Percutaneous Plantar Fasciotomy

David C. Novicki, DPM, FACFAS

Learning Objectives

- Discussion of long term clinical results of percutaneous medial band plantar fascia release
- Technical considerations when doing partial plantar fascia release
- Potential complications discussed

Disclosure Information

I or a related party have a financial relationship with a financially interested entity within the past/next 12 months (lecturer and developer of surgical instrumentation)

Function of Plantar Fascia

- Provide arch support
- Dynamic shock absorber during ambulation
- Hicks 1954: Windlass Mechanism
  - During propulsion phase of gait, MTPJs are dorsiflexed, resulting in high tensile forces concentrated at the calcaneal attachment of the plantar fascia
  - Windlass Mechanism shortens the fascia to create rigidity in the foot to facilitate gait propulsion

Plantar Fasciitis

- Inflammation of plantar fascia proximal attachment and surrounding perifascial soft tissue structures

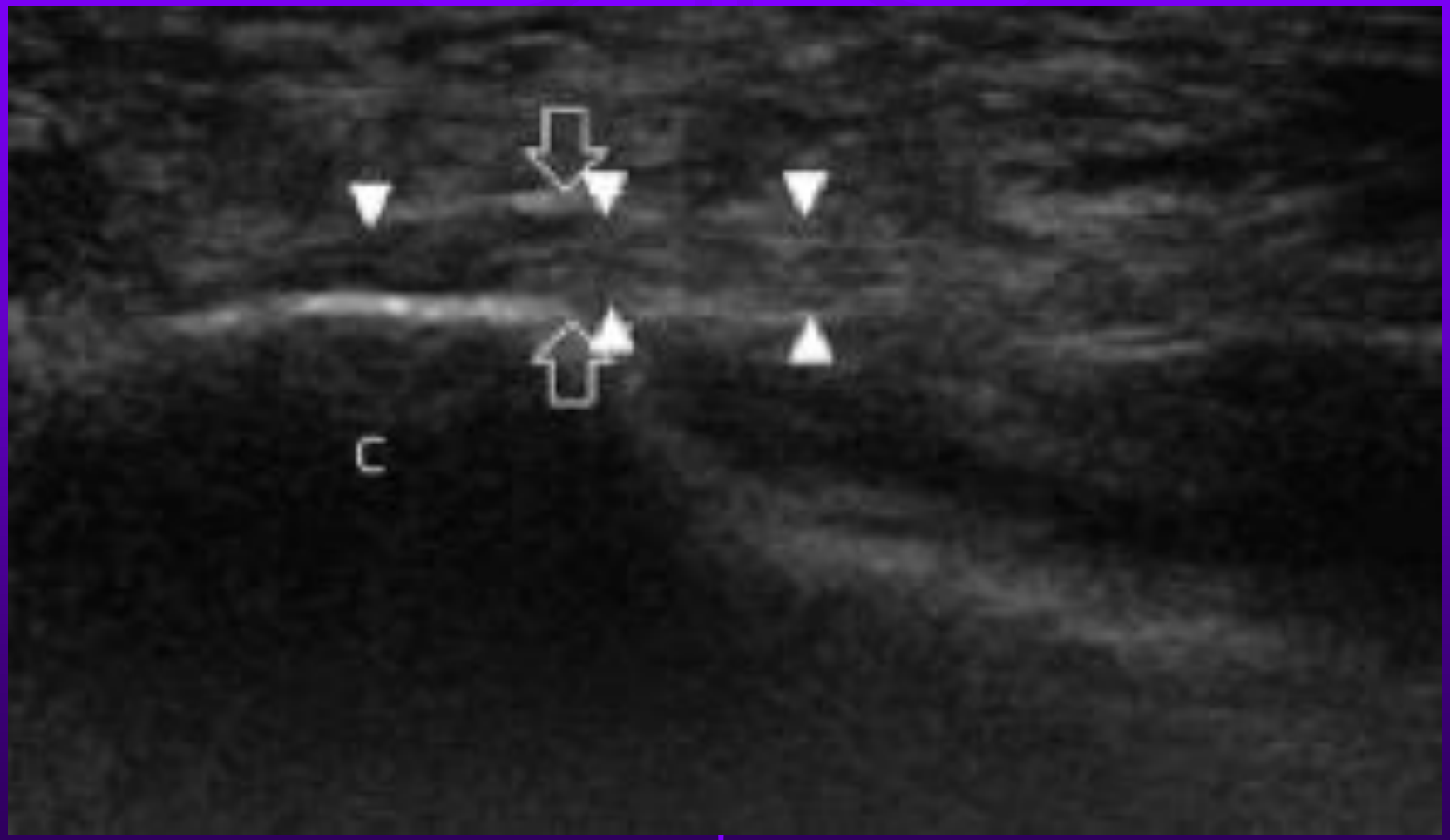
Diagnosis

- Sharp, stabbing pain localized to medial calcaneal tubercle
- Poststatic dyskinesia
- Improvement in heel pain with ambulation, but may be intensified at end of day with excessive walking
- Passive hyper-dorsiflexion of the toes stretches the inflamed fascia and may reproduce symptoms
- Equine gait to avoid placing pressure on painful heel

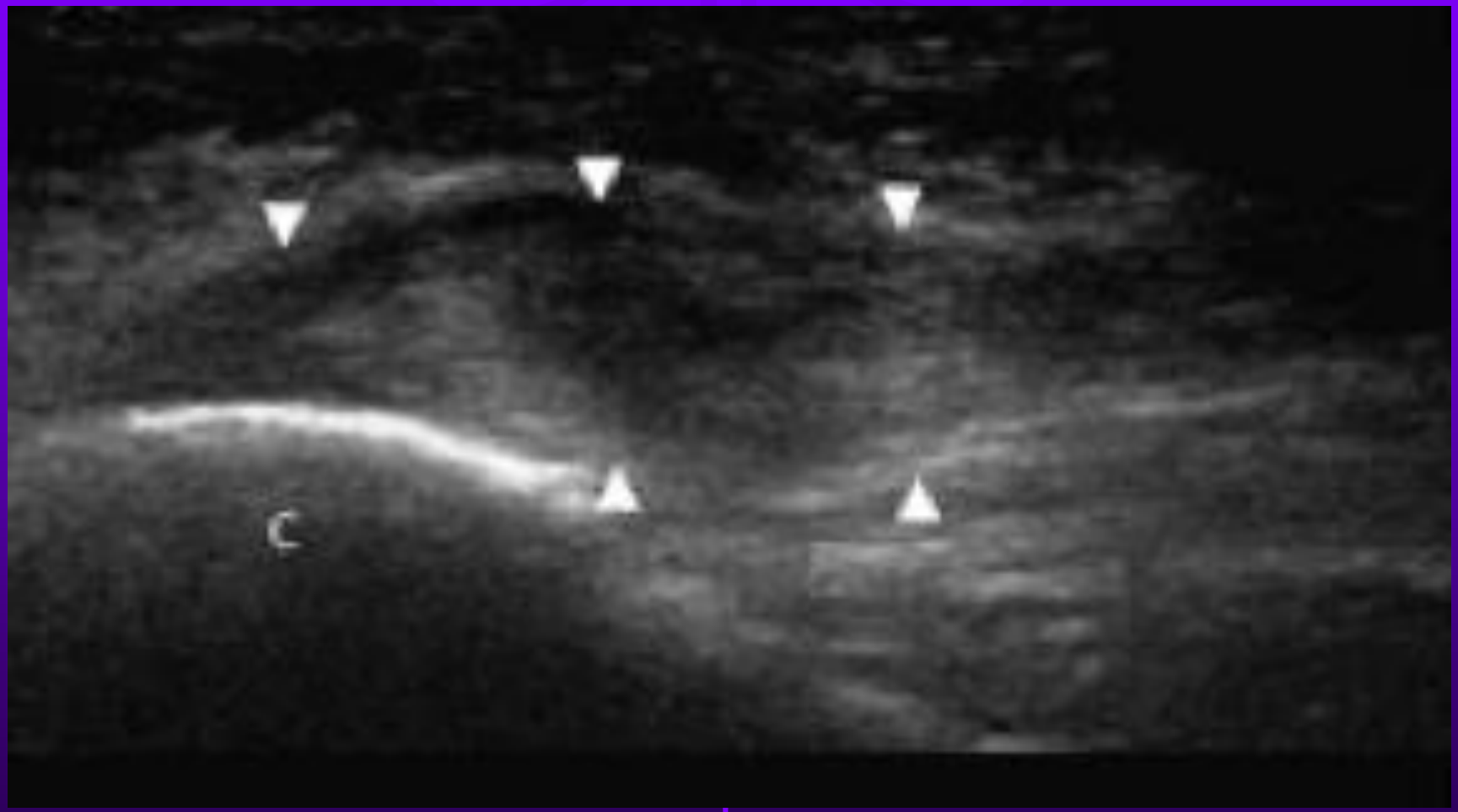
Diagnosis

- Radiographs
  - Sub-calcaneal spur from chronic strain reaction on fascia-bone interface
- Ultrasound
  - Normal: Homogenous, hyperechoic band with internal linear interfaces on longitudinal sections
  - Abnormal: Diffuse hypoechogenicity with proximal plantar fascia thickening >4mm

Normal Plantar Fascia



Abnormal Plantar Fascia



Diagnosis

- MRI
  - Increased proximal plantar fascia thickening with increased signal intensity on T2-weighted and STIR images
  - Bone marrow edema at calcaneal-fascia interface
- EMG/NCV
  - Rule out spinal radiculopathy, peripheral neuropathy, tarsal tunnel syndrome, local nerve entrapment
- Serum hematologic and immunologic testing
  - HLA-B27, ESR, RF, ANA, uric acid levels

Heel Pain Differentials

- Plantar fascia rupture
- Baxter's nerve entrapment
- Neuropathy
- L5-S1 radiculopathy
- Tarsal tunnel syndrome
- Sural nerve entrapment
- Calcaneal stress fracture
- Calcaneal apophysitis
- Calcaneal tumor
- Infracalcaneal bursitis
- Myositis
- Tenosynovitis
- Rheumatoid arthritis
- Psoriatic arthritis
- Reactive arthritis
- Ankylosing spondylitis
- Diffuse idiopathic skeletal hyperostosis
- Lupus
- Gout
- Fibromyalgia
- Hyperparathyroidism
- Infection
- Heel contusion
- Plantar fibroma

Risk Factors

- Age
- Bodyweight
- Pes planus
- Pes cavus
- STJ pronation
- LLD
- Femoral or tibial torsion
- Equinus
- Footwear
- Excessive activity
- Fat pad atrophy
- Tibial and subtalar varum

Histology of Plantar Fasciitis

- Consistent with fasciosis
- Collagen degeneration with fiber disorientation
- Increased mucoid ground substance
- Angiofibroblastic hyperplasia
- Calcification
- Proximal fibroma

Lemont H, Ammirati KM, Usen N. Plantar fasciitis: A degenerative process (fasciosis) without inflammation. J Am Podiatr Med Assoc. 2003; 93: 234-237.

Histology of Plantar Fasciitis

- Most studies show degenerative changes, but active inflammatory infiltrate rarely reported
- Polymorphonuclear leukocytes, lymphocytes and macrophages seen infrequently

Tountas AA, Fornasier VL. Operative treatment of subcalcaneal pain. Clin Orthop 1996; 332: 170-178.

Histology of Plantar Fasciitis

- Inflammation may not be predominant feature
- Advanced fascial degeneration (plantar fasciosis) may be a more appropriate term
- Proximal plantar fibroma is pathologic process in 25% of chronic recalcitrant heel pain cases

Hafner S, Han N, Pressman MM, Wallace C. Proximal plantar fibroma as an etiology of recalcitrant plantar heel pain. J Foot Ankle Surg. 2011; 50(2): 153-157.

Conservative Treatment Options

- Rest
- Activity modification
- Immobilization therapy
- Cryotherapy
- Myofascial massage
- Iontophoresis
- NSAID
- Heel pads
- Orthotics/braces
- Night splints
- Corticosteroid injections
- Taping/strapping
- Physical Therapy
- Stretching
- Extracorporeal shockwave therapy
- PRP Injections

PRP Injection

- Cohort of 32 patients receiving PRP injections for plantar fasciitis
- 65.63% satisfied patients

Pressman MM, Scholnick KS, Novicki DC. Percutaneous needle plantar fasciotomy for recalcitrant heel pain: A retrospective analysis of 157 patients and 175 procedure. 2014. Manuscript submitted for publication.

PRP Injection

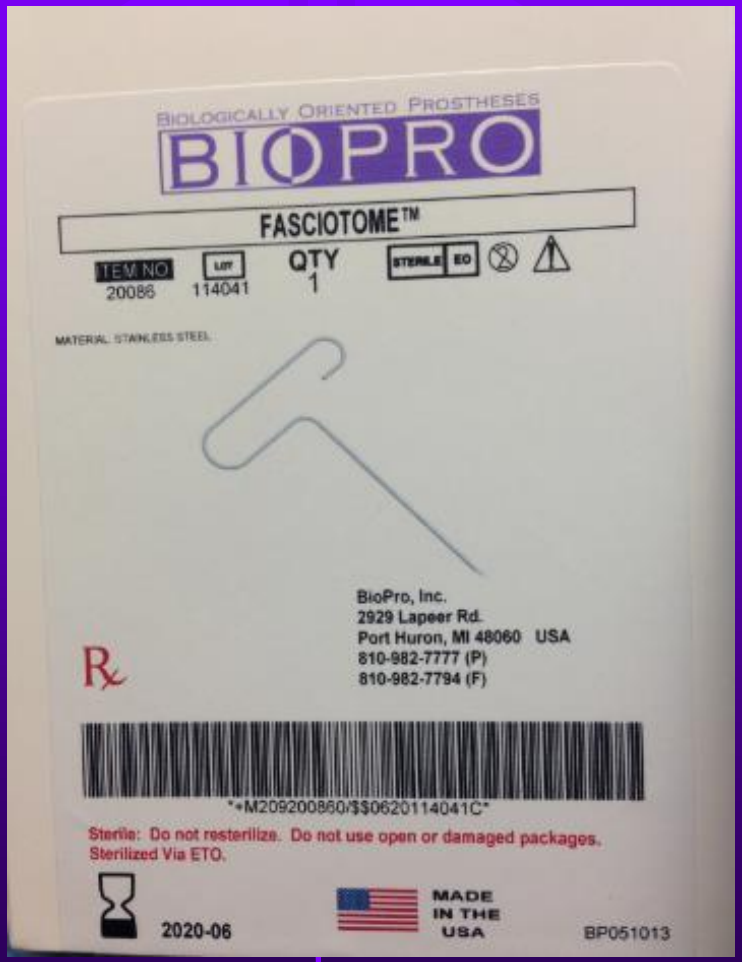
Surgical Treatment Options

- Open plantar fasciotomy
- Plantar fasciectomy
- Cryosurgery (CryoStar)
- Radiofrequency nerve ablation
- Coblation therapy (Topaz)

Percutaneous Fasciotomy Surgical Procedure

- Fasciotome inserted into the plantar medial heel at the level of the medial calcaneal tubercle where the plantar fascia attaches
- Maximally dorsiflex ankle and hallux to stretch the plantar fascia
- Utilize transverse swipes of the fasciotome to release the medial band of the plantar fascia until the tight band in the arch is released
- Will hear the fascia cutting
- Start superficially on the fascia and slowly advance deeper to release the medial band of the fascia
- Avoid cutting deep to the musculature
- Don't direct the fasciotome laterally to avoid disruption of the central and lateral bands

Fasciotome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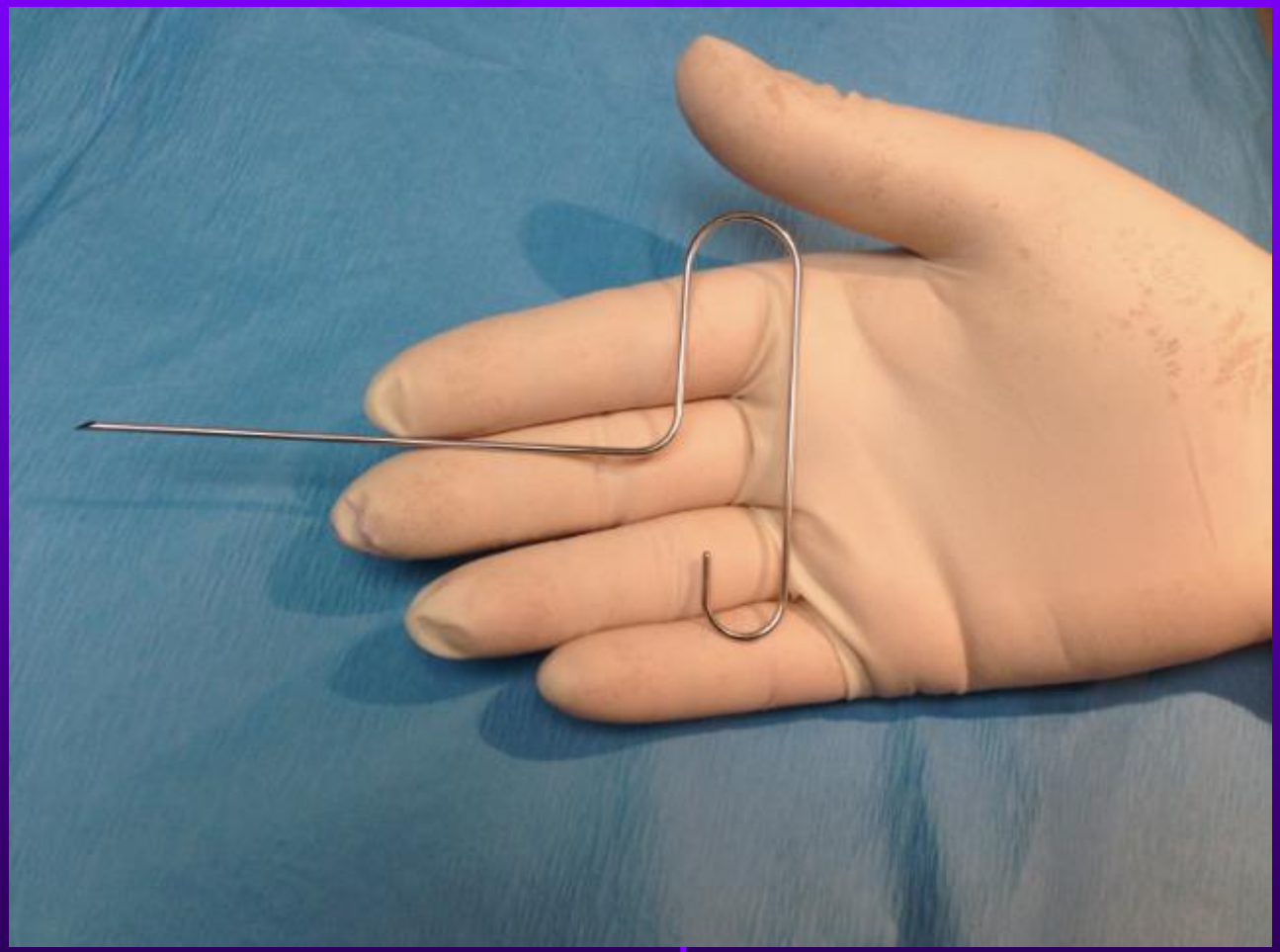

Fasciotome

BIOPRO
BioPro Fasciotome™

Indications for use:

2. Percutaneous partial release of the plantar fascia.

Sterile: STERILE EO

Sterilized with ethylene oxide gas. Caution: For one procedure only. Do not re-sterilize. Do not use if package is open or damaged. This is a single use device. Re-use of this device can result in the transfer of materials not limited to bone, tissue, blood, or infectious disease. The device is provided sterile and re-sterilization of the device has not been validated.

Instructions for use:

8. After an appropriate local block has been obtained, locate the medial band of the plantar fascia by dorsiflexing the foot and great toe. This allows you to palpate the medial band in the arch area and followed back to proximal to the heel.
9. The percutaneous portal is located by bisecting the medial malleolus and drawing the bisection line down to the medial plantar area of the foot. This approach brings you to a safe location for percutaneous release of the fascia by being proximal to the medial and lateral plantar nerves.
10. Ultrasound imaging can aid in the accurate placement of the percutaneous Fasciotomy.
11. The foot should be appropriately prepped and draped, utilizing the Fasciotome™ the skin is penetrated and the Fasciotome™ is brought in contact with the medial band of the plantar fascia, cutting the medial band of the plantar fascia and a portion of the central band, if desired.
12. After the Fasciotome™ releases the medial band, there should be a loss of the prominence of the medial band to the fascia in the arch area.
13. No suturing of the portal is necessary, dry sterile dressing, and a modified Campbell's rest strapping of the foot and ankle is recommended.
14. Patient may immediately weight bear on this.

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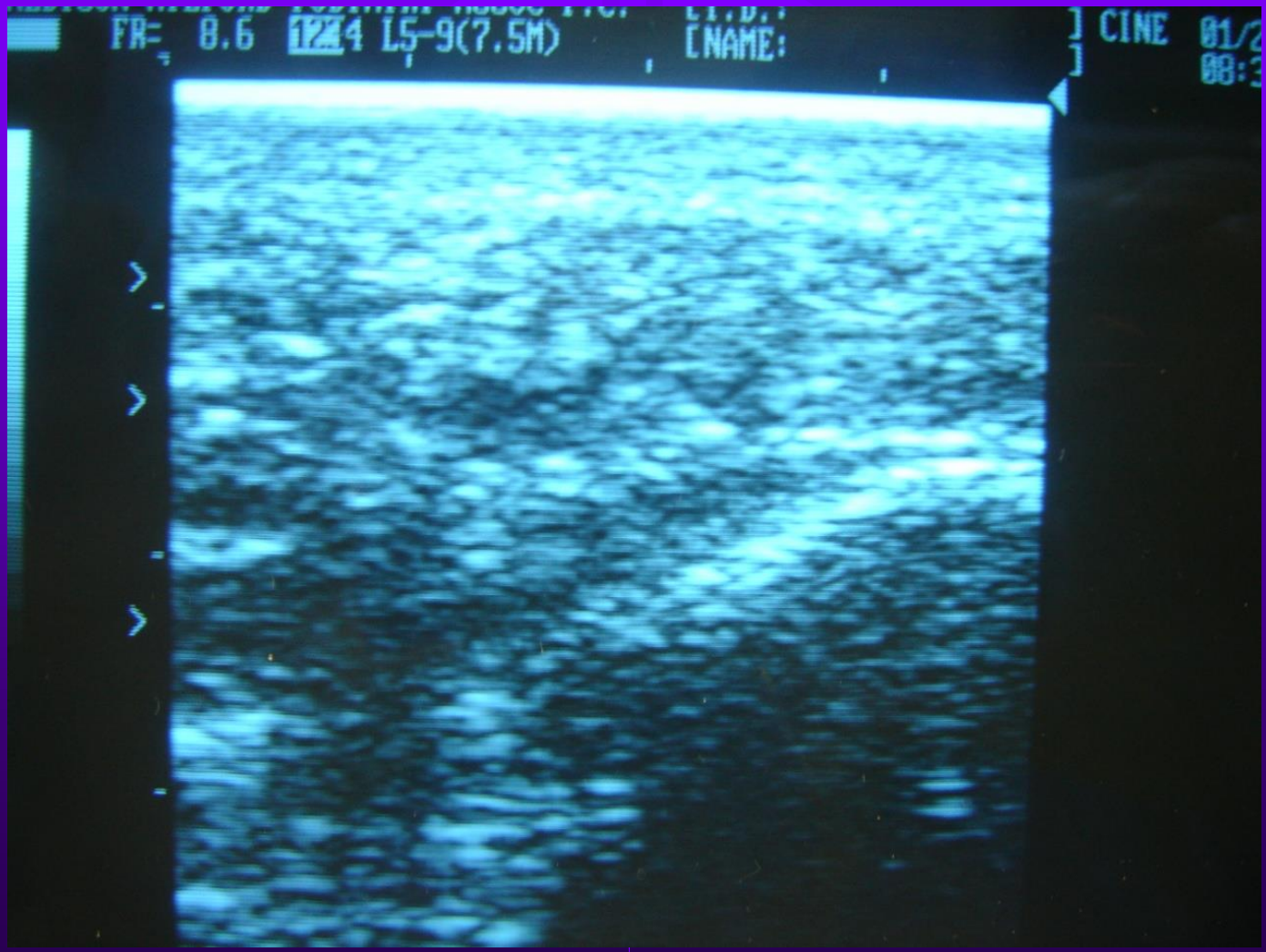
Surgical Procedure

Medial Malleolus Bisection

Ultrasound Imaging

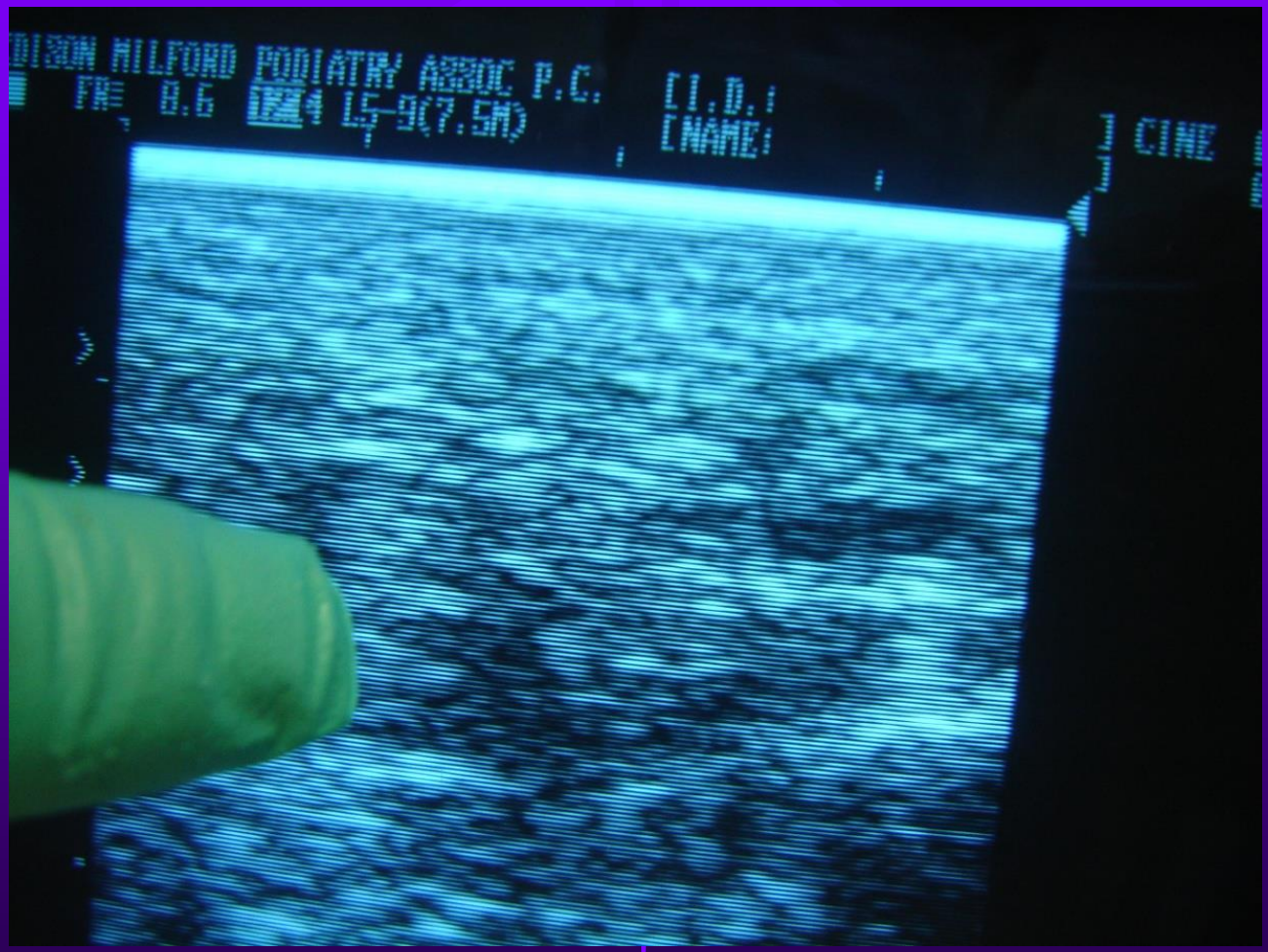
Dorsiflex Ankle and Hallux to Stretch Fascia

Find Calcaneal Tuber and Plantar Fascia



Surgical Procedure

Post-op Image of Transected Fascia



Post-op Cortisone Injection

Percutaneous Plantar Fasciotomy Literature

- Benton-Weil et al. JFAS. 1998
  - 83% satisfaction rate using a percutaneous plantar fasciotomy
- Perelman et al. J Foot Surg. 1995
  - 91.3% reported at least 80% satisfaction

Benton-Weil W, Borrelli AH, et al. Percutaneous plantar fasciotomy: a minimally invasive procedure for recalcitrant plantar fasciitis. J Foot Ankle Surg. 1998; 37: 269-272.

Perelman GK, Figura MA, Sandberg NS. The medial instep plantar fasciotomy. J Foot Surg. 1995; 34: 447-457.

Potential Complications

- Nerve injury if too distal in the arch
- Lateral column pain
- Patients who do not improve may have proximal fibroma (optional needle biopsy)

Reducing Risk of Complications

- Start superficial and slowly advance: Plantar fascia is superficial to the plantar nerves and arteries, which are deep to the intrinsic muscles
- Minimize arch instability and reduce straining on plantar ligaments/joint capsules by releasing <40% of fascia

Cheung JT, An KN, Zhang M. Consequences of partial and total plantar fascia release: a finite element study. Foot Ankle Int. 2006; 27(2): 125-132

Reducing Risk of Complications

- Pain following sectioning of the entire plantar fascia was due to equinus rotation of the calcaneus and a drop in the cuboid causing strain of the plantar CCJ capsule and ligament
- Avoid this by sectioning only 1/3 of the fascia

Murphy GA, Pneumaticos SG, Kamaric E, et al. Biomechanical consequences of sequential plantar fascia release. Foot Ankle. 1998; 19: 149-152.

Percutaneous Needle Plantar Fasciotomy for Recalcitrant Heel Pain

- Retrospective analysis of 157 patients and 175 procedures
- Average ACFAS score improved from 55.31 preoperatively to 80.91 postoperatively
- 86.9% completely relieved of pain
- 5.71% some improvement in pain
- 7.43% minimal or no pain relief

Pressman MM, Scholnick KS, Novicki DC. Percutaneous needle plantar fasciotomy for recalcitrant heel pain: A retrospective analysis of 157 patients and 175 procedure. 2014. Manuscript submitted for publication.