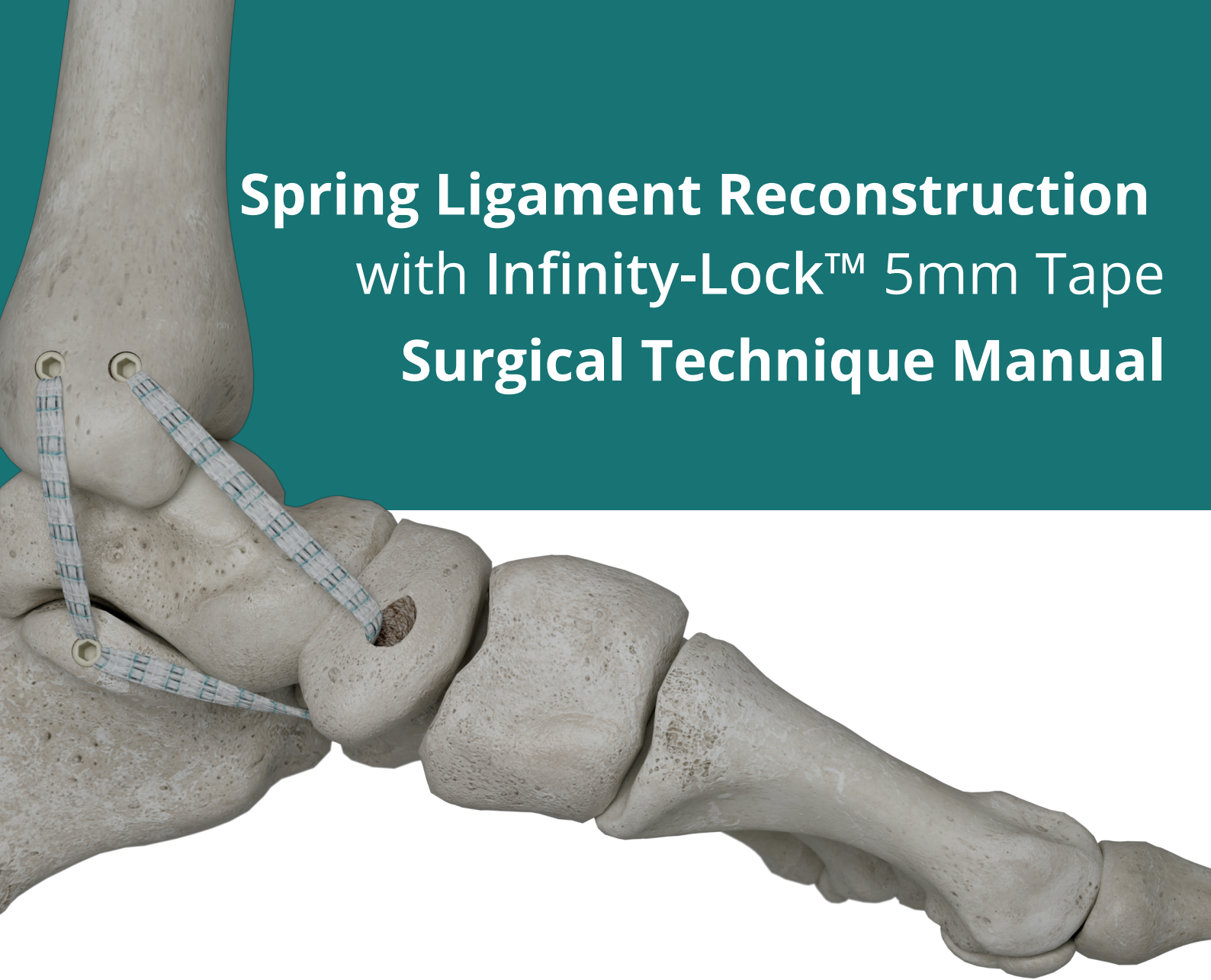


An anatomical illustration of a human knee joint in a sagittal view. The femur (thigh bone) is at the top, and the tibia (shin bone) is at the bottom. A blue and white checkered tape, representing the Infinity-Lock 5mm Tape, is shown reconstructing the anterior cruciate ligament. The tape is threaded through two small holes in the femur and one hole in the tibia, forming a loop that mimics the natural ligament. The background is a solid teal color.

Spring Ligament Reconstruction with Infinity-Lock™ 5mm Tape Surgical Technique Manual

Introduction

Adult Acquired Flatfoot Deformity (AAFD) is a condition defined by “medial foot arch insufficiency”, which is commonly caused by Posterior Tibial Tendon Dysfunction (PTTD) or deltoid spring ligament complex incompetency. Both etiologies have undergone substantial research to better understand their course and treatment. In severe AAFD, increasing tension on the interosseous and spring ligaments causes progressive peritalar subluxation, followed by deltoid and spring ligament insufficiency.

Understanding the architecture of the joints, which includes the talonavicular, subtalar, and tibiotalar joints, might help understand the increasing kinematic alterations and the need of restoring peritalar stability in advanced AAFD surgical therapies.

Anatomical research has shown that the deltoid ligament integrates with the spring ligament to provide medial tibiotalar and talonavicular stability. A comprehensive understanding of the anatomy of the “spring ligament and deltoid complex” is essential for effectively treating deformities affecting the foot and ankle.

Patient Selection

The technique is suitable for cases including:

- Posterior Tibial Tendon Dysfunction (PTTD): Especially in stage II.
- Post-Traumatic Medial Column Instability: Neglected or missed injuries leading to progressive arch collapse.
- Flexible Flatfoot Deformity: With symptomatic instability.
- Hyperlaxity Syndrome in Adults: Causing significant deformity and discomfort.
- Failure of Conservative Treatments: Cases unresponsive to orthotics, physical therapy, or shoe modifications.
- Pain and Functional Impairment: Symptoms interfering with daily activities and walking.

Cautions

The surgeon is responsible for determining if the patient has any structural or pathological condition of the bone or soft tissue that would be expected to impair health or prevent secure fixation. Caution is advised in patients with rigid flatfoot whether due to post-traumatic causes or advanced arthritis. These cases lack the flexibility necessary for realignment and soft tissue balancing, thereby limiting the effectiveness of ligament reconstruction procedures. Refer to IFU for a full list of cautions, warnings and essential information on safe use

Implants

Supplied by Xiros:

- **Infinity-Lock™** 5mm Tape, Order Code: 102-1098
or
- **Infinity-Lock™** 3mm Tape, Order Code: 102-1097
(size of tape depending on the size of the foot)

Not supplied by Xiros:

- 1 x 5mm Knotless Suture Anchors
- 2 x 4.75mm Knotless Suture Anchor

Instrumentation Not supplied by Xiros

- Basic orthopaedic set
- Power tool
- Periosteum
- Retractors
- Osteotomy instruments
- Sutures

In patients with adult-acquired flatfoot deformity (AAFD), the Achilles tendon often becomes tight and contracted. Achilles tendon lengthening is a crucial component of flatfoot reconstruction. If necessary, perform your preferred achilles tendon lengthening technique before proceeding with the steps below.



Preparation

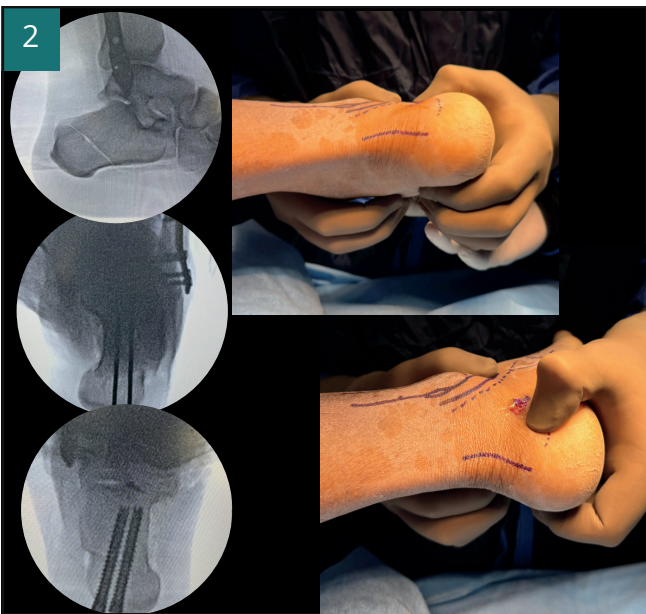
Position the patient in a supine position.

Perform precise incision planning and marking of the anatomy for the Medial Displacement Calcaneal Osteotomy (MDCO)

Note: Proper alignment of the medial calcaneus is critical to the success of the reconstruction

Figure: Lateral View of the ankle

1. Fibula
2. Peroneal Tendons
3. Sural Nerve
4. Lateral boarder of Achilles Tendon
5. Demarcation of plantar and dorsal foot
6. Base of 5th MT



Medial Displacement Calcaneal Osteotomy

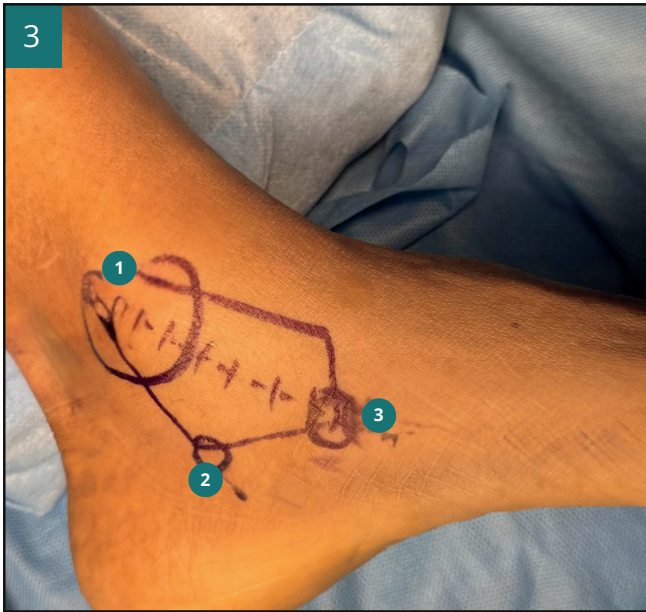
Also referred to as a “heel slide,” this procedure involves cutting the heel bone to reposition it under the leg. The osteotomy is fixed with screws, staples, or a plate to maintain proper alignment.

Note: Purpose of MDCO is correction of heel valgus by shifting distal fragment having Achilles attachment from lateral to medial correction.

In minimal invasive MCDO, 10 – 15 mm calcaneal displacement is performed, which is variable in all cases, on basis of preoperative radio-graphical evaluation.

Figure: displacement by manual manipulation with Intraoperative image of osteotomy, guide wire placement and fixation with 6mm Headless Compression Screw

Surgical Technique

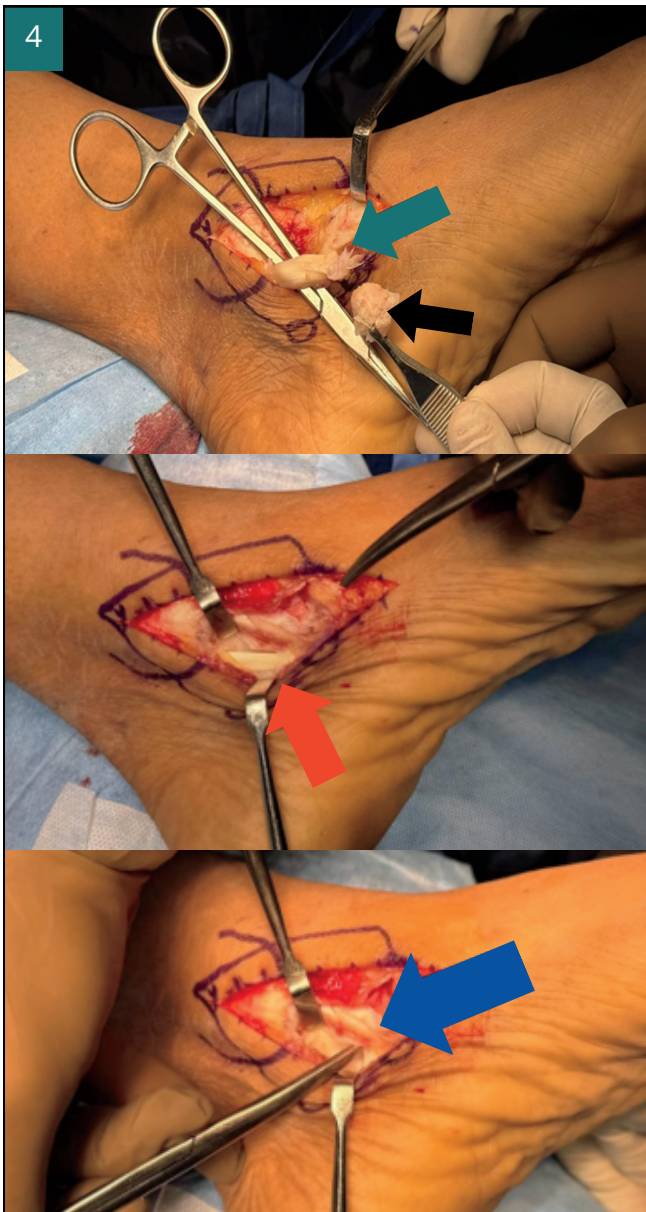


Incision and Marking for Quadrangular Reconstruction

Carefully plan and mark the incision site for the quadrangular repair of the deltoid spring complex.

Figure: Medial view

- 1. Medial Malleolus
- 2. Sustentaculum Tali
- 3. Navicular Tuberosity



Identification of Key Structures

Identify and isolate the **Posterior Tibialis tendon**.

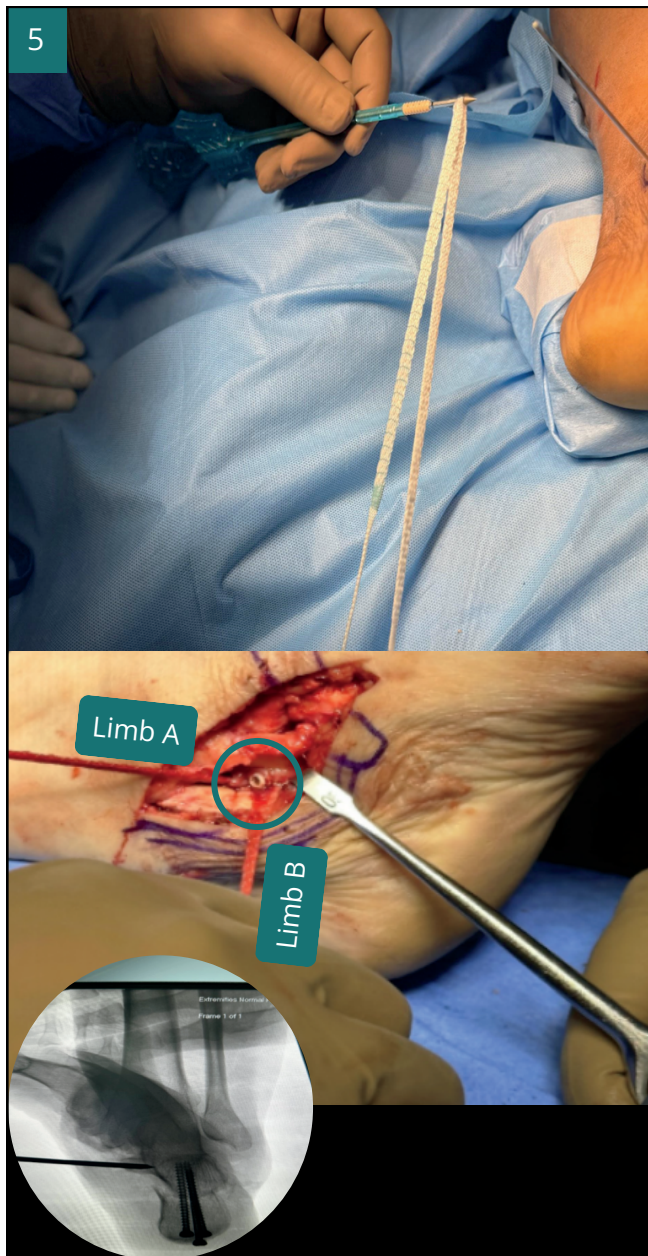
Identification of talonavicular joint and Spring Ligament

Identification of any **accessory navicular bone** and, if present, must be removed to reduce medial tension and restore alignment.

Identify **Flexor Digitorum Longus** tendon which is present just posterior to tibialis posterior.

After anterior retraction of FDL, palpate the first bony prominence, which is the **sustentaculum tali**.

Surgical Technique



Anchor Suture in Sustentaculum Tali

Load the **Infinity-Lock 5 mm Tape** into a 5 mm Knotless Suture Anchor. The entry position for the sustentaculum anchor is medial to lateral, directed slightly posteriorly in the subchondral region of the sustentaculum. Start with a guide pin and over-drill to a depth of 14 mm using a 4.5 mm cannulated drill bit and insert the anchor. Identify Limb A and Limb B of the tape.

Check the X-ray axial view to avoid joint penetration

*Note: The **Infinity-Lock 5 mm Tape** has a pre-installed loop out of the packet. To remove the loop, simply pull the loop apart to create a single long tape.*



Navicular Tunnel Preparation

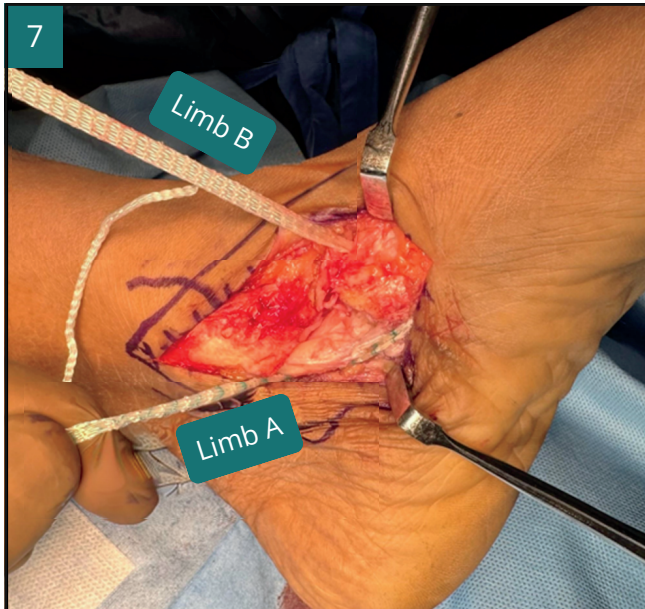
Create a 3 mm* or 5 mm** bone tunnel in the navicular bone drilling from plantar to dorsal direction for optimal positioning and construct strength.

Note: one can use any size of tape depending on the size of the foot

*when using of Infinity-Lock 3 mm.

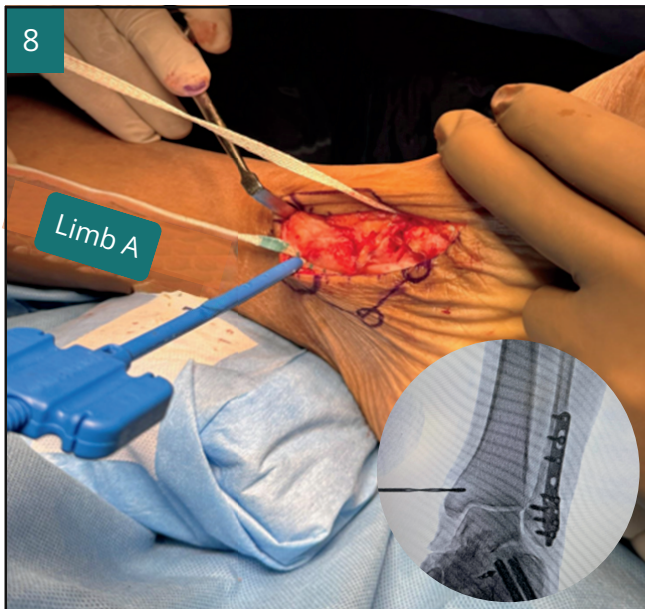
** when using of Infinity-Lock 5 mm.

Surgical Technique



Navicular Tunnel Passage

Pass Limb B of the **Infinity-Lock** Tape through the navicular tunnel, forming a quadrangular **Infinity-Lock** Tape construct.



Tibial Anchoring of Infinity-Lock Limb A

Limb A is secured into the distal tibia at the posterior deltoid ligament footprint. Insert a guide pin 15 mm above the ankle joint line in subchondral bone or 35 mm above the medial malleolus, and then over-drill with a 4 mm cannulated drill bit to a drill depth of 14 mm. Pass Limb A of the **Infinity-Lock** Tape through the eyelet of the 4.75mm Knotless Suture Anchor, and secure to the bone under appropriate tension after reduction of the talonavicular joint.

*Figure: Intraoperative Drill bit position for securing 4.75mm Knotless Suture Anchor loaded with Limb A **Infinity-Lock** Tape.*

Surgical Technique



Tibial Anchoring of Infinity-Lock Limb B

Starting with a guide pin, over-drill another 4 mm tunnel to a depth of 14 mm into the distal tibia at the anterior deltoid ligament footprint, about 10 mm anterior to the Limb A anchor, and using another 4.75 mm knotless suture anchor, secure Limb B to the bone under appropriate tension.

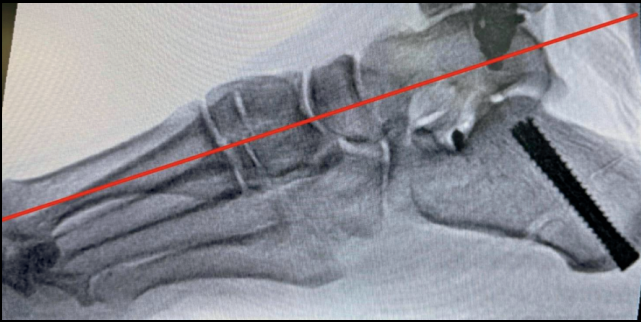
Before securing Limb B, the foot should be forefoot corrected from abduction to neutral position (alignment of the long axis of the tibia and 2nd metatarsal should be at one line) with no talonavicular uncovered in the C-arm image.

Avoid fixation of the deltoid spring tape in too tight a position, and avoid overcoverage of the talonavicular joint to prevent Cavovarus deformation

Figure: shows the placement of both anchors from an anteroposterior view of the ankle.

Surgical Technique

10



Reattachment and Closure

Reattach the tibialis posterior tendon to the medial navicular for improved medial arch support and stability.

Close the incision in two layers:

1. Deep Layer: Repair of soft tissue structures.
2. Superficial Layer: Skin closure ensuring minimal tension and proper alignment.

Post-Operative Alignment

After successful MDCO and deltoid spring reconstruction using **Infinity-Lock** Tape, talus becomes completely aligned to first metatarsal (**Meary's angle become zero**) and sinus tarsi get widened and more visible as shown in this X-ray taken in stimulated weight bearing position.

Post-operative Management

Standard rehabilitation protocols should be applied. A typical example is as follows:

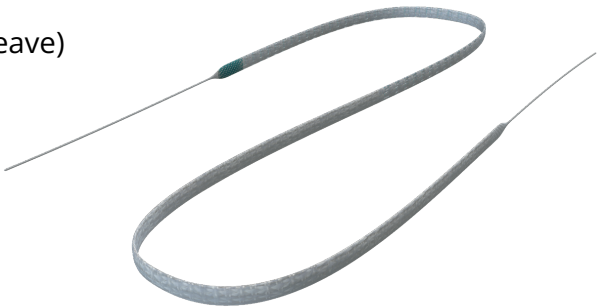
- Below knee splint and non-weight bearing till 6 weeks.
- Start toe touching, ROM exercises and partial weight bear from 6 weeks to 8 weeks.
- Start full weight bear walking and aggressive proprioceptive gait training exercises after 8 weeks.
- Sport activities should be resumed after 6 months

Ordering Information

Implant

102-1097 Infinity-Lock Tape, 3 mm x 400 mm (open weave)

102-1098 Infinity-Lock Tape, 5 mm x 400 mm (open weave)



Please refer to the Instructions for Use leaflet for essential information, including Use, Sterility, Indications, Contraindications, Warnings and Precautions, Potential Adverse Effects



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