtually no need for hardware removal. I have also incorporated them in my fusions with deformity as I am now incorporating one (1) 7.0 mm X-Large Compression FT screw in addition to the Arthrex anterior ankle fusion plate.
Q. Why would you use the AITFL Internal/Brace ligament augmentation repair with a syndesmosis injury?

A. I think the biggest use of the AITFL Internal/Brace ligament augmentation repair is in the presence of residual instability of the syndesmotic complex following placement of the TightRope® implant. This is primarily seen as an external rotatory instability and this is less frequently coupled with posterior translational instability (Fig. 1a, 1b). In certain injury patterns (particularly PER 4 injuries or fracture/dislocations with high-grade soft-tissue disruption of the deltoid and syndesmosis) despite rigid fracture fixation, there may be some excessive fibular motion identified during intraoperative external rotation stress test. There has always been a focus on the reduction/fixation of malleolar fractures but we are certainly evolving into ligament restoration in an effort to “fine tune” the construct to regain the preinjury stability. A recent study by Clanton has provided new information about the individual ligaments of the syndesmosis and their physiologic role, particularly the AITFL. Based on this study and Michelson’s work on the importance of the deltoid, there is a greater appreciation of the importance of the soft tissues in the overall stability of the mortise. This knowledge has lead to a surgical focus on ligament reconstruction in rotational ankle fractures with the hopes to improve long-term outcomes.

More specifically, my personal use of AITFL Internal/Brace ligament augmentation are PER 4 injuries, fracture/dislocations, injuries where the soft-tissue component is significant (deltoid and syndesmosis) or any time instability is identified by intraoperative stress maneuvers. Generally, I will load the FiberTape® suture into the eyelet of the distal fibula plate prior to securing it with screws to the fibula (Fig. 2). This is primarily a time-saving effort as it is harder to pass the FiberTape suture once the plate is mounted. Following stabilization of all osseous injuries, an external rotation stress is performed under both fluoroscopic evaluation and visual inspection. Often times, rotation of the fibula is not identifiable on dynamic fluoroscopy and requires direct palpation or visual inspection during testing. Even if the syndesmosis doesn’t allow lateral talar translation, the fibula may still demonstrate movement similar to that of a door hinge. If the anterior syndesmosis opens up much like a book, it should be stabilized with the Internal/Brace ligament augmentation. More frequently, small degrees of abnormal motion are seen after syndesmotic fixation (Fig. 3). In these situations, the syndesmosis is anatomically reduced, temporarily pinned and the AITFL Internal/Brace ligament augmentation is appropriately tensioned (Fig. 4). The ankle is then stressed again and carefully evaluated. I will typically perform a valgus stress test to evaluate the competency of the deltoid complex. If medial instability is identified, my preference is to repair the deltoid with an anatomic Internal/Brace ligament augmentation technique (Fig. 5).
Q. What are some of your tips/pearls for AITFL?

A. The most important tip is the continual evaluation of the stability of the syndesmosis and medial ankle. I am using the AITFL approximately in 50%-60% of rotational ankle fractures, so not every patient is a candidate for this technique. Secondly, just like with the Internal Brace ligament augmentation for lateral ankle instability, tensioning plays an important role. I believe it is possible to create an internal rotation malposition of the fibula with significant overtensioning. I am unaware if there is any negative clinical outcome associated with this, but the whole concept of the repair is to restore the preinjury anatomy and strength of the ankle joint.

Q. What is your rehab with AITFL InternalBrace ™ ligament augmentation and TightRope ® suture compared to syndesmotic screws?

A. The rehabilitation is largely determined by the magnitude of the injury and the ratio of soft tissue to bone disruption. For example, I am more cautious with a PER 4 fracture that has a completely disrupted syndesmosis and deltoid. The injury’s outcome will largely depend on the quality of soft tissue repair/healing which is often unpredictable. The biggest benefit of InternalBrace ligament augmentation is the long-term maintenance of the stability until the soft tissue strengthens which can take 6-9 months. With that being said, I am more aggressive with earlier weightbearing protocols using the AITFL InternalBrace ligament augmentation versus traditional screws. The major issue, in my opinion, with screw fixation is hardware loosening or failure during the soft-tissue healing phase which ultimately leads to latent diastasis which is incredibly hard to fix and has a significant negative impact on tibiotalar contact characteristics leading to uneven chondral wear/degradation.
CASE REVIEW

InternalBrace™ Ligament Augmentation — ATFL

Patient #1

An 18-year-old female presented complaining of instability and rolling her ankle every couple of weeks. She failed conservative treatment and opted for surgical repair. The patient underwent a modified Brostrom-Gould procedure using 2 bone anchors in the fibula. Patient was non-weightbearing for 3 weeks and in a boot for an additional 3 weeks before starting physical therapy around 6 weeks postoperatively. She recovered well and was happy with her repair. She returned to activity with no restrictions. She did well until 12 months later when she accidentally tripped off a treadmill and rolled her ankle. Two weeks later the patient presented saying she could feel the ankle had “loosened” and “wasn’t the same.” Upon clinical exam, obvious swelling was noted to the lateral aspect of the ankle. She was in a lot of pain with palpation to the lateral ankle ligaments. She was very guarded upon stress maneuvers. No signs of syndesmosis injury were noted. MRI was obtained which confirmed complete disruption of both the anterior talofibular ligament (ATFL) and calcaneal fibular ligament (CFL). Patient was offered conservative treatment and ultimately ended up opting for revisional surgical stabilization. A Brostrom procedure was completed including an InternalBrace ligament augmentation. Patient healed well and is now in her 6th year postsurgery.

Patient #2

A 44-year-old female presented with complaints of ankle instability. The patient reported 2 significant inversion-type injuries while playing volleyball in college. Since that time, she reports trying to stay active and exercise, but her ankle frequently rolls and gives out on her. She enjoys trail running and has several types of ankle braces. Patient underwent several rounds of formal physical therapy attempting to strengthen her ankle and uses custom-made orthotics. After exhausting conservative treatments, she opted for ankle stabilization with an InternalBrace ligament augmentation.

Preoperative radiographs demonstrated an avulsion fragment on the anterior aspect of the distal fibula. Clinical exam revealed obvious instability with anterior drawer maneuver as well as inversion stress test. No signs of syndesmotic instability were identified, and the patient did not have hindfoot varus or cavus foot structure. MRI demonstrated complete tear of the anterior talofibular (ATFL) with scarring at the avulsion fragment and partial tear of the calcaneal fibular ligament (CFL). No peroneal pathology was identified.

Patient underwent an ankle arthroscopic debridement, after which a longitudinal utility incision was made on the lateral aspect of the ankle. The avulsion fragment was completely excised preserving as much of the residual ATFL tissue as possible. Two bone anchors were placed at the anterior face of the distal fibula and a standard modified Brostrom-Gould procedure was completed. The repair was augmented with an InternalBrace ligament augmentation using a 4.75 mm SwiveLock® anchor in the talus, and a 3.5 mm SwiveLock anchor in the fibula with interposing FiberTape™ suture over top of the repaired ligaments.

Patient was allowed to weightbear at 3 days postoperatively in an immobilization boot. Her postoperative course was uneventful. She transitioned into regular shoes, a brace and physical therapy at 4 weeks and was discharged around 12 weeks with no restrictions and returned to exercising and trail running.

Four years later, the patient called the office saying she had severely rolled her ankle when she slipped off a curb, and was unsure if she had damaged the ankle. Upon presentation, the patient reported some soreness on the outside of her foot. Clinical exam however revealed no ankle swelling and no pain with palpation to the lateral ankle ligaments. After thoroughly testing the lateral ankle with stress maneuvers, no instability could be identified. She did have some tenderness with palpation to the extensor brevis muscle belly further distal on the dorsal lateral aspect of the foot, but no pain to the ankle itself. Radiographs were negative, and the patient was encouraged to rest, ice and use anti-inflammatory medications. Within 10 days, she was back to regular activity.

This case not only demonstrates the ability of the InternalBrace ligament augmentation to allow early weightbearing and rehabilitation, but in contrast to Patient #1, reinforces its capacity to help protect the ATFL long-term. This patient recovered well initially, but as is the case for many people, an unexpected ankle injury may occur at some point in the future. If this occurs, unprotected ligaments are likely to be torn again and a revision may be necessary; the remaining tissue is typically less viable and less amenable to direct repair. I have learned through these and other similar cases, it is well worth augmenting my Brostrom repair with the InternalBrace ligament augmentation, helping to provide serious protection to the ATFL for years to come.
Q. What lateral ankle procedures do you currently use in your practice?

A. I use the open Brostrom with InternalBrace™ ligament augmentation, the ArthroBrostrom® technique, the allograft lateral ankle reconstruction and the ArthroBrostrom with InternalBrace ligament augmentation (extra-articular).

Q. Is one procedure superior to the others?

A. I would argue that the open Brostrom with InternalBrace ligament augmentation is the ideal lateral ankle stabilization. Results are excellent, patient satisfaction is high, and the technique is straightforward and reproducible. The short- and long-term benefits of this procedure make it the all-around ideal lateral ankle stabilization solution.

Q. What is your postoperative protocol?

A. Typically, I allow weightbearing at 3 days postoperatively for most procedures. I extend non-weightbearing (NWB) time for patients over 250 lbs, osteopenic, elderly, the allograft lateral ankle (6 weeks NWB) and as other concomitant procedures require.

My typical postoperative protocol for a healthy individual undergoing an open Brostrom with InternalBrace ligament augmentation is 3 days NWB, 3 weeks in a cam walker boot, and weightbearing as tolerated. At 3-4 weeks the patient transitions into regular shoes, a brace and starts formal physical therapy. Return to sport is around 8 weeks depending on the sport. I am comfortable allowing earlier weightbearing, transition into shoes and motion/therapy knowing the InternalBrace ligament augmentation is helping to protect my repair.

Q. How do you decide which procedure to perform?

A. Open Brostrom with InternalBrace ligament augmentation – My favorite procedure is an open Brostrom using the InternalBrace ligament augmentation. This is my go-to procedure for chronic lateral ankle instability. I perform this procedure 10:1 to other lateral ankle procedures. Unless the fibular physis is open, I no longer perform open Brostrom without adding the InternalBrace ligament augmentation.

ArthroBrostrom® – Before the InternalBrace ligament augmentation, this was my primary lateral ankle procedure. This is an attractive procedure because it is minimally invasive and results in virtually no swelling postoperatively. However, with the introduction of the InternalBrace ligament augmentation, I cannot justify leaving the patient without protective augmentation. So, when do I perform the ArthroBrostrom technique? When treating intra-articular pathology, I commonly encounter partial ATFL tear on MRI. Instability may not be the patient’s primary complaint however, a partial ATFL tear often causes subtle instability within the joint. In this scenario, it may not be necessary to perform a formal open Brostrom repair. This is when I use the ArthroBrostrom technique to repair the ATFL; as it is easily completed during the arthroscopy portion and remains minimally invasive while ultimately decreasing strain and sheer on the repaired defect.

Allograft lateral ankle – Fortunately, I rarely need this procedure as it requires using a graft, up to 6 weeks of NWB, and typically results in longer term swelling and stiffness. On occasion however, patients will present with incongruent ankle varus without arthrosis. This usually necessitates an allograft in combination with other procedures to bring the ankle back into position.

ArthroBrostrom technique with InternalBrace ligament augmentation (extra-articular) – It is possible to combine all the benefits of the InternalBrace ligament augmentation and the ArthroBrostrom procedure. I highly recommend keeping the brace outside the joint. I first place the InternalBrace ligament augmentation in the talus under arthroscopic visualization. The ArthroBrostrom technique is then completed, after which FiberTape® suture is passed outside the joint, subcutaneously over the repair and a small incision made on the anterior fibula. With the foot in 30° plantarflexion, the FiberTape suture is secured in the fibula. Surgical time is a little longer with this, but for smokers or high-risk incision patients, this technique works well.
WHAT’S IN MY BAG?
Advantages for Posterior Plating of Fibula Fractures

Nicholas Todd, DPM

Q. Surgeons most commonly use the lateral approach for fibula fractures. Why do you fix some fibular fractures from a posterior approach?

A. First off, the most important aspect of treating fibular fractures is proper anatomic reduction (restoring the mortise). Foot and ankle surgeons are trained with a standard lateral approach due to the ease of fixation placement. What surgeons must understand is that placement of hardware has biomechanical implications. Numerous studies have shown that posterior plating of the fibula is biomechanically superior with a higher torque to failure when compared to lateral plating. I have also found that establishing proper fibular length is technically easier from a posterior approach as the surgeon can key in the posterior spike to its anatomic location.

Q. What are some situations for which you would use posterior lateral/posterior fibular plates?

A. When I first started using the posterior fibular plates, I reserved this for fixating the posterior malleolus. The posterior corridor made placing a posterior plate extremely easy. As I became more confident with the surgical approach, I began to understand that for isolated fibular fractures or bimalleolar ankle fractures, the incision was not much different than the standard lateral approach. I now routinely perform a slightly posterior lateral incision. I will carefully create a plane between the peroneals and the fibula. This surgical plane gives me visualization of the posterior spike and simplifies the reduction.

Q. Any tips and pearls for posterior lateral and posterior plating?

A. There are numerous morphologies of fibular fractures and one must understand the mechanism before applying fixation. With standard Weber B ankle fractures, I often use a posterior lateral plate and will incorporate the lag screw through the plate. With comminuted fibular fractures with segmental bone loss, I often employ a posterior plate. I will fixate the most distal fragments with locking screws and will employ a push/pull technique to restore fibular length. Often with these fractures, I can’t use an interfragmentary screw so bridge plating is needed.

Figure 1A. Pre-op AP ankle of a patient treated with a posterior fibula plate
Figure 1B. Pre-op lateral ankle of a patient treated with posterior fibula plate
Figure 1C. Post-op AP ankle of a patient treated with a posterior fibula plate
Figure 1D. Post-op lateral ankle of a patient treated with a posterior fibula plate

2.7 mm screws
Q. There are numerous fibular plates on the market. Why do you use the Arthrex ankle fracture system?

A. Several key features differentiate the Arthrex ankle fracture system. First, the anatomic posterior lateral fibular plate decreases the soft-tissue disruption by its posterior to lateral bend. On the posterior lateral and posterior fibular plates, multiple distal screws can be used from posterior to anterior to capture comminuted fracture fragments. The screws are zero profile so the surgeon will not have to worry about peroneal irritation. Finally, the new posterior lateral plates have a screw tab so that surgeons can use a TightRope® implant to fixate syndesmotic injuries through the plate.

Q. How has using a posterior plate changed your postoperative management?

A. For isolated fibular fractures, I will walk the patient in a weightbearing cast at 10 days due to the biomechanical stability afforded by the Arthrex posterior plate. I will progress them out of a weightbearing cast at 6 weeks. I will limit the amount of external and internal rotation at therapy for another 3 weeks and feel confident in return to activity at 8 weeks.

With a traditional lateral plate, I would have the patient non-weightbearing for at least 6 weeks before ambulation. With the increased speed in recovery, the patient is able to return to activity and is able to resume range of motion much sooner.

Q. Can you comment on your own clinical experiences and patient results?

A. I have been using the posterior lateral and posterior plates for close to 2 years. I have used them in comminuted fractures as well as more straightforward Weber B fractures. I feel more confident in the strength of my construct for comminuted fractures due to the biomechanical superiority of posterior plates. The approach is reproducible, the hardware makes biomechanical sense, and patients have had improved outcomes.
I have had the privilege of using the Arthrex Dorsal Midfoot Fusion Plate on several patients. For midfoot tarsal metatarsal fusions, there is no better option in the marketplace. I have had success with this plate on many cases. This plate has been designed to sit anatomically about the 2nd and 3rd tarsal metatarsal joints. It has several fixation options for this location to account for any anatomic variations. There are proximal locking holes and/or nonlocking holes to set the plate up for stable proximal fixation. There is a new hybrid screw that has a 3.5 mm screw shaft with a 3.0 mm variable angle locking head which allows for superior fixation and fit for cuneiform fixation given its characteristic morphological shape. Once locked into the cuneiforms, the compression hole on the plate distally can be used for compression and will bring the plate flush down to bone. Then, the distal locking holes can be filled for additional rigidity. The plate is very low profile for this area, which has often been a problem traditionally. Once fused, I doubt hardware removal will become necessary here given this anatomic fit and fixation.

Another thing I appreciate about the plate is the construct length. Compared to traditional fixation methods (i.e. compression screws, straight plates, etc.) this construct length provides for more of an ability to load the joints early. With adequate fixation and bone stock, I will mobilize and begin weight-bearing at 2 weeks post-op because I know that the plate can be trusted given its length. There are 3 sizes available for any size of midfoot tarsal metatarsal relationship you may encounter. This plate also works well with other Arthrex lapidus fusion systems when a fusion is also needed at the 1st tarsal metatarsal joint, which is often the case. Beyond reconstructive midfoot fusion cases, the plate can also be reliably used for Lisfranc fracture dislocation cases where a fusion would be most beneficial for the patient.

I have found the Arthrex Dorsal Midfoot Fusion Plate a welcome player in my midfoot arsenal to tackle 2nd and 3rd tarsal metatarsal fusions. As we look to the future of fixation, I see more site-specific fusion options to become available that allow us to reliably and reproducibly fixate joints for fusion and early active mobilization.

Case 1: Pre-op and Post-op (HAV and 2nd and 3rd tarsal metatarsal arthritis)
Case 2: Pre-op and post-op (primary arthritis of the 2nd and 3rd tarsal metatarsal joints)

Case 3: Pre-op and post-op (failed prior fusion)
Q. As a surgeon with many choices in soft-tissue anchors, what intrigued you to trial the DX FiberTak anchor compared to other traditional fixation options?

A. Smaller fixation with superior pullout strength is an intriguing quality in a suture anchor that foot and ankle surgeons should seek. Additionally, the DX FiberTak anchor uses a smaller drill size resulting in minimal bone removal for insertion.

Q. Have you used an all-suture anchor before? Any comments on how the FiberTak anchor performs compared to the competition?

A. Yes. Although there are similarities, my experience and confidence with #1 FiberWire® suture in combination with superior pullout strength gives the DX FiberTak anchor the performance edge on its competition.

Q. What are the most common procedures where you are implanting DX FiberTak anchors? Any specific procedure where it truly changed your surgical approach or outcomes?

A. I am currently using the DX FiberTak anchor with:

1. Brostrom lateral ankle stabilization procedures in combination with the InternalBrace™ ligament augmentation repair
2. Kidner procedures
3. Peroneal subluxation procedures

Particularly with the Brostrom procedure, the combination of the DX FiberTak anchor and InternalBrace ligament augmentation repair has allowed even more confidence with early weightbearing.

Q. What are some pearls you have learned that you can pass along to your peers regarding the DX FiberTak anchor?

A. Once you have drilled, steady the guide with 2 hands as your assistant taps the anchor in. Since the drill hole is so small, this ensures stability and proper direction as the anchor is inserted.

Q. What are the key features of the DX FiberTak anchor?

A. There are several key features that should put this anchor in the forefront of fixation options for ligament and tendon procedures:

1. Ease of insertion and maneuverability
2. Smaller footprint in bone allows for more confidence in earlier weightbearing and additional anchors if needed
3. Decreased risk of intra-articular excursion
4. Minimal bone resection
5. Superior pullout strength (see photos)

Note: In the photos below I am literally lifting the entire weight of the leg off the table by pulling on a single DX FiberTak anchor. Having even more confidence in earlier weight bearing with my lateral ankle stabilization has been one of the many features I have loved about the combination of the DX FiberTak anchor and InternalBrace ligament augmentation.
Q. What type of fracture pattern/injury did your patient have?

A. The FibuLock fibula nail can be considered in patients who have sustained a Weber B or Weber C fracture. Those patients with avulsion fractures of the distal fibula or highly comminuted fractures may do better with traditional plating techniques.

Q. Considering this was a high-energy type of fracture did you have any concerns or challenges (soft tissue/incisions)?

A. In high-energy tibia and fibula fractures, we are dealing with both osseous as well as soft-tissue injuries. The soft tissues have to be respected and incision placement and timing of surgery are all important factors to consider. The FibuLock fibula nail is an excellent option for initial stabilization of the fibula fracture along with delta frame external fixation as an initial procedure. The FibuLock fibula nail can be inserted with extremely small stab incisions and stabilize the fibula before external fixator placement. This allows for less trauma to the extremity and less swelling than we would see with a traditional open incision.

Q. How did you determine nailing vs plating?

A. This is done based on fracture pattern and location of the fracture. Again, the FibuLock fibula nail is ideal for Weber B fractures and lower Weber C fractures of the fibula. If there is extensive comminution of a fracture or a Weber A fracture, then traditional plating may be a better option.

Q. What are the benefits of the FibuLock procedure?

A. Minimally invasive procedure, soft tissue sparing, fast, reproducible and potentially allows for earlier weightbearing due to the load sharing ability of intramedullary nails.

Q. Are there any important surgical tips and pearls that you would pass along?

A. The FibuLock fibula nail is inserted under fluoroscopic guidance. It is important to make sure the fibula is reduced before any wires are inserted from the distal tip of the fibula. I will often use 2 small pointed reduction clamps percutaneously to reduce the fibula. My first clamp is placed distally on the fibula to bring it back out to anatomical length and most of the time I am internally rotating the distal fragment back into anatomic position. My second clamp is then placed more proximal percutaneously and with the handle toward the knee to keep the fracture reduced and so the extramedullary jig won’t hit the clamp when the nail is being inserted. If reduction is difficult, a small stab incision can be made as well to reduce the fibula. In addition, when wires are being inserted, it is important to use the oscillating option on the wire driver so that the pointed tip of the wire does not engage the cortex of the fibula. In the FibuLock fibula nail set, there is an instrument called the fracture finger which can be used to help reduce the fracture from the intramedullary canal as well as help pass the initial guide wire up the canal if it abuts the cortex and is difficult to pass above the fracture site.

Q. How has the FibuLock fibular nail impacted your practice/way you treat patients?

A. The FibuLock fibula nail has been a game changer in my high energy tibia and fibula fractures. I am able to stabilize the fibula with a minimally invasive technique, apply an external fixator and allow soft tissue swelling to resolve before definitive repair of the tibia. In addition, placement of incisions is less of a concern when dealing with a staged fracture repair. The FibuLock fibula nail is inserted with such a minimal incision it leaves many options for later tibia incisional placement.

With the load-sharing benefit of the FibuLock fibula nail, I have been walking my fibular fractures with syndesmosis repairs much faster than with traditional plating techniques. I will use the FibuLock nail for the fibular fracture and the syndesmotic TightRope® suture through the nail to stabilize the syndesmosis.* I am comfortable with protected weightbearing at 10-14 days postoperatively and have had excellent outcomes with this protocol.

*FDA clearance pending
Case 1

37-year-old female fell at a county fair

Initial X-rays

Note the fibula has been brought out to length and internally rotated into anatomical position. The FibuLock fibula nail has been inserted with nice reduction of the fibula and tibia.

Temporary external fixation with the ArthroFX™ external fixator allowed the soft tissues to calm down. A CT was ordered for preparation of definitive ORIF of the tibia.

After definitive ORIF of the distal tibia with the Arthrex pilon set.
Case 2

34-year-old male who fell off a horse

AP and lateral films. The distal medial tibia is highly comminuted with multiple vertical fracture components.

Initial treatment consisted of placement of a FibuLock® nail and ArthroFX™ external fixator to allow the soft tissue edema to settle down before definitive ORIF of the tibia.

Two weeks following definitive ORIF of the distal tibia and removal of the external fixator. The patient went on to heal uneventfully.

CASE 3

56-year-old female who fell while playing tennis

AP and lateral views showing a displaced fibular fracture with syndesmotic disruption.

Initial C-arm films at the time of reduction.

Three months postsurgery, the patient was back to playing tennis and pain free.
Q. What are the material characteristics of the BioSync® system for the Evans and Cotton osteotomies?

A. Traditionally, adolescent and/or adult patients selected for an Evans and/or Cotton osteotomy suffer from an underlying acquired pathologic pes valgo planus foot deformity. To this end, allograft tissue has been the historical graft choice implanted for structural correction via either osteotomy design.

A significant advantage of the BioSync system in this context is its inherent material design and the exacting anatomic design specifically created for these osteotomy applications.

From a basic science standpoint, tantalum trabecular metal as a biomaterial has been successfully implanted with widespread clinical success. Its utility as an adjunct to hip and knee arthroplasty is very well established in addition to other applications in orthopedic surgery. Recent studies have demonstrated the ability of these materials to support human bone marrow stromal cells (HBMSCs) with significant cellular ingrowth characteristics and matrix production throughout the implanted material. Mechanically, in comparison to acellular constructs (ie, allografts), trabecular metal demonstrates enhanced tensile characteristics to allograft.

Q. Can you share your thoughts, experience and observations on using the BioSync system in Evans and Cotton osteotomies?

A. Clinically, I have traditionally fashioned allograft tissue (ie, a calcaneal wedge allograft) with attention to detail for both the Evans or Cotton osteotomy. This takes some expertise and expends valuable OR time. It is technically demanding to create an exacting size in all 3 dimensions towards a stable, press fit graft/host interface. Even with appropriate sizing, adequate stability at the site of implantation and adequate structural correction achieved, resorption at the allograft-host interface in isolated cases may occur and can be associated with loss of structural correction.

In my experience to date, the BioSync wedges in both the Evans and Cotton osteotomy applications have been very successful. Clinical stability, stable radiographic findings and progression to successful weightbearing has been universally noted. No patient in my clinical series to date has experienced delay in progression of weightbearing nor delay in progression of their activity level. No patient to date has demonstrated clinical signs nor radiographic evidence of graft loosening, osteolysis, or shift or displacement of the BioSync wedges. No loss of radiographic correction has been noted in follow-up at one year in any patients to date.

Q. What are your technique tips or pearls for successful implantation of the Evans BioSync wedge?

A. • Anatomic dissection and meticulous soft-tissue handling and accurate osteotomy placement and design are critical elements for successful implantation and stability.

• Specific to the Evans, I use an obliquely oriented incision within the relaxed skin tension lines over the anterior lateral calcaneus. In doing so, one must be accurate with placing the incision in a manner to access the anterior lateral calcaneus at the site of the proposed osteotomy somewhere between 1.25 cm and 1.5 cm proximal to the calcaneocuboid joint.

• Preserving the dorsal calcaneocuboid ligament is important towards maintaining an inherently stable anterior calcaneal process and towards a stable press fit Evans BioSync wedge upon implantation.

• Intraoperative assessment of the degree of structural correction via use of the distraction device assists to open and control the osteotomy. This is a valuable means of creating and assessing correction. One can modulate the correction with use of the distractor to determine the degree of correction desired/required. The sizing trials are then inserted and the distractor is released towards intraoperative assessment of the degree of correction, and the position and stability of the templated sizer.

Q. Can you summarize the value of the BioSync wedge in the Evans calcaneal osteotomy?

A. The anatomic design of both the Evans and Cotton graft sizes match very well with the morphology and anatomy of the implant site. The distraction device in the system is very attractive as it allows for gentle controlled distraction of the osteotomy, identification of the required degree of correction, and ease of access of the sizing templates which provide for reproducible and accurate graft size selection. OR time is significantly reduced in comparison to allograft preparation to BioSync wedge.

The basic science of the material, successful widespread clinical use of this material technology in multiple applications in orthopedics, and the exacting anatomic designs of the BioSync wedges provide a value added equation over allograft. My clinical experiences and observations to date have established this frame of reference.

I am enthusiastic regarding the effectiveness of the BioSync instrumentation, sizing templates and anatomical designs. Meticulous soft-tissue handling, and accurate osteotomy design remain prerequisite to successful implantation and quality clinical outcomes.
Preoperative and postoperative "glass bottom boat" weight-bearing images demonstrating restoration of plantargrade weight-bearing distribution following Evans calcaneal osteotomy, medial displacement calcaneal osteotomy and Cotton osteotomy.

One-year postoperative radiographs demonstrating successful BioSync® Evans calcaneal osteotomy and modified Kidner procedure.

Postoperative weight-bearing radiographs at 1 year postoperatively demonstrating structural correction via medial displacement calcaneal osteotomy, Evans calcaneal osteotomy, and Cotton osteotomy. Note triplanar correction of a neutral plantargrade stable foot type.

Preoperative weight-bearing radiographs of pathologic (nonspasitic) collapsing pes valgo planus foot deformity in adolescent patient. Note the significant peritalar subluxation, uncovering of the talonavicular joint, and talo-calcaneal divergence. These radiographic findings are indicative of a pathologic foot type. Plan of care includes Evans calcaneal osteotomy, possible medial calcaneal displacement osteotomy and Cotton osteotomy as well as medial soft tissue adjunctive reconstruction.
WHAT’S IN MY BAG?
Syndesmosis TightRope® XP Implant System

Brian Burgess, DPM

Q. When using the Syndesmosis TightRope XP implant system, what features have you found most valuable?

A. There are a lot of benefits of the TightRope implant system for syndesmotic fixation. The TightRope implant allows for consistent, reproducible anatomic reduction and fixation without the need for removal. The TightRope implant also allows for physiologic motion that promotes ligamentous healing and can help limit malreduction. The benefits of the TightRope implant system vs screw fixation have been extensively studied and its use is supported in the literature with 26 scientific articles. Surgeons can have long-lasting confidence in the quality and stability of their syndesmotic fixation using the TightRope implant system.

Q. Do you have to tie knots with the TightRope implant system?

A. One of the benefits of the TightRope implant and TightRope XP implant system is that they are both knotless. This allows for faster OR time and no knot prominence. The knotless fixation allows for a lower profile and less potential for soft tissue irritation.

Q. When would you use the new Syndesmosis TightRope XP implant?

A. Prior to the implant, I would routinely make a medial incision to facilitate getting the button down on bone. I have found that the Syndesmosis TightRope XP allows easier deployment of the medial button thus eliminating the need for the second incision. This is great under every circumstance but especially in conditions of compromised soft-tissue envelope.

I believe that the TightRope XP implant is ideal in situations where you are looking to avoid a medial skin incision. The TightRope implant has been safely implanted since 2005 and the TightRope XP implant allows for easier deployment of the medial button. The TightRope and TightRope XP implants are my fixation of choice for most syndesmotic injuries ranging from mild to frank instability.

References:

2. Arthrex Research and Development. APT 3296A. 2017