Arthrex®

Bio-Tenodesis™ Screw Fixation in Tendon Enhanced Ankle Ligament Reconstruction

Surgical Technique

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Bio-Tenodesis Screw Fixation

Bio-Tenodesis Screw Fixation in Tendon Enhanced Ankle Ligament Reconstuction

Surgical Technique

This surgical technique describes an augmented ankle reconstruction using a free tendon graft and rigid interference screw fixation using the Bio-Tenodesis System. The goal of this technique is to achieve an anatomic reconstruction of the anterior talofibular and calcaneofibular ligaments with simple tensioning and rigid fixation of the graft. Rigid fixation allows earlier postoperative motion. A smaller incision is needed and less surgical exposure is required. In addition, the peroneal tendons are not disturbed.

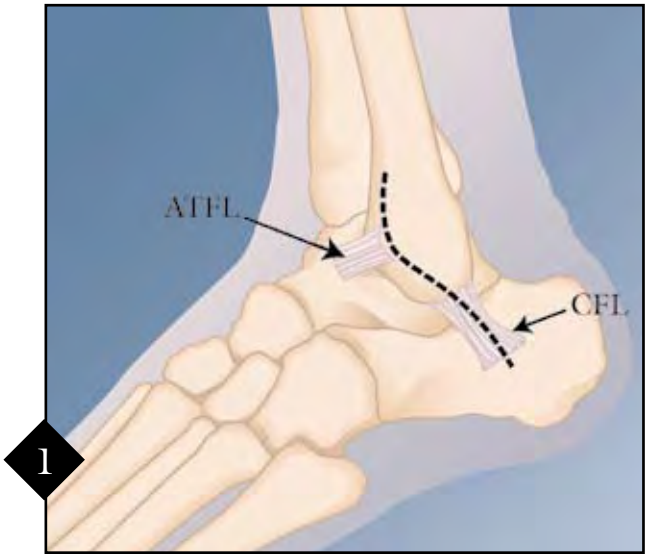
Tissue augmentation in ankle ligament reconstruction is usually reserved for patients with ligamentous laxity or surgical revisions. Common to these techniques is the need for wide surgical exposures, lack of rigid fixation of the graft and the recommended postoperative immobilization.

Revision ankle ligament reconstruction is an option for the patient with recurrent instability and is usually performed with tissue augmentation. Many of these techniques (Evans/Chrisman-Snook) are nonanatomic. Anatomic procedures include those described by Drs. Elmslie and Colville. Some of these techniques use the peroneus brevis tendon to augment ligamentous tissue. Dr. Coughlin described an anatomic reconstruction using a free semitendinosus graft and stressed the importance of preserving peroneal tendon function in patients with recurrent ankle instability. The method of graft fixation is similar in all of these techniques which involves passing the tendon graft through bone tunnels and suturing it back on itself. This type of fixation is quite variable and is based on the size of the bone bridge created, the quality of bone and the holding strength of the suture in the tendon.

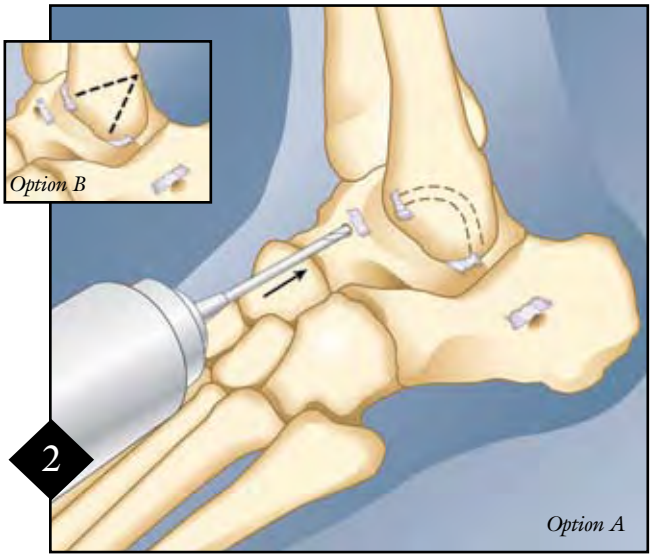
Graft Harvesting & Preparation

Harvest the semitendinosus tendon from the ipsilateral knee. An allograft soft tissue tendon may also be used. The graft length should be 14 cm for most patients. It is suggested that a locking whipstitch, using 2-0 or #2 FiberWire® be created at the end of the graft to be placed into the talar attachment site. The whipstitch should extend no more than 15 mm from the tip of the tendon, as this resembles the length of the 4.75 & 5.5 mm x 15 mm Bio-Tenodesis Screws suggested for this procedure.

Using the sizing holes on the Bio-Tenodesis Driver's thumbpad, take an accurate diameter measurement of the tendon. Selection of the appropriate Bio-Tenodesis Screw should be based on the diameter of the tendon *from the tip of the tendon to approximately 15 mm along the graft at both ends*.



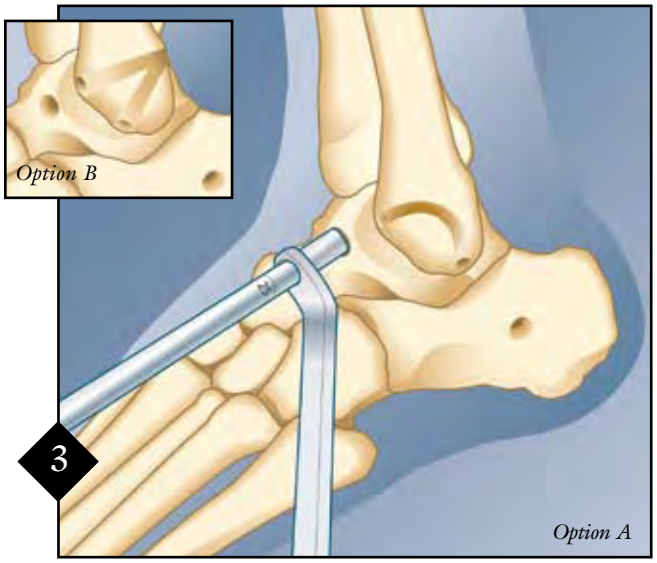
An arthrotomy is made at the talofibular joint and is carried around the distal end of the fibula to the peroneal sheath. This sheath is opened and the peroneal tendons are retracted posteriorly. The capsule and periosteum over the distal fibula is elevated, exposing the previous insertion of the calcaneofibular and anterior talofibular ligaments.



After anatomic attachment sites are determined, pilot holes are drilled with a 2.4 mm guide pin in the talar neck and calcaneus. Two options are described for reaming the fibular sockets.

Drill Technique Option A: A 5 mm cannulated reamer from the anterior and distal fibula at the insertion point of the anterior talofibular and calcaneal fibular ligaments. These tunnels are connected using a curved curette.

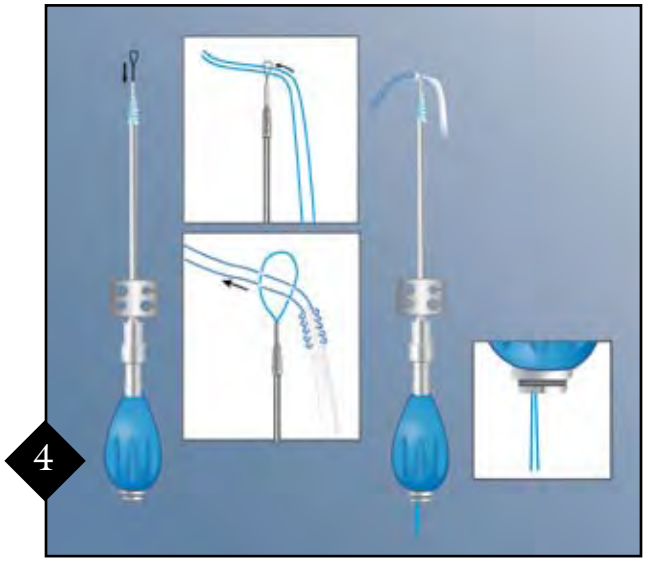
Drill Technique Option B: The fibular socket (ATFL arm) should start anterior to posterior, angling slightly proximal and exiting the posterior fibula. The CFL arm is drilled from the anatomic attachment site of the CFL on the tip of the fibula to the posterior fibula. This approach will increase the bone bridge between the ATFL arm and CFL arm of this construct.



A 5.5 mm diameter x 17 mm long tunnel is drilled in the talus and a 5 mm tunnel is created in the fibula for passage of the graft.

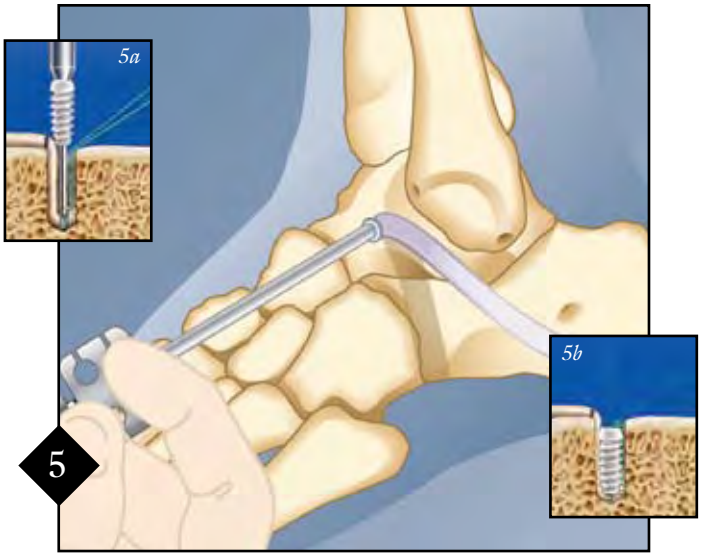
Note on creation of bone tunnels:

- ***Proper screw and pilot hole diameter depends on the exact diameter of the tendon graft***
- ***Bone tunnel diameter should be .5 mm to 1 mm larger than the size of the tendon (ex. 4.5 mm graft requires 5-5.5 mm diameter hole)***

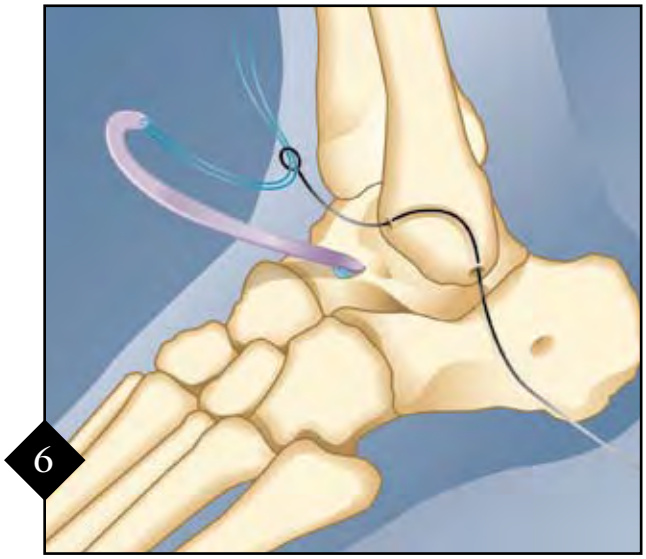


Creation of FiberWire Suture Loop

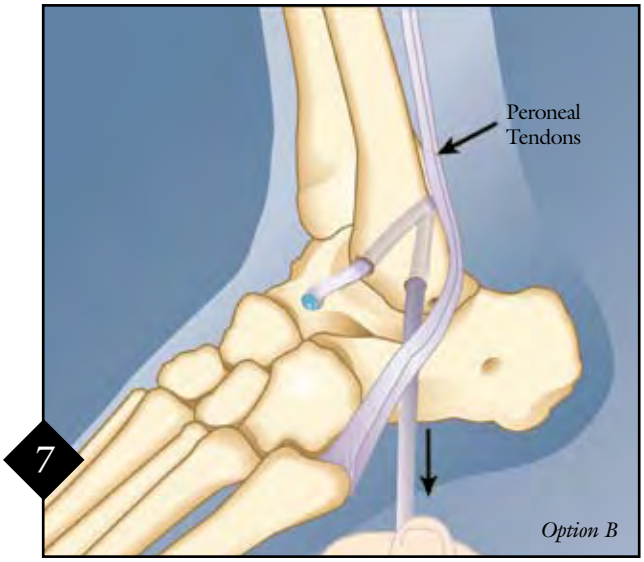
Prior to placement of the talar screw or calcaneal screw, use the nitinol wire and #2 FiberWire to create a suture loop at the tip of the Bio-Tenodesis Driver. Snare the tip of the whipstitched tendon 2 mm from the end of the graft. Place tension on the sutures exiting the back of the Tear Drop Handle and wrap them once around the o-ring inside the cleat. ***It is important to maintain maximum tension between the driver tip and the tendon during initial placement of the tendon in the tunnel.***



Place the driver tip with tendon into the bone socket. It is important that the tip of the driver with tendon attached be placed in the tunnel until the proximal screw threads are in contact with the anterior cortex. Prior to turning the Tear Drop Handle, make sure the tendon is seated properly in the tunnel (Fig 5a). Turn the blue handle clockwise while holding the metal thumbpad stationary. The screw is seated properly when it is flush with the cortical bone. Remove the driver and tie the suture tails over the top of the screw. Cut the remaining suture (Fig 5b).

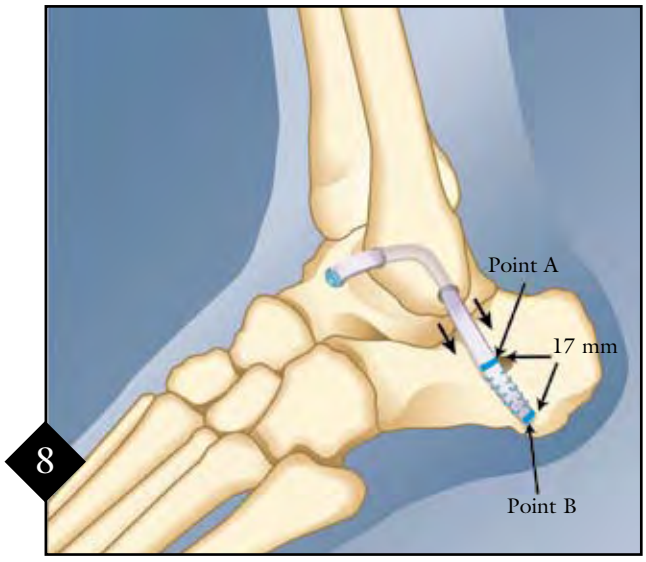


To pass the ATFL arm of the graft through the fibula, insert the nonlooped end of the Nitinol Suture Passing Wire through the anterior fibular drill hole and distally through the tunnel exiting the hole on the bottom of the fibula. With the Nitinol loop exposed, insert both tails of the traction stitch one inch from the tip. Pull the Nitinol loop through the fibular tunnel, passing the graft from proximal to distal. The tendon graft is now ready for proper anatomic tensioning and calcaneal screw placement.

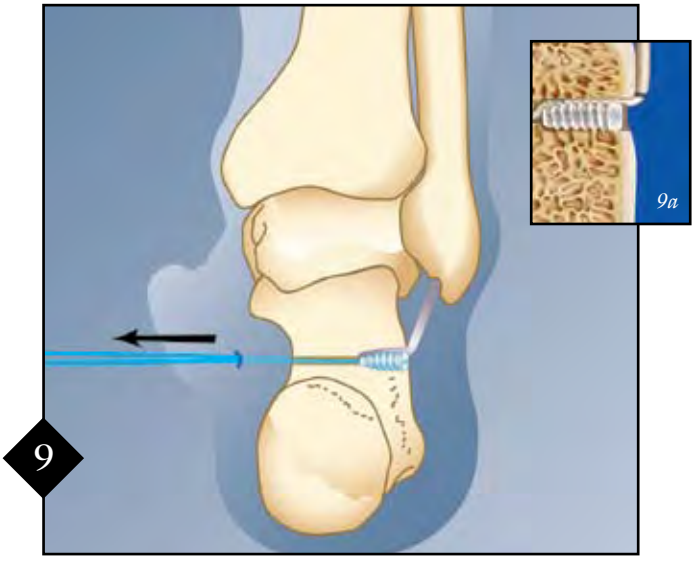


Fibular Drilling Technique

Pass the tendon graft anterior to posterior and place a right angle clamp at the posterior exit point, tensioning the ATFL arm of the construct with the ankle in slight eversion. Place sutures into the periosteum on both sides of the ATFL arm of this construct on the posterior fibula. Use the Nitinol loop to aid passage of the remaining portion of the graft through the distal fibular drill hole, positioning the graft underneath the peroneal tendons.

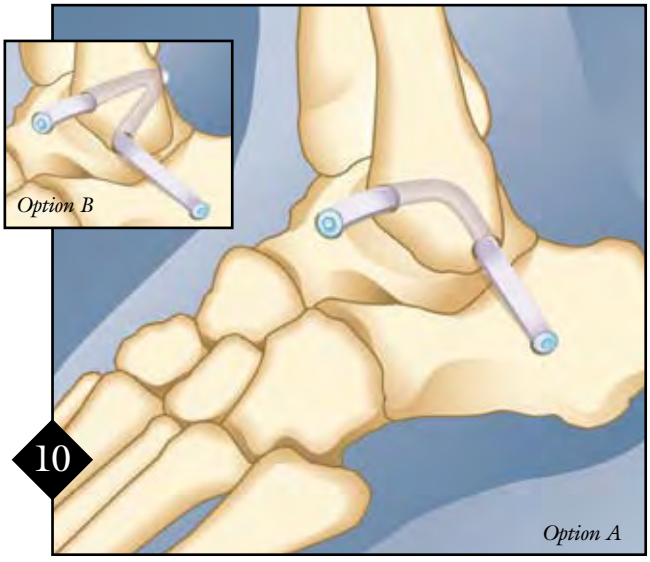


Tension the CFL arm with neutral ankle flexion and slight heel eversion and mark a blue line across the tendon where the graft should enter calcaneal bone tunnel (Point A). Measure 17 mm down (2 mm more than length of 5.5 mm x 15 mm screw) on the remaining tendon graft and place another blue mark. Whipstitch the portion of the tendon between the two blue lines and remove any excess tendon (Point B). Refer to Step 4 for placement of calcaneal screw. Place the heel in slight eversion and the ankle in a neutral position prior to screw insertion. To insert the screw hold thumbpad and turn the blue Tear Drop Handle. Insert the screw until it is flush with the lateral cortex.



Alternative Fixation Method in Calcaneus

Using a 2.4 mm beath pin (w/eyelet), drill a pilot hole from the insertion point (CFL) posteromedially, exiting the medial cortex of the calcaneus. Overdrill the pilot hole with 5.5 mm reamer to a depth of 17 mm. The suture on the end of the tendon is passed through the tunnel with the aid of the beath pin. This suture is tensioned, pulling the graft into the tunnel. The driver with screw attached is placed over the graft and inserted while tension is applied to the traction suture. The remaining traction suture is cut. Reference (9a) for close-up of the complete construct using this alternative fixation method.



The construct is complete, using fibular drilling techniques.

Ordering Information

Bio-Tenodesis Screw System Implants, sterile, single use:

Bio-Tenodesis Screw w/handled inserter, 3 mm x 8 mm	AR-1530B
PEEK Tenodesis Screw w/handled inserter, 3 mm x 8 mm	AR-1530PS
Bio-Tenodesis Screw, 4 mm x 10 mm	AR-1540B
PEEK Tenodesis Screw, 4 mm x 10 mm	AR-1540PS
Bio-Tenodesis Screw, 4.75 mm x 15 mm	AR-1547B
PEEK Tenodesis Screw, 4.75 mm x 15 mm	AR-1547PS
Tenodesis Screw, titanium, 4.75 mm x 15 mm	AR-1350-475
PEEK Tenodesis Screw, 5.5 mm x 15 mm	AR-1555PS
PEEK Tenodesis Screw, 5.5 mm x 8 mm	AR-1655PS
Tenodesis Screw, titanium, 5.5 mm x 15 mm	AR-1350-55
Bio-Tenodesis Screw, 5.5 mm x 15 mm	AR-1555B
Bio-Tenodesis Screw, 6.25 mm x 15 mm	AR-1562B
PEEK Tenodesis Screw, 6.25 mm x 15 mm	AR-1562PS
Bio-Tenodesis Screw, 7 mm x 23 mm	AR-1570B
Bio-Tenodesis Screw, 7 mm x 10 mm	AR-1670B
PEEK Tenodesis Screw, 7 mm x 10 mm	AR-1670PS
Bio-Tenodesis Screw, 8 mm x 23 mm	AR-1580B
PEEK Tenodesis Screw, 8 mm x 12 mm	AR-1680PS
Bio-Tenodesis Screw, 8 mm x 12 mm	AR-1680B
Bio-Tenodesis Screw, 9 mm x 23 mm	AR-1590B
Disposable Tenodesis Driver w/5.5 mm Screw and #2 FiberWire	AR-1555DS
includes: driver, 5.5 mm screw, preloaded #2 FiberWire loop	

Bio-Tenodesis Master Instrument Set (AR-1675S) includes:

Tear Drop Handle w/Suture Cleat	AR-2001BT
Cannulated Drill, 4 mm	AR-1204L
Cannulated Drill, 4.5 mm	AR-1204.5L
Cannulated Headed Reamers, 5 mm - 10 mm	AR-1405 - 1410
Driver for 10 mm long Bio-Tenodesis Screw	AR-1540DB
Driver for 12 mm long Bio-Tenodesis Screw	AR-1670DB
Driver for 15 mm long Bio-Tenodesis Screw	AR-1350D
Driver for 23 mm long Bio-Tenodesis Screw	AR-1570DB
Bio-Tenodesis Screw Instrumentation Case	AR-1675C

Optional Disposable Accessories:

Bio-Tenodesis Disposables Kit	AR-1676DS
includes: Short Guide Pin, Suture Passing Wire, Skin Marking Pen, ruler, #2 FiberLoop w/Straight Needle, two #2 FiberWire, two 2-0 FiberWire	
Small Diameter Bio-Tenodesis Disposables Kit	AR-1677DS
includes: Short Guide Pin, Suture Passing Wire, Skin Marking Pen, ruler, 0 FiberWire, 0 TigerWire, 2-0 FiberWire, 2-0 FiberLoop	
Bio-Tenodesis Disposables Kit for 3 mm x 8 mm screw	AR-1530DS
#2 FiberSnare, #2 FiberWire, 26 inches (green) stiffened w/closed loop, 12 inches	AR-7209SN
#2 FiberLoop w/Straight Needle	AR-7234
Cannulated Drill Bits (accepts 2.4 mm K-wires)	
2.5 mm cannulation, for use with AR-1676DS:	
Cannulated Drill Bit, 5 mm	AR-1676C-50
Cannulated Drill Bit, 5.5 mm	AR-1676C-55
Cannulated Drill Bit, 6 mm	AR-1676C-60
Cannulated Drill Bit, 6.5 mm	AR-1676C-65
Cannulated Drill Bits (accepts 1.57 mm K-wires)	
1.7 mm cannulation, for use with AR-1677DS:	
Cannulated Drill Bit, 4 mm	AR-1677C-40
Cannulated Drill Bit, 4.5 mm	AR-1677C-45
Cannulated Drill Bit, 5 mm	AR-1677C-50
Cannulated Drill Bit, 5.5 mm	AR-1677C-55

Optional Accessories:

Bio-Tenodesis Tap, 4 mm x 10 mm	AR-1540T
Bio-Tenodesis Tap, 4.75 mm x 15 mm	AR-1547T
Bio-Tenodesis Tap, 5.5 mm x 15 mm	AR-1555T
Bio-Tenodesis Tap, 6.25 mm x 15 mm	AR-1562T
Bio-Tenodesis Tap, 7 mm x 23 mm	AR-1570T
Bio-Tenodesis Tap, 7 mm x 10 mm	AR-1670T
Bio-Tenodesis Tap, 8 mm x 12 mm	AR-1680T
Drill Pin Tip Headed Reamer, 7 mm	AR-1407DP

This description of technique is provided as an educational tool and clinical aid to assist properly licensed medical professionals in the usage of specific Arthrex products. As part of this professional usage, the medical professional must use their professional judgment in making any final determinations in product usage and technique. In doing so, the medical professional should rely on their own training and experience and should conduct a thorough review of pertinent medical literature and the product's directions for use.

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U.S. PATENT NOS. 6,544,281 and 6,716,234