

# Management of Adhesions in Foot and Ankle Surgery



# Faculty

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# Faculty Disclosures

- **Dr. Ng:** Consultant — Depuy/Synthes, Embody, GLW, In2Bones, Lifenet, Novastep, Organogenesis, Stryker/Wright, Zimmer/Biomet

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# Learning Objectives

- Examine the cause and impact of adhesions in foot and ankle surgery
- Explore current treatment options
- Examine results from a published study evaluating the effect of dehydrated human amnion/chorion membranes (dACMs) on tendon repair in a diabetic model with impaired healing
- Explore case studies using an amniotic-derived product to help prevent adhesion formation

# Cause and Impact in Foot and Ankle

- Procedure-specific risk
  - If high-risk procedure, will often prophylactically utilize scar barrier
    - Tarsal Tunnel
- Pos-surgical scar tissue
  - Often patient-dependent
  - Many instances, we won't know if they are a bad scar former
  - Arthrofibrosis or post-surgical adhesions with indurated scar tissue
  - Often times, a secondary procedure will be necessary to excise scar tissue and attempt to prevent recurrence
    - Difficult to prevent when has occurred already

# Scar Tissue

- Impact on patients
  - Painful
  - Can cause angular malalignment
  - Loss of ROM
- What is it?
  - Crosslinked collagen fibers which forms from stress to the ECM
    - Overproduction causes the collagen dense and crosslinking makes it very inelastic
    - Fibroblasts proliferation contracts the tissue

# Current Treatment Options Foot and Ankle

- **Amnion-based products**
- HA and PLA products – biodegradable nerve conduit or tube
- Collagen implant

# Thought Process

- Placental Membranes
  - Natural adhesion barrier
  - Provide gliding surface
  - Anti-inflammatory factors and regenerative factors may assist in repair of the nerve/soft tissue/cartilage
  - Affinity — fresh amniotic membrane, live cells
  - NuShield — dehydrated amnion, chorion membrane
    - Terminally sterilized and thicker (longer retention time?)

# Discussion-Dehydrated Amnion/Chorion Improves Achilles Tendon Repair in a Diabetic Animal Model

- This study is novel in that it is the the first to evaluate the effect of an amniotic allograft in a delayed diabetic model of tendon healing; and also the **first study to evaluate dACM grafts as an adjunct for Achilles' tendon repair. Placental-derived grafts have been reported to contain numerous growth factors and cytokines thought to support tendon healing, including PDGF-BB, IGF-1, TGF- $\beta$ 1, and bFGF.<sup>38</sup>** Placental tissues also have been shown to promote cell proliferation and migration in a variety of cell types and promote angiogenesis<sup>39</sup>; these results along with other published **work suggest a clinical benefit of dACM for augmenting tendon repair beyond the accepted adhesion barrier function.**
- **Where dACM-wrapped tendons resulted in reduced failures, improved mechanical integrity, and greater cell migration to the site of injury in a T2DM animal model.** Biomarker analysis also indicated that treating injured tendons with dACM reduced the time to repair; however, by 28 days, both dACM-wrapped and unwrapped (control) tendon groups were inferior to the noninjured group (sham), illustrating the effects DM has on delaying tendon healing.

PDGF = platelet-derived growth factor; IGF-1 = Insulin-like growth factor 1; TGF- $\beta$ 1 = transforming growth factor beta 1; bFGF = basic fibroblast growth factor; DM = diabetes mellitus

McQuilling JP, et al. *Wounds*. 2019;31(1):19-25. McQuilling JP, et al. *Wounds*. 2017;29(6):E38–E42. McQuilling JP, Vines JB, Mowry KC. *Int Wound J*. 2017;14(6):993–1005.

# Dehydrated Human Placental Allograft Skin Substitute Orientation

- Amnion/chorion membrane barrier inclusive of all layers
- Contains extracellular matrix and growth factors
- Dehydrated and terminally sterilized
- Stored at room temperature with a 5-year shelf life



# Dehydrated Human Placental Allograft Skin Substitute Orientation

- Notched to provide precise orientation
  - Middle notch at top, and the notched corner to its right
  - Upper side is epithelial and the side facing down is chorion
- Non-adherent, non-occlusive dressing may be used directly over dehydrated skin substitute



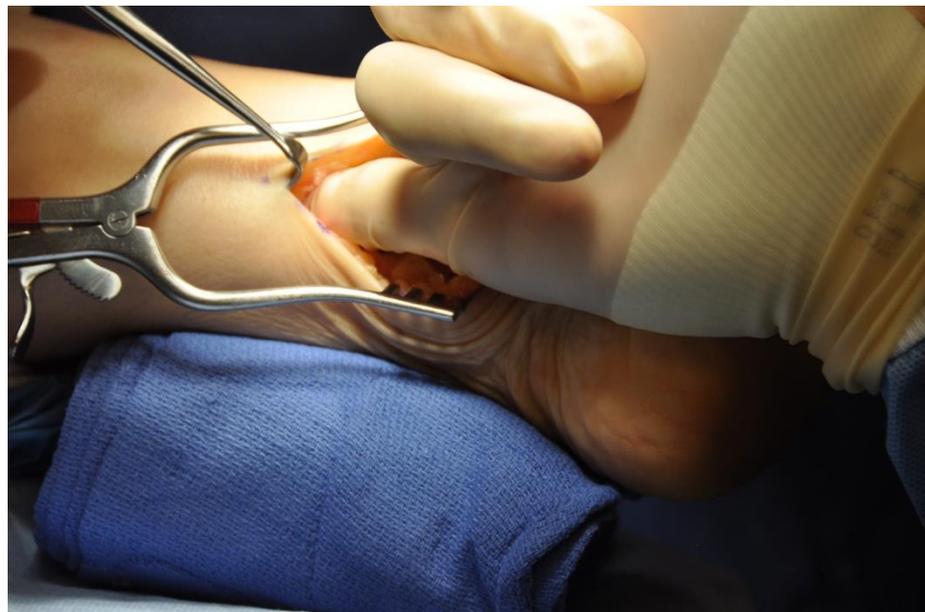
# Tarsal Tunnel

- Utilized to decrease adhesions to posterior tibial nerve after release
- Must be meticulous when handling post tib nerve
- Place human placental allograft skin substitute from just above the transected laciniated ligament and down to the adductor hiatus

# Laciniated Ligament



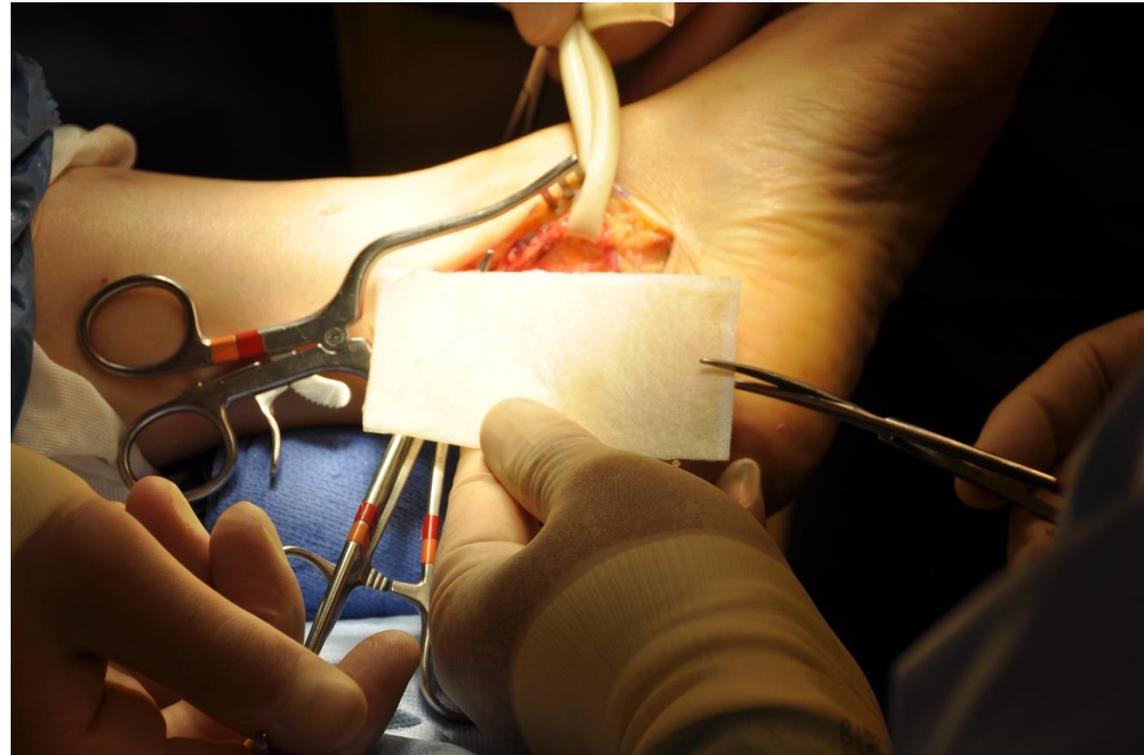
# Finger Test



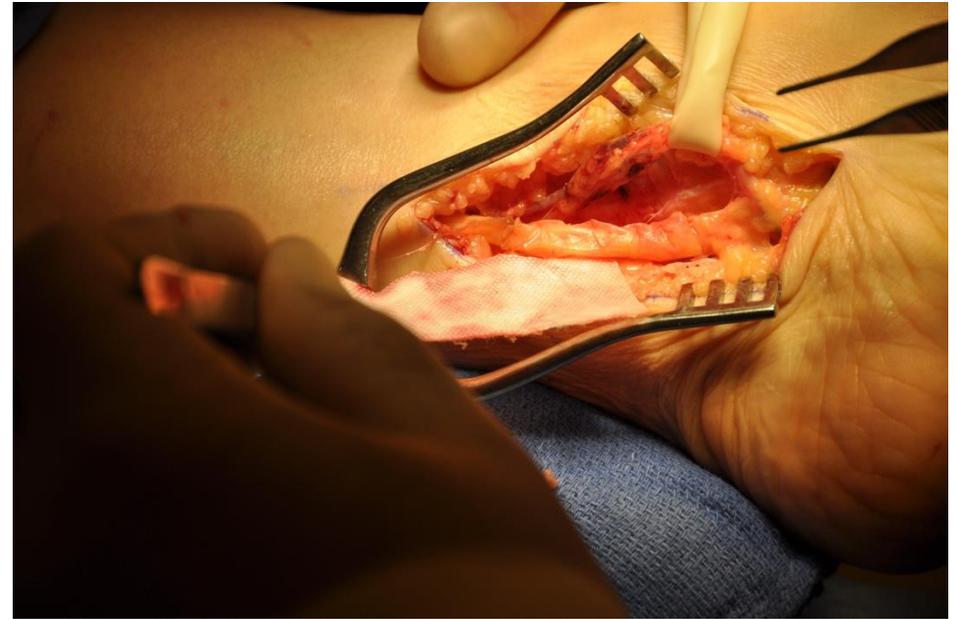
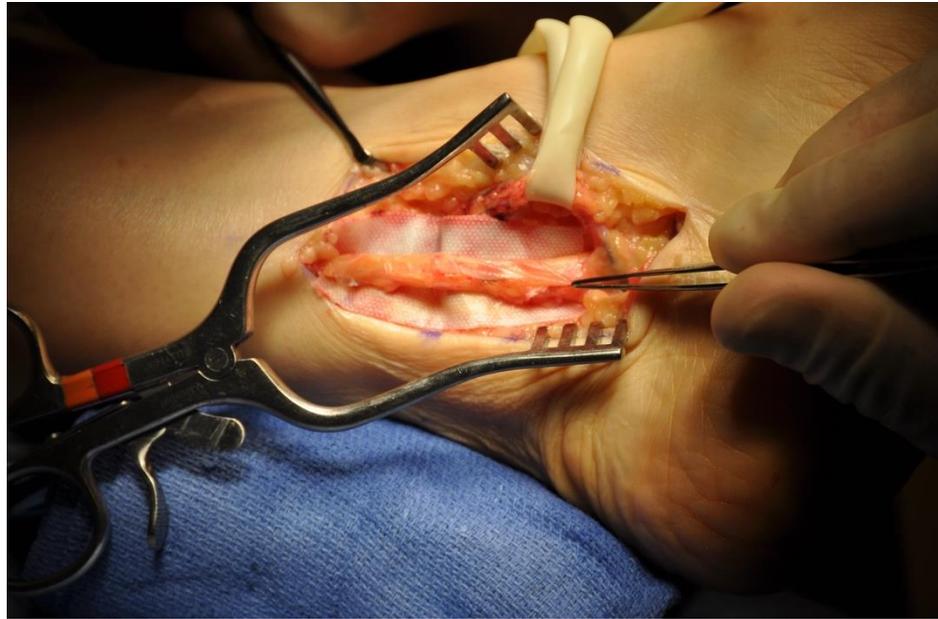
# Isolate Nerve



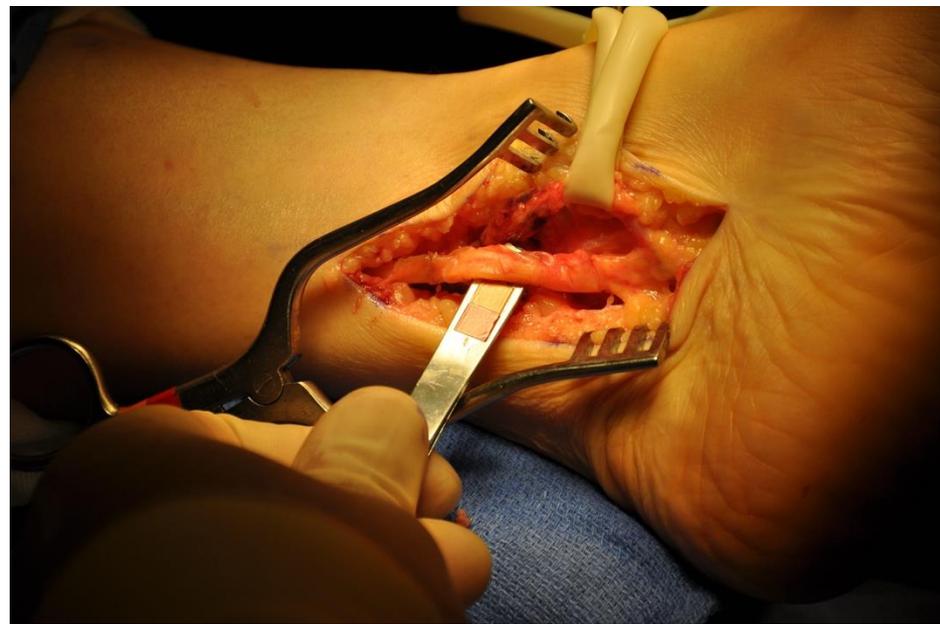
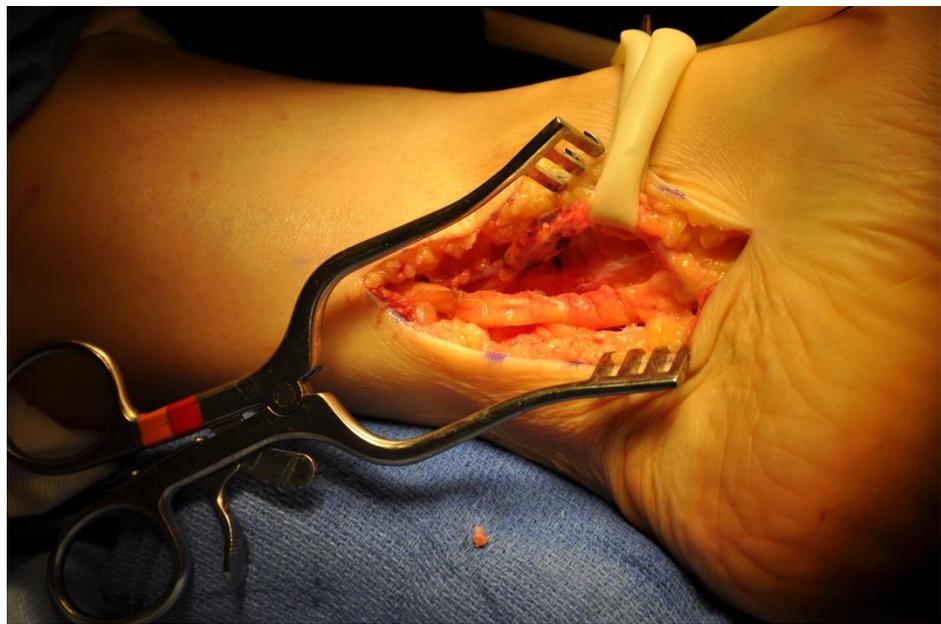
# Size Length of Amnion



# Removing Backing



# 5.0 Monocryl



# Scar/Nerve Barrier

- Used for postoperative scarring
  - In conjunction with soft tissue release and or neurolysis
  - Utilized in joint capsule adhesion — ie, predislocation syndrome repair
- Postoperative neuropraxia or adhesions to nerve
  - Generalized scar tissue causing nerve impingement

# Peroneal Nerve Entrapment



# Placement with Backing



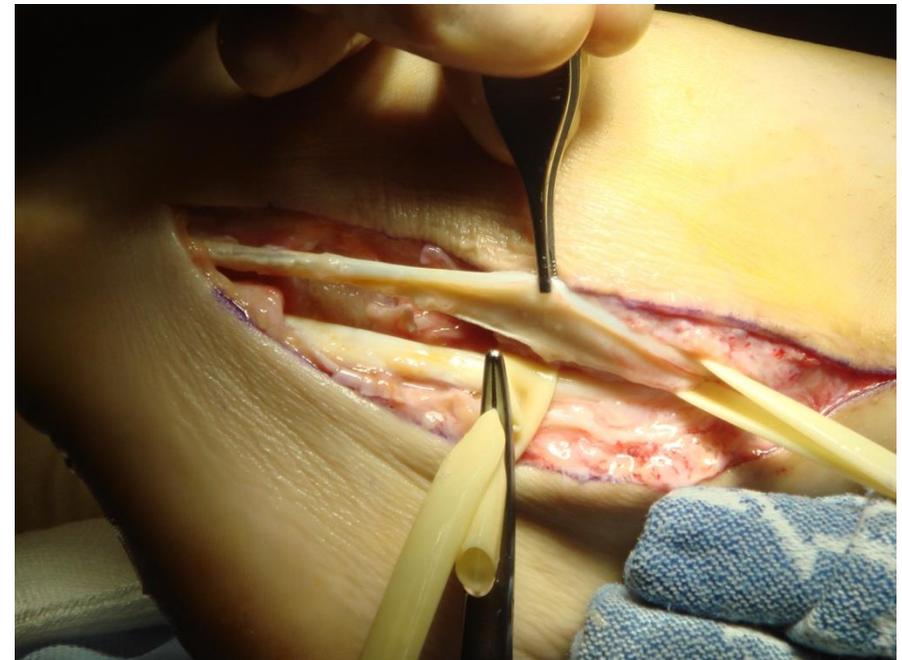
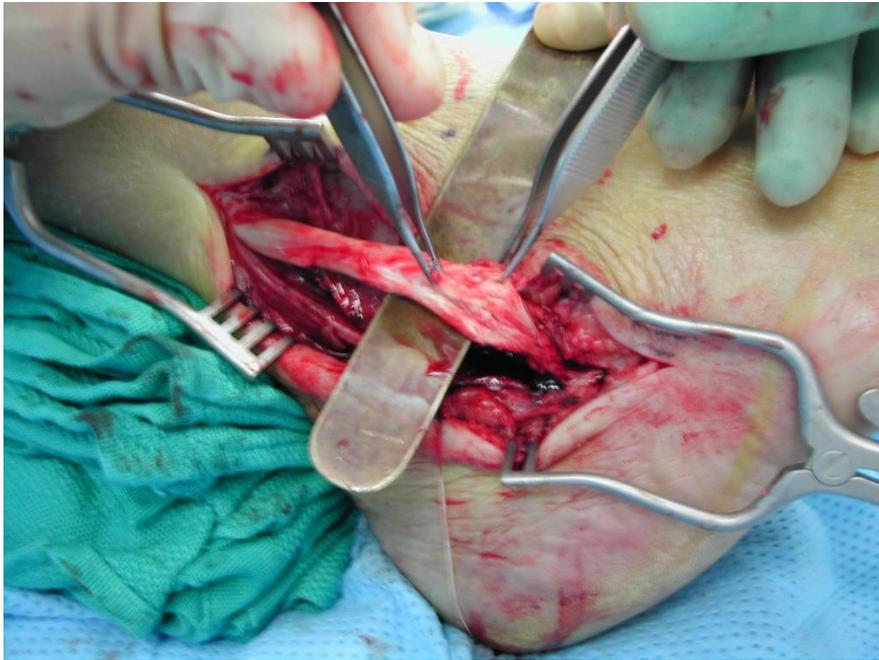
# Wrapped Nerve



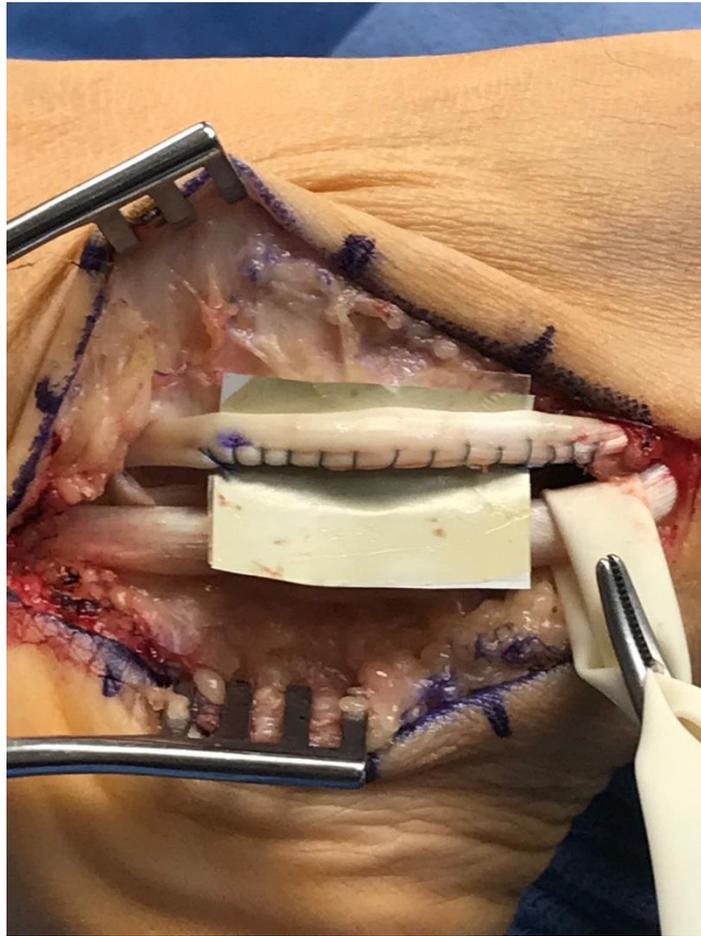
# Peroneal Tendon Repair



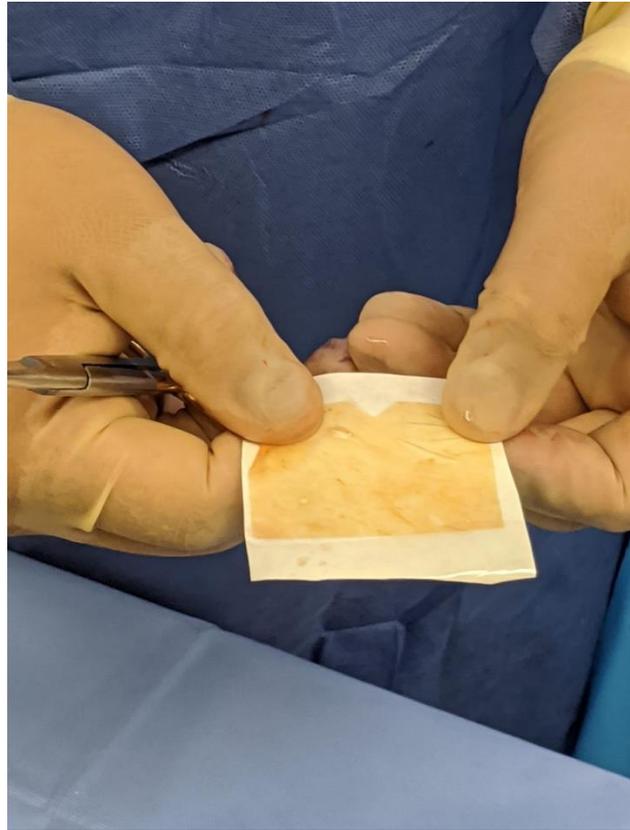
# Peroneal Repair



# Wrap with Backing on Amnion



# Post Tib Tendon Tear



# Post Repair

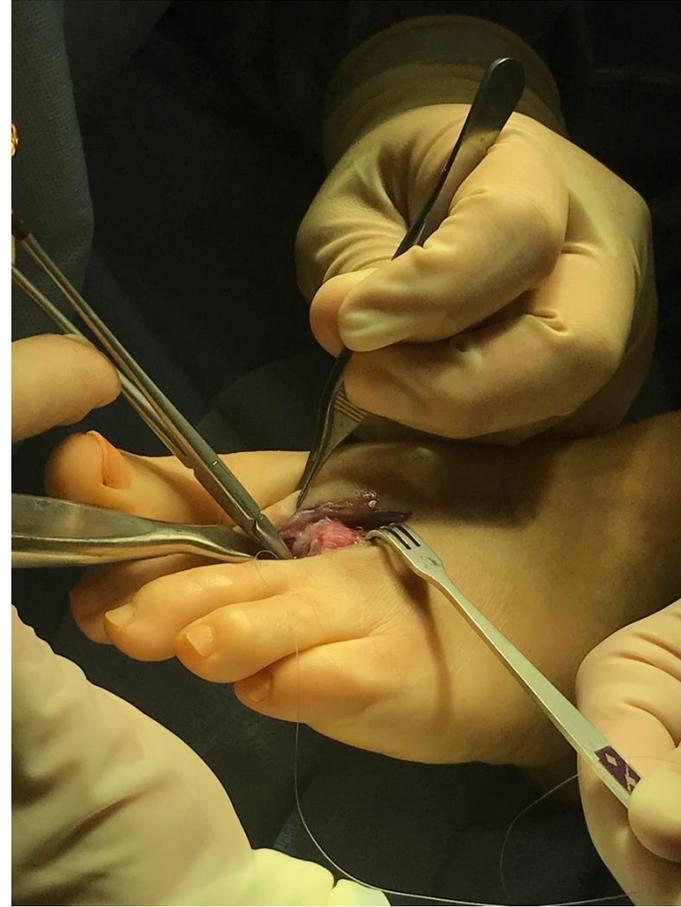
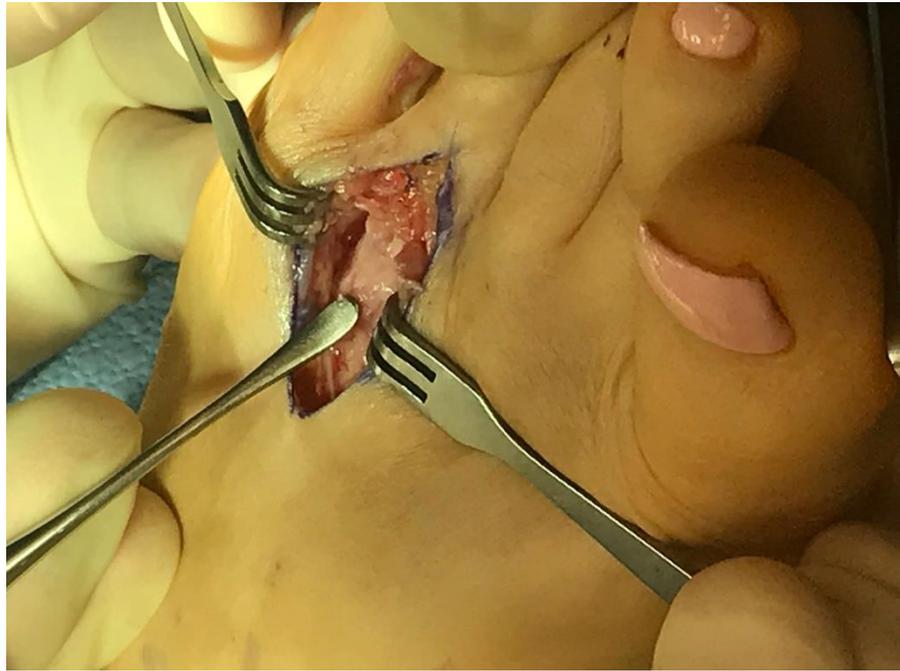


# Scar Tissue Impact Post Surgical Procedure: Adhesion Barrier

- Utilized in elevated and arthrofibrosed capsule after predislocation
- Can be placed in any area where you have to release scar tissue or an area that is prone to scar tissue
- Stromal side down away from scarred area



# Failed Elevated Predislocation

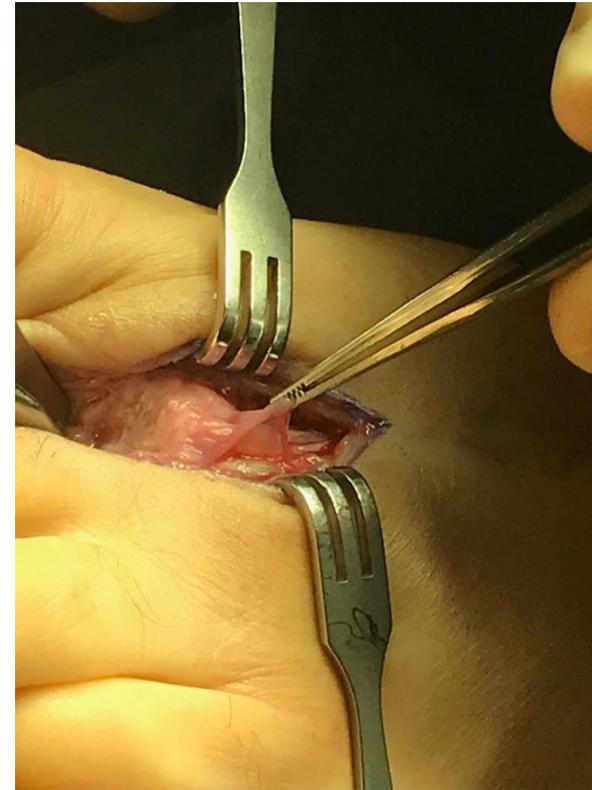


# Application on Met Head

NuShield



Affinity



# Combined with Z-Plasty

Affinity consistency

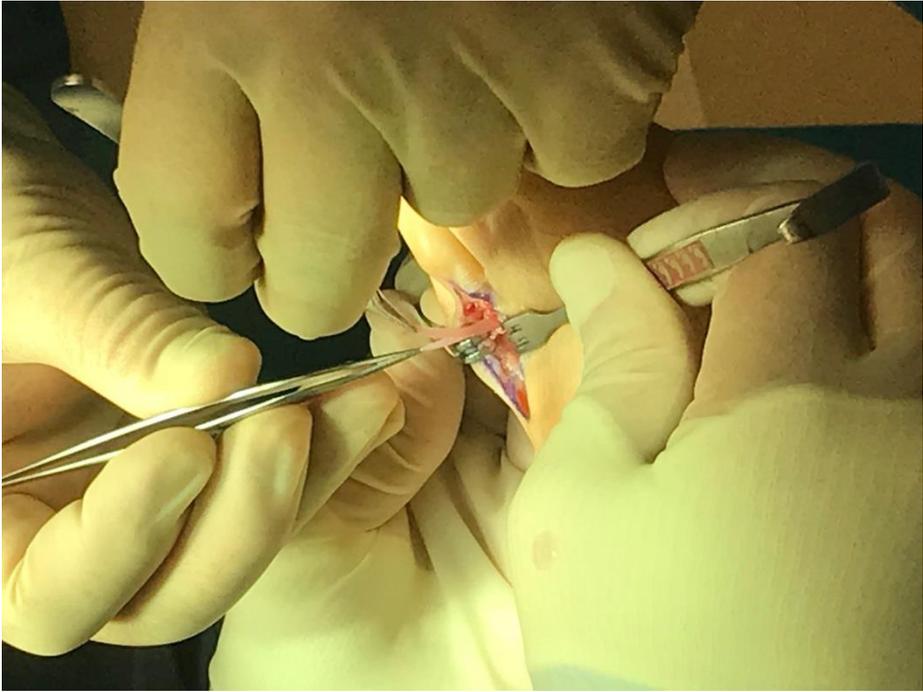


# Arthrofibrosis

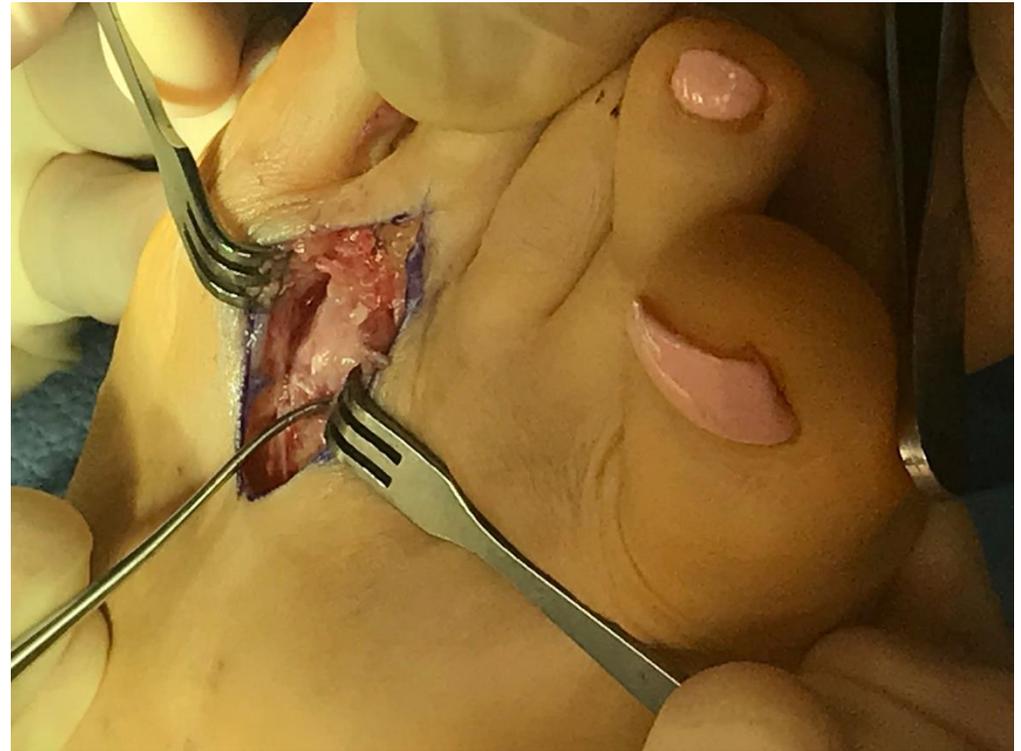
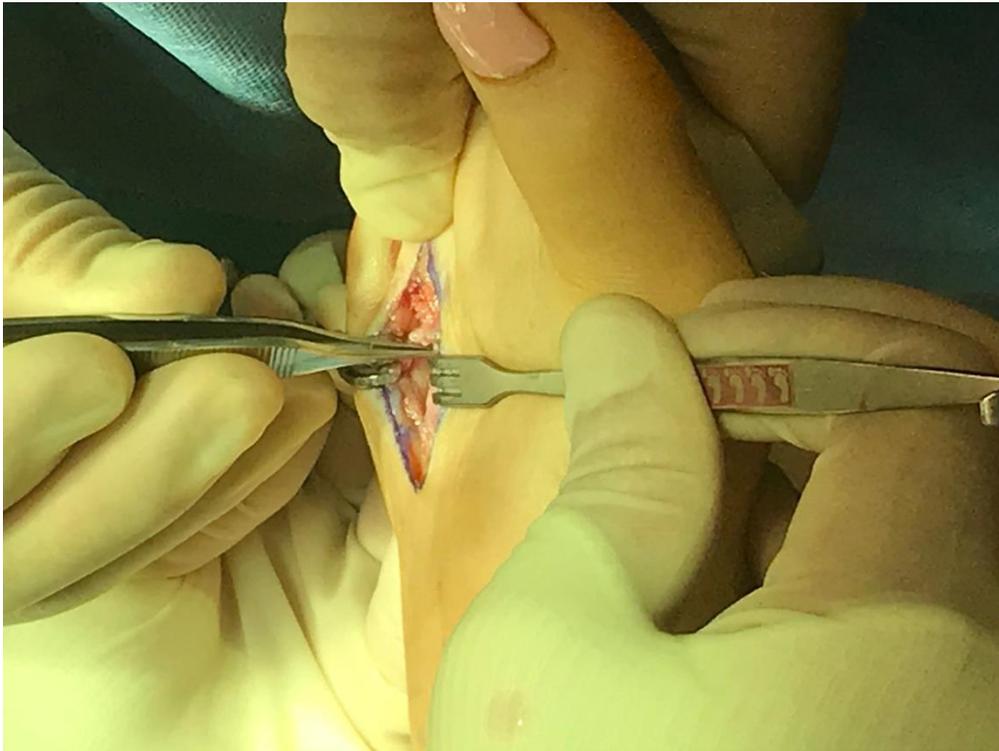
Affinity



Careful handling



# Placement



# Z-Plasty



# First MPJ OCD and Debridement

Typical isolated OCD



Dehydrated human placental allograft skin substitute to assist in chondrogenesis and adhesion prevention



# Stage 3 HL/HR

Post-debridement

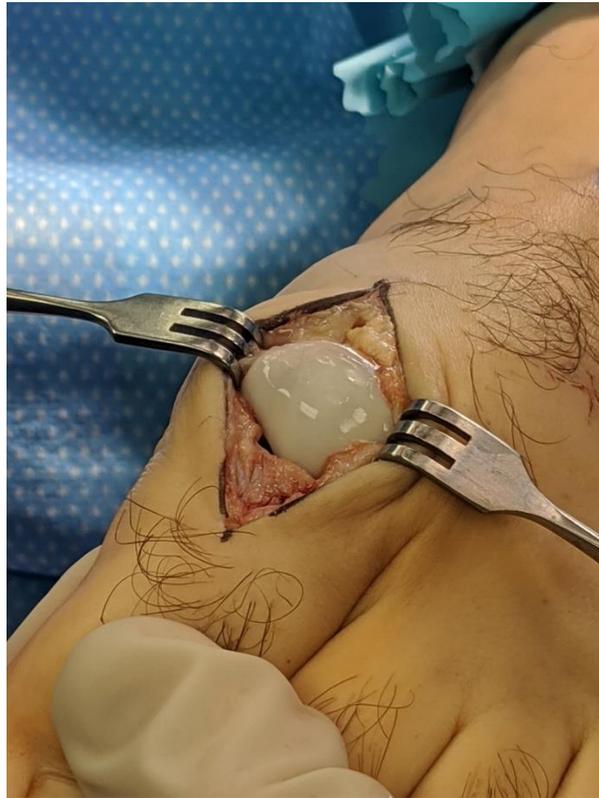


Placement of BMAC with dehydrated human placental allograft skin substitute

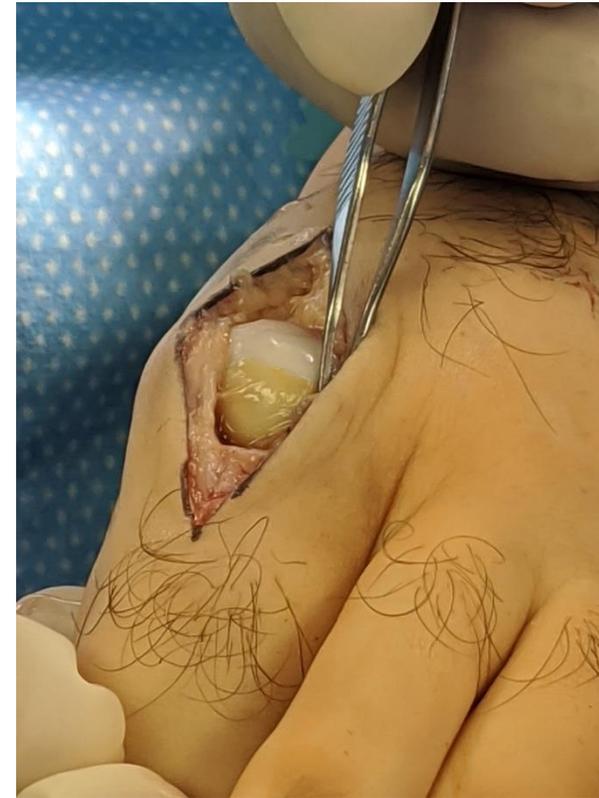


# Post First MPJ Dislocation with Limited ROM

Cartilage Pristine



Metatarsal sesamoid post-traumatic adhesion



# Summary

- Decreased sural neuritis post-peroneal tendon repair, or assist in improved outcomes after nerve decompression
- Less Neuropraxia in Tarsal Tunnel
- Utilized for revision failed predislocation syndrome scar tissue, combined with skin plasty
- Scar tissue removal, placed to prevent recurrent scaring

# Q&A

