Osteochondral Lesions of the Talus

A Unique Surgical Approach

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Introduction

- Osteochondral lesions of the talar dome can cause significant functional impairment and a decreased quality of life.

  - Defined as a separation of articular cartilage from the talar dome, with varying amounts of subchondral bone. These lesions can be chronic in nature, as seen in Osteochondritis Dissecans (OCD).

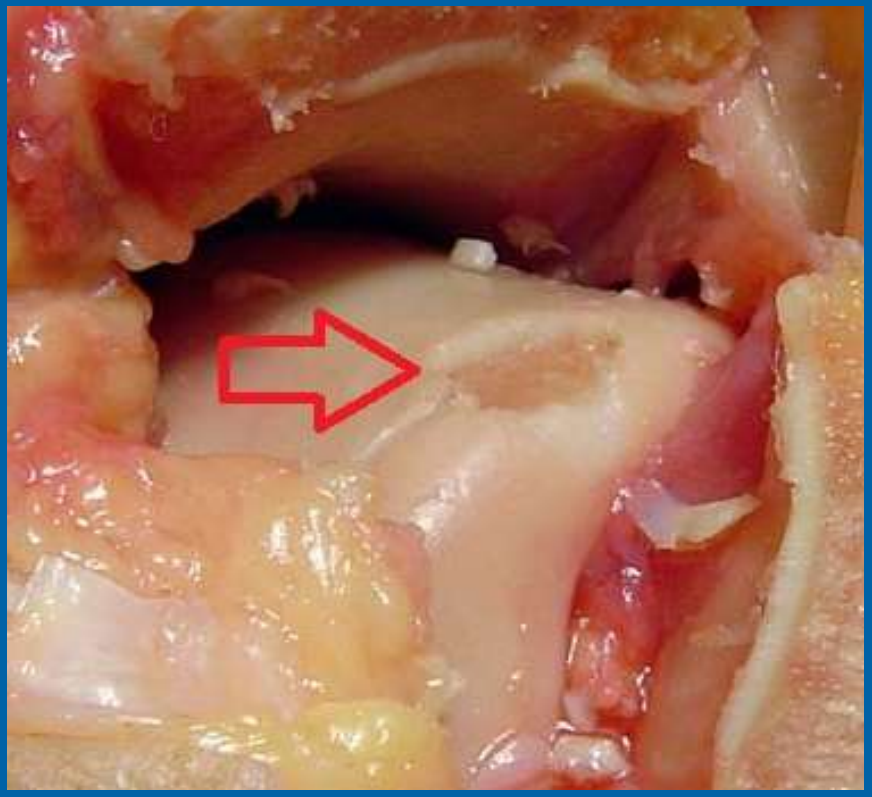
Introduction

- In 1888, Francis Konig described osteochondritis dissecans as a subchondral inflammatory process of the knee resulting in a loose cartilaginous fragments.

- In 1922, Kappis described the same process in the talus (5).

OLTs

- Osteochondral lesions of the talus (OLTs) occur in 70% of sprains & fractures of the ankle
- 98% of lateral lesions involve trauma
- 70% of medial lesions involve trauma
- Conservative treatment successful in less than 45%
- MRI is modality of choice for visualization



Hannon, C.P. et al. *Osteochondral Lesions of the Talus: Aspects of Current Management.* The Bone and Joint Journal. February 2014, Vol 96B, pg 164-171

Etiology

- Trauma is often a causative factor (3)
  - Occur in 2-6% of all ankle sprains
  - Estimated to be accompanied by concurrent ligamentous injuries 28-45% of the time (2).
  - High incidence following ankle fractures

- May occur without a history of Trauma
  - Attributed to difference in mechanical properties between articulating TTJ surface. Tibial cartilage may be stiffer resulting in microtrauma, leading to an OLT
  - Idiopathic Osteonecrosis
  - Associated with ETOH, Endocrine, Steroids, Genetics, ect.

Incidence

- Talar osteochondral injuries represents 1% of all talar fractures and 4% of all osteochondral lesions (2, 4)
- More commonly seen in males (2).
- Average age affected between 20 and 30 years old
- 10% of these lesions occur bilaterally (3).

Incidence

- *True incidence of OLT's may be under-reported due to missed or delayed diagnosis.*
  - *OLT's in patients with unexplained chronic ankle pain has been reported as high as 81%.*

Classification

- The Berndt Hardy Classification is most commonly used in describing the severity of OLTs.
  - 1959, an extensive review, including staging criteria was performed by Berndt and Harty (1). Using cadaver studies, they postulated that lateral lesions were the result of dorsiflexion and inversion, while plantarflexion and inversion lead to medial lesions.

Canale & Belding

- retrospective 35-year follow-up review that concluded that some stage III lesions and all stage IV lesions require surgical intervention (1, 2).

- Updates by Anderson et. al resulted in two subclasses added to stage III injuries.

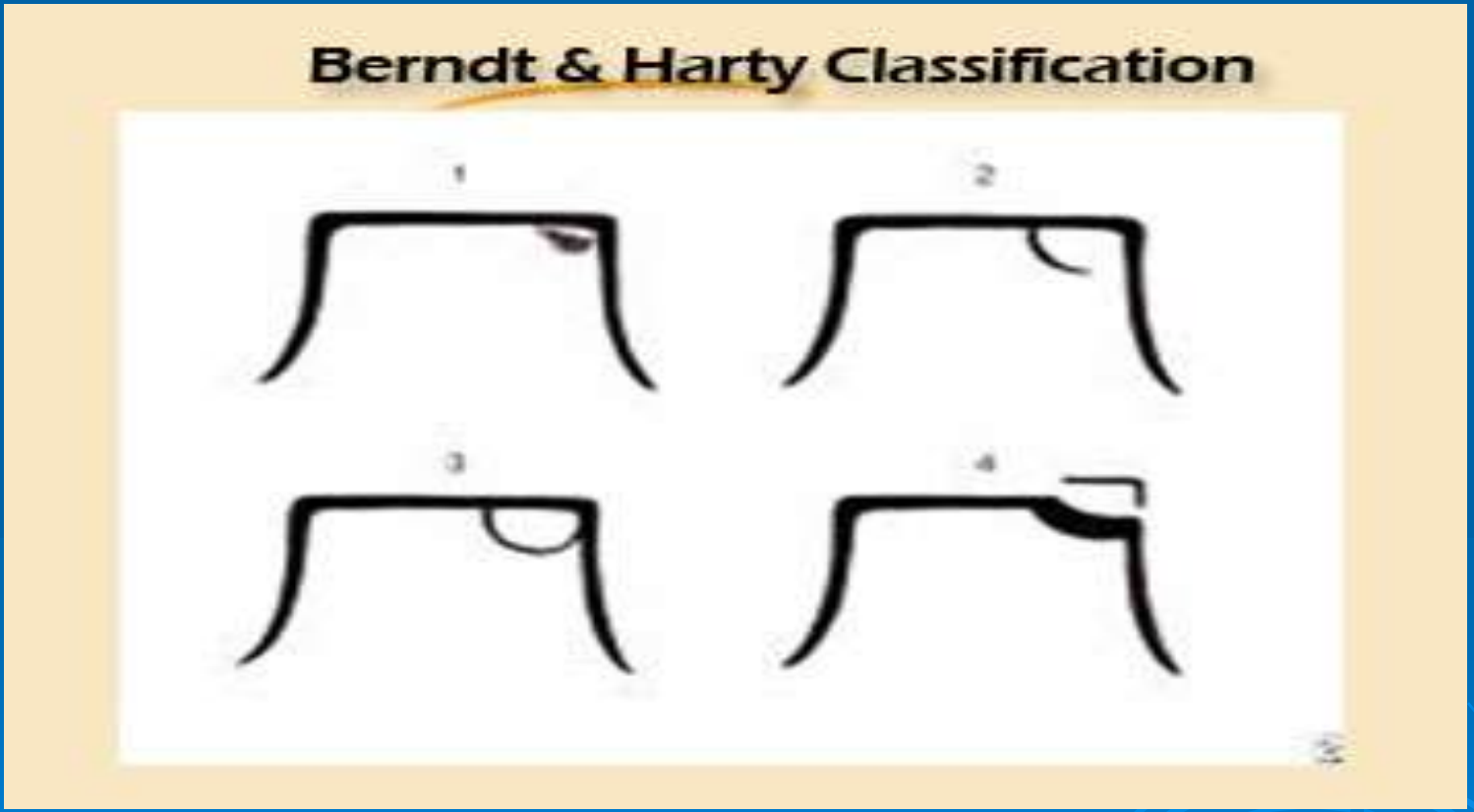
Classification

Berndt Hardy and Canale

Stage	Description of Bony Defect
I	Small Area of Subchondral Compression. Diagnosed with CT or MRI.
II	Partially Detached Fragment. Diagnosed with Radiographs, CT, or MRI
III	Completely Detached Bony Fragments Held Within Defect by intact Cartilage
III A	Subchondral Cyst
IIIB	Undisplaced Fragment
IV	Displaced Loose Fragment within Joint

Table I: Berndt Hardy Classification (1)

Classification



Types of Lesions

- Reported that 57% occur posteromedially and 43% occur anterolaterally (4).
  - Lateral lesions are located in the middle third of the talar dome and are shallow and wafer-shaped.
  - Medial lesions are typically located in the posterior third of the talar dome and are deeper and cup shaped (2).

Presentation

- Most often present with a chief complaint of a sprained ankle.
  - Often report a history of trauma, recurrent sprains or chronic instability(4).
  - Pain increased with WB
- Common Symptoms include pain, swelling, weakness, and decreased range of motion, ankle joint stiffness.

Presentation

- Physical Exam Findings Non specific:
  - Patients often have pain on palpation of the anterolateral or posteromedial aspects of the ankle joint, along with pain with dorsiflexion and inversion.
- Note: With ankle sprains, pain and swelling should subside within a few months with conservative treatment.

Radiographic Exam

- Plain X-rays:
  - Anterior Posterior
  - Lateral
  - Mortise
    - Plantarflexed mortise may help better visualize posterior medial lesions
    - Dorsiflexed mortise may help better visualize anterior medial and lateral lesions
- ***Because patients often present with a chief complaint of ankle pain without radiographic evdience of acute fracture (i.e Stage I compression fractures) these lesions are often misdiagnosed ***

Plain X-ray

Radiographic Exam

- MRI:
  - *Occult OLT's
  - Cartilaginous surfaces
  - Surrounding Bony Edema
  - Fragment stability
  - Other soft tissue injuries

MRI: Stage I

MRI: Stage IV

Differential Diagnosis

- Bony and soft tissue impingement
- Lateral ankle instability
- Ankle and/or subtalar joint arthritis
- Tendinitis
- RSD
- Tarsal coalitions
- Synovitis

Important Points

- Contained Lesions
- UnContained Lesions
- 150 mm2

Size Really Does Matter

- *Chuck-Paiwong et al*:
  - *Good-excellent results in 100% under 15mm*
  - *31/32 patients over 15mm had poor result*
    - *73 patients*
- *Choi et al*:
  - *80% with lesions over 15mm had poor outcome*
    - *25 patients*

Treatments

- Various: Non –operative vs. Operative
- Tol et al systemic review (7)
  - Summarized 65 study groups in 52 studies
  - Systematically screened Electronic databases from January 1966 to December 2006
  - ***Non operative treatment 25-40% success rate***
    - All stages involved
  - ***OATS, BMS and ACI scored success rates of 87, 85 and 76%, respectively.***
    - Stage III and IV
  - Bone marrow stimulation (BMS) was identified as the best treatment option.

Treatment

- Symptomatic, Non-displaced lesions are often treated conservatively
  - NWB in short leg cast; crutches
  - Rest
  - ICE
  - NSAIDs
  - Physical therapy
- 3-6 months non-operative treatment

Treatment

- Surgical intervention is often reserved symptomatic lesions that have failed conservative therapy or displaced, stage III or IV lesions; smaller lesions <1.5 cm
  - Excision and Curettage : Arthroscopic or Open; remove fragment
  - BMS: Drilling or microfracturing:
    - Disrupts intra osseous vessels→Growth Factors→Angiogenesis→ Bone Marrown Cells → Fibrocartilage

Treatment

- Larger Lesions
  - Fresh Osteochondral Allograft
  - Mosaicplasty with Autogenous Graft
    - Lesions 1-4 cm^2
    - 6.5, 4.5, 3.5 cylindrical plugs autogenous graft derived from ipsilateral knee
    - Medial upper part of the medical femoral condyle is primary harvest site.
    - Goal is to reproduce the mechanical, structural and biochemical properties of the original hyaline articular cartilage which has become damaged

Treatment

- Osteochondral Autologus Transfer system (OATs)
  - Similar Concept as Mosaicplasty
  - Complete osteochondral plug is removed from site of the lesion
  - 6-10 mm osteochondral plugs are transferred from ipsilateral knee to deficit; never leaves harvest tube

Treatment

- Autologous Chondrocyte Transplantation (ACT) (9)
  - Osteochondral slices (10x 3mm) from ipsilateral knee → sterile tub → lab
  - Eznymatic break down cartilage, isolation chondrocytes, which are then cultivated in culture medium 2 weeks
  - Cultured cells are injected under tibial periosteal flap (8)

Microfracture

- Indicated for lesions up to 15mm in diameter
- Multiple holes created at 3-4mm intervals
- Stimulate mesenchymal stem cells (MSCs) and growth factors
- Results in fibrin clot & eventually fibrocartilaginous repair
  - Fibrocartilage mostly Type I collagen
    - Softer & more easily damaged than hyaline

2. Polat, G. et al. *Long-Term Results of Microfracture in the Treatment of Talus Osteochondral Lesions.* European Society of Sports Traumatology. February 2016 Vol 24, pg 1299-1303

Subchondral Drilling vs Microfracture

- Heat necrosis is main concern of drilling
  - May cause bone necrosis, pain, edema, or stress fracture
- Microfracture avoids heat necrosis, but can create loose body particles
  - If not removed, may cause locking & cartilage damage
  - Particles may block access channels to bone marrow, impeding healing

3. Choi, J.I. and Lee, Keun-Bae. *Comparison of Clinical Outcomes Between Arthroscopic Subchondral Drilling and Microfracture for Osteochondral Lesions of the Talus*. Knee Surgical Sports Traumatology Arthroscopy. January 2015. pg

Autologous Osteochondral Transplant (Mosaicplasty / OATS)

- Cylindrical osteochondral grafts harvested from NWB portion of ipsilateral knee
- Indicated for lesions over 15mm in diameter
- May result in cystic formation due to incongruence with surrounding cartilage
- *Zengerink et al:*
  - *87% good-excellent results*
    - *243 patients*

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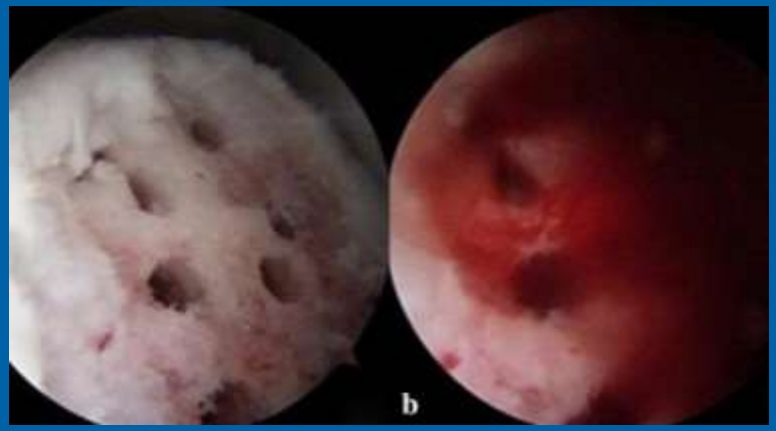
Drilling vs Microfracture cont.

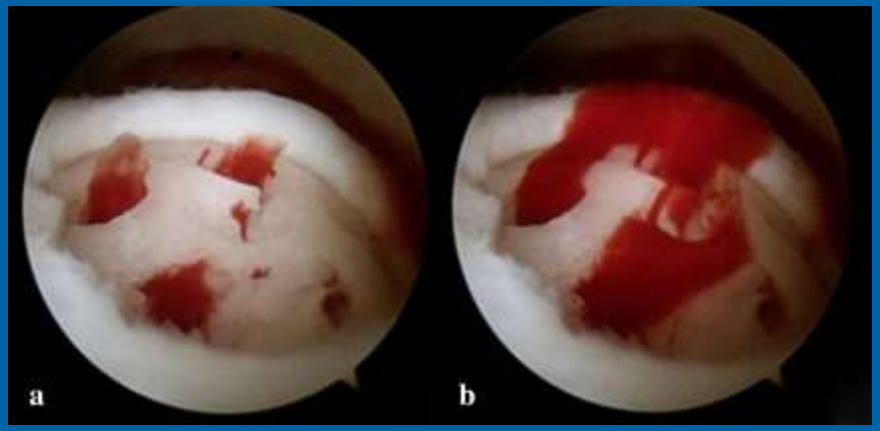
- *Choi et al cont*:

	Drilling	Microfracture
Patients	40 (28M,12F)	50 (40M,10F)
Pre-op AOFAS	66	66.5
Post-op AOFAS	89.4	90.1
Mean f/u	38.1 months	38.5
Mean lesion size	1.0cm^2	1.0 cm^2
Results:		
Excellent	30 (75%)	34 (68%)
Good	5 (12.5%)	10 (20%)
Fair	5 (12.5%)	6 (12%)

Drilling vs Microfracture cont.



Subchondral Drilling



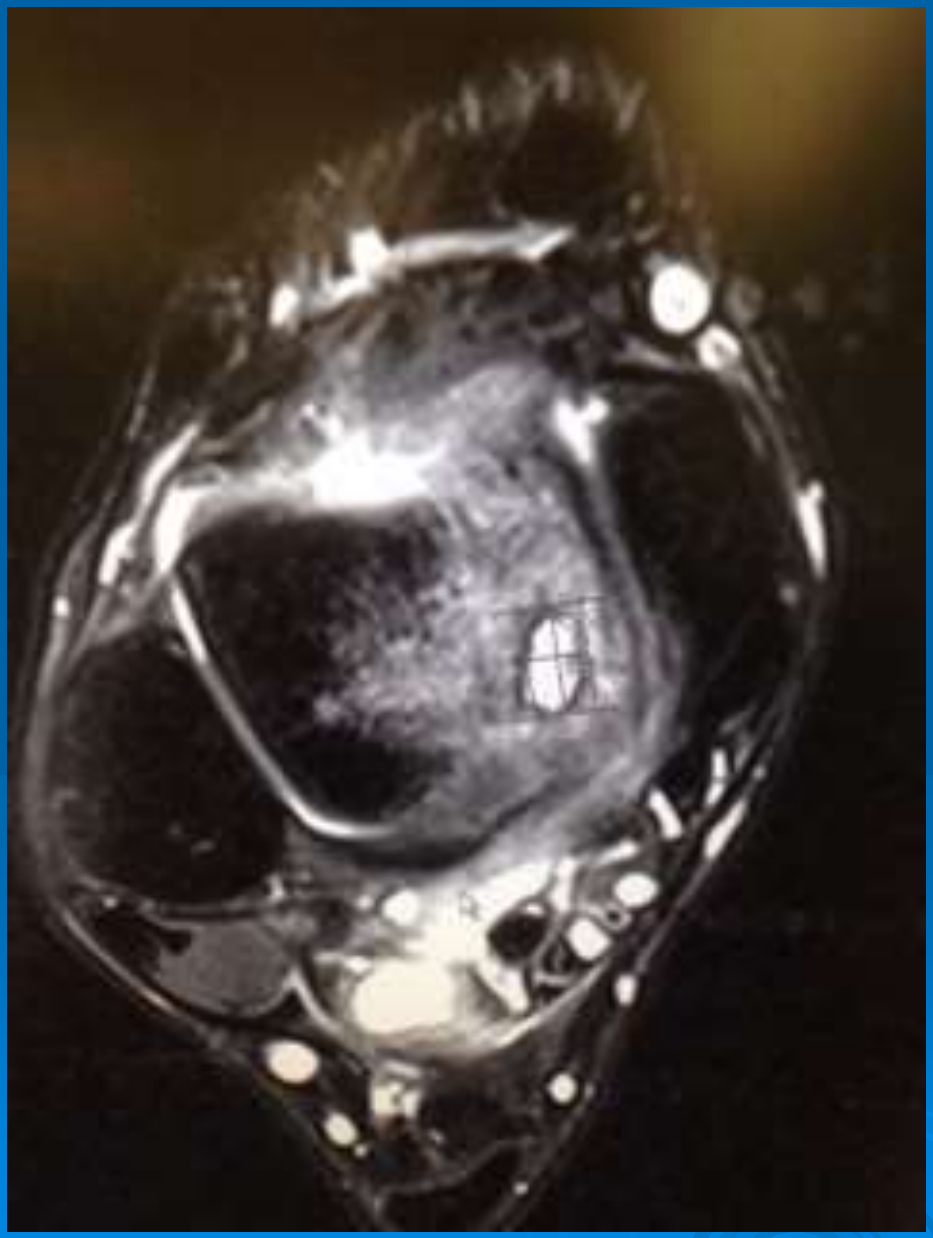
Microfracture

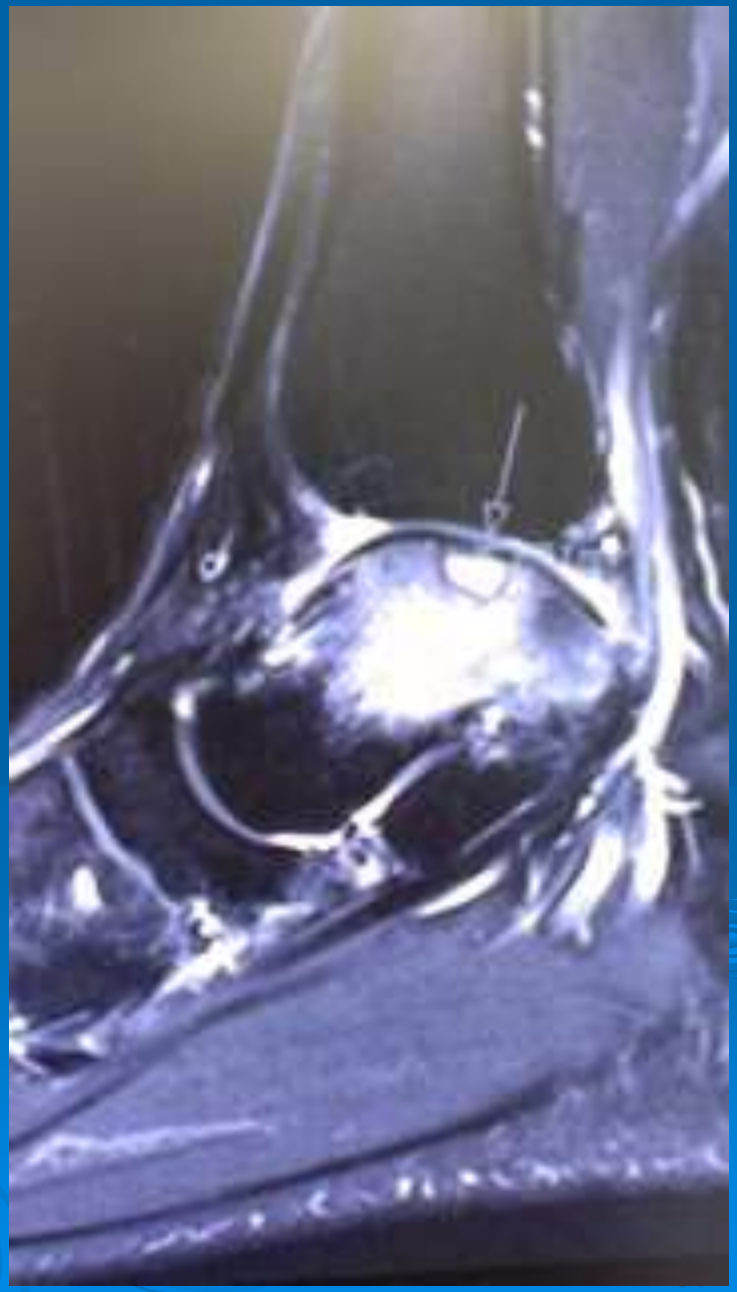
3-4 mm apart

-Adequate bleeding must be verified upon releasing tourniquet

Surgical Technique

- Local Ipsilateral Allograft
- Less Morbidity
- One Surgical Incision
- Decreased Surgical Time





Incision

Medial Malleolar Osteotomy Preparation

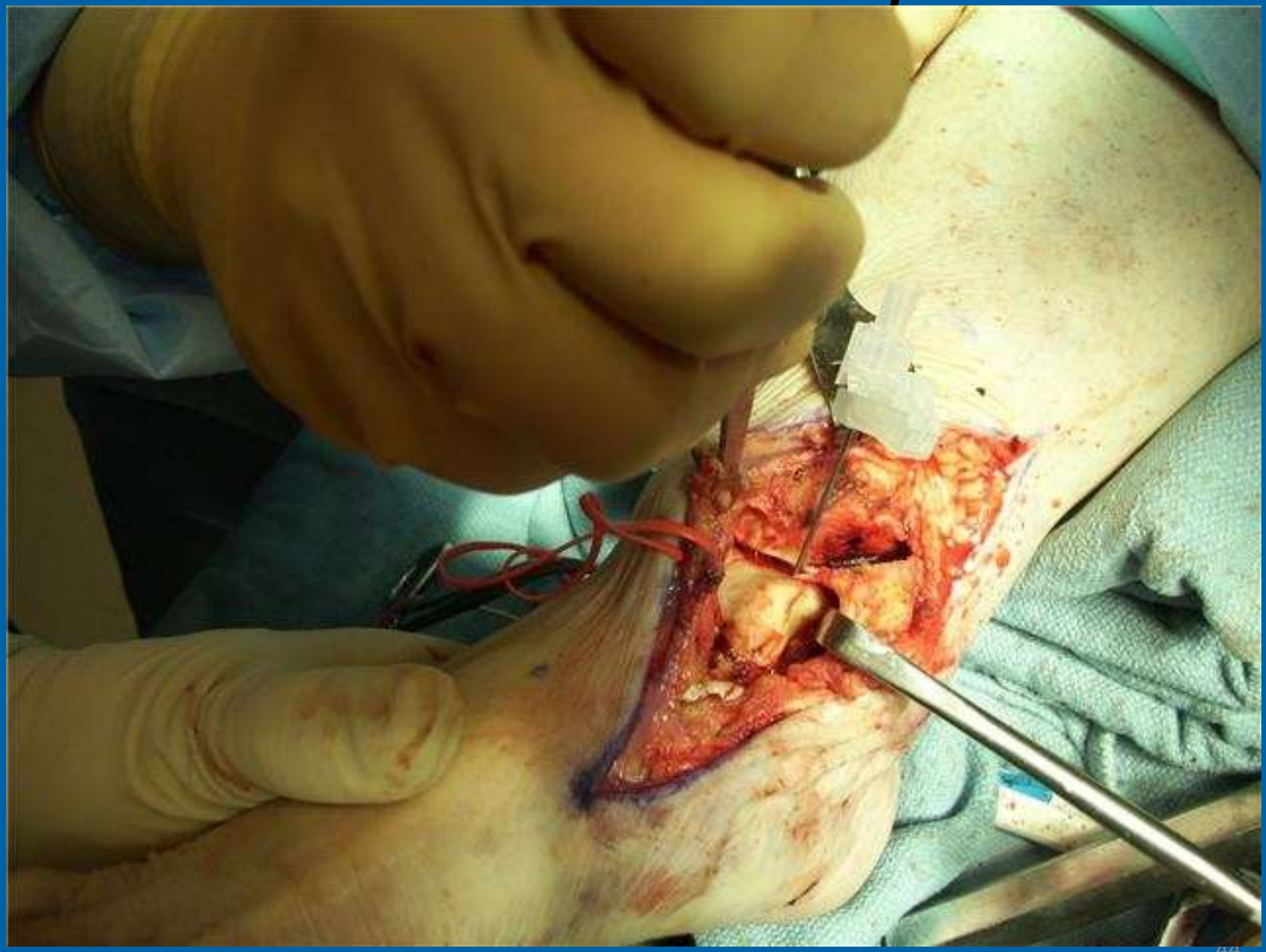
Medial Osteotomy Creation

Finalizing Medial Osteotomy

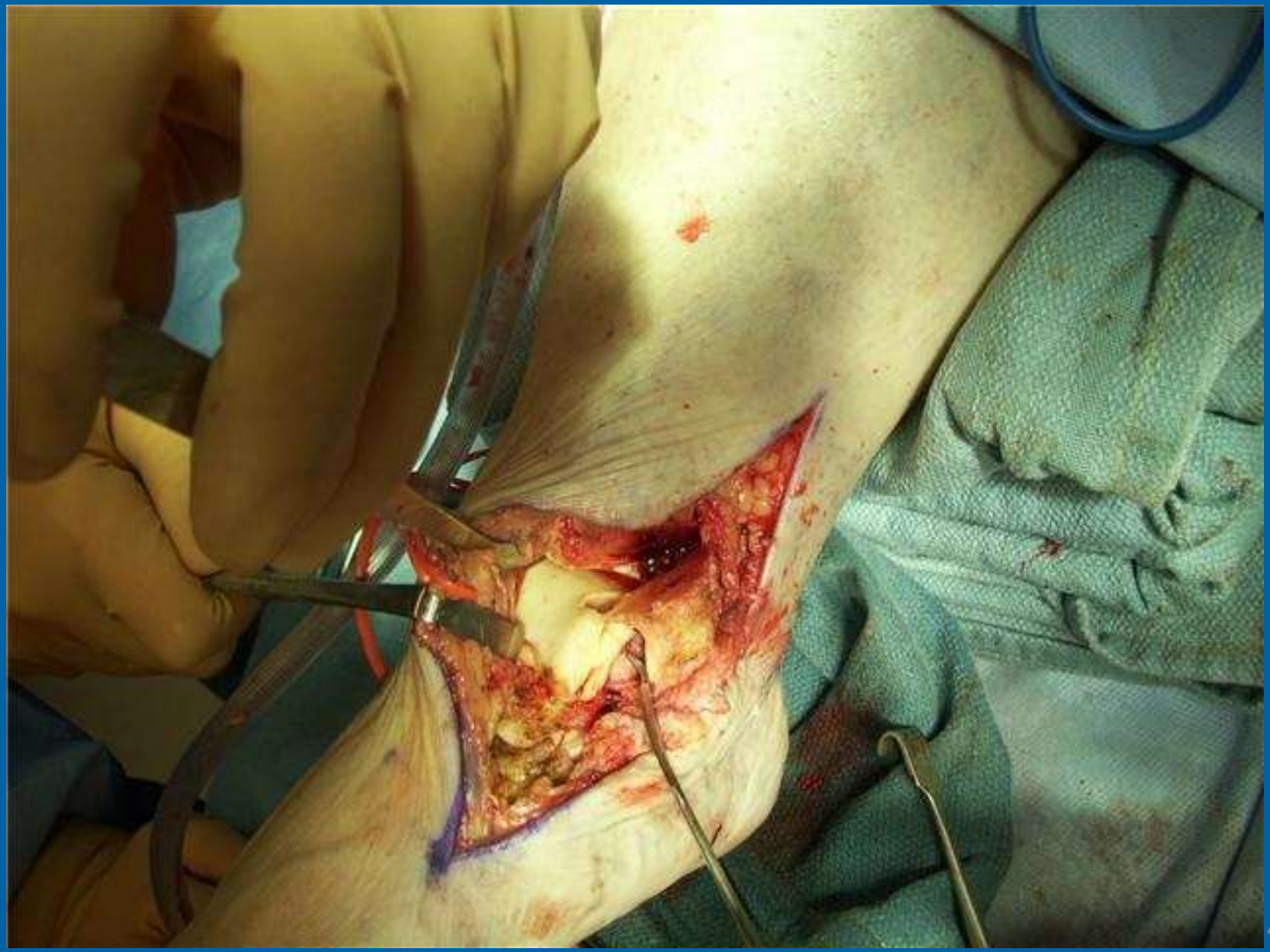
Medial Osteotomy Take Down

Medial Talar Dome Lesion Exposure

Talar Dome Lesion Exposure

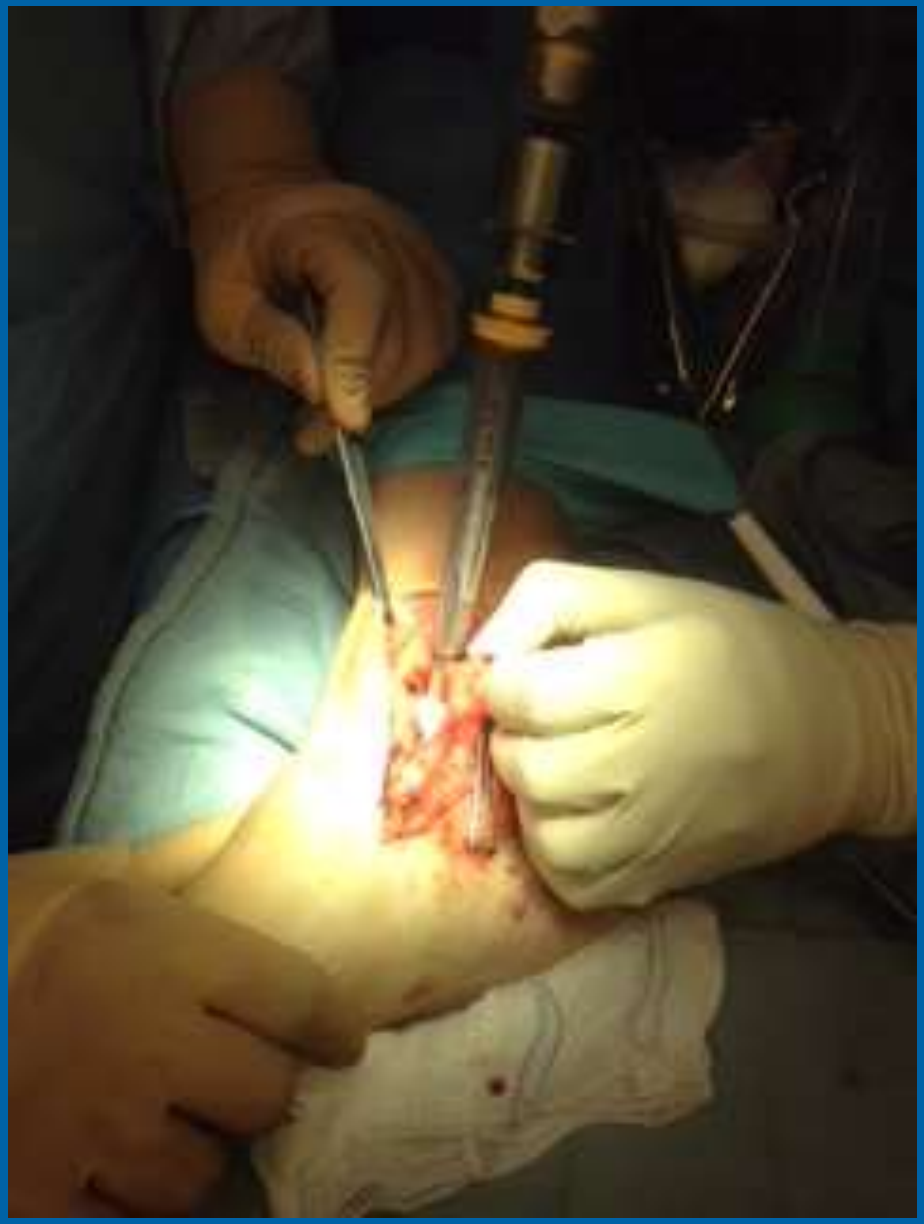


Medial Talar Dome Defect



Medial Talar Dome Lesion Excision

Talus Dome Core Decompression

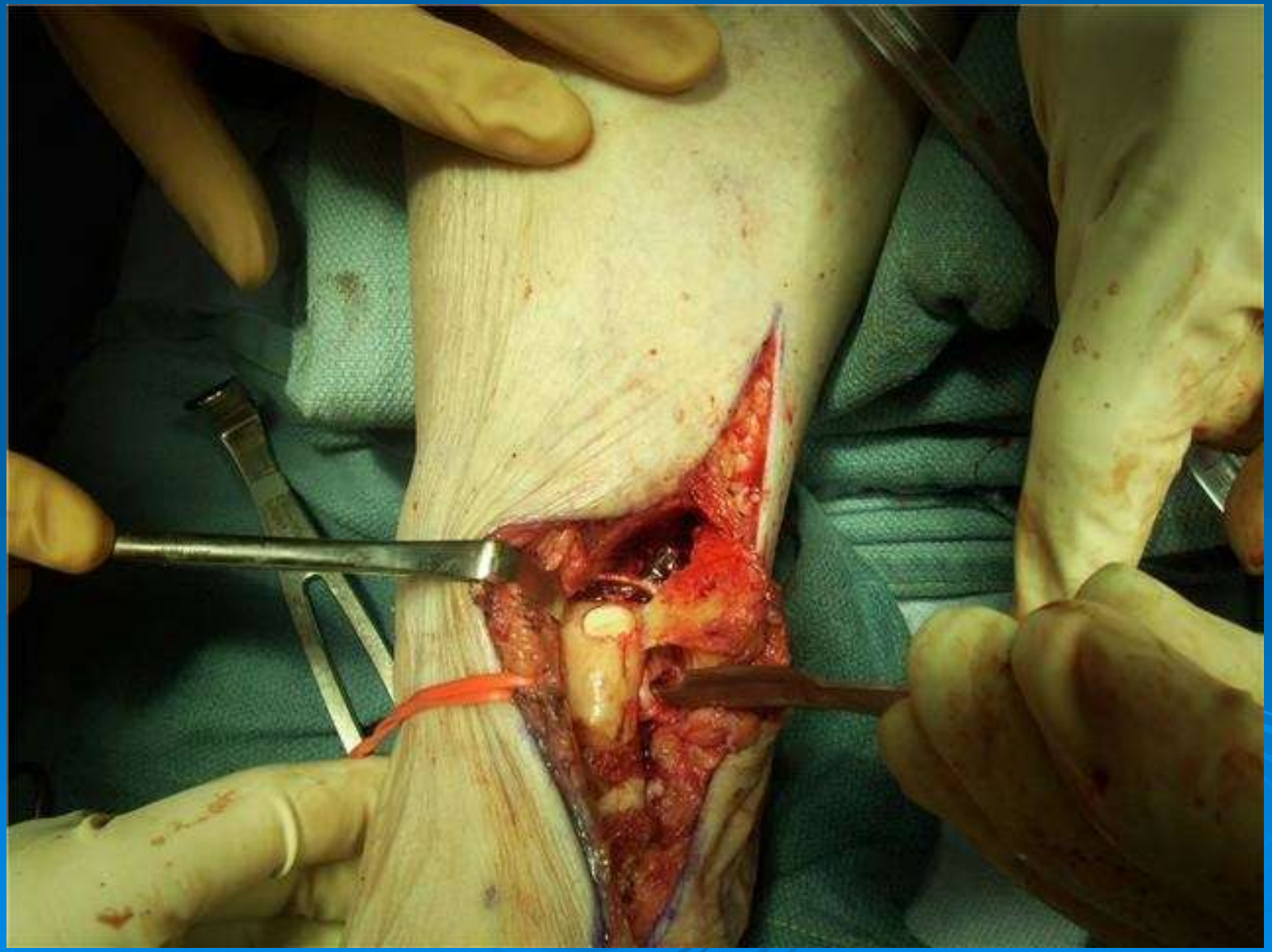


Inferior Talus Harvest Site

Harvest Site

Harvested Plug

Insertion Osteochondral Plug



Reposition Medial Malleolus

Reinforcement of Deltoid Ligament


R
MCH
R
MCH
R
MCH

Potential Complications

- Post-operative pain, infection, nerve and arterial compromise, hypertrophic scar formation, RSD, DVT, PE, non-union, delayed union, amputation, and death.

- Failure of graft, Non-union of the osteotomy site

Post Operative Course

- NWB 4-6 weeks splint/ cast
- Walking Boot 4-6 weeks
- ROM @ 4 weeks
- PT week 8
- Shoe 10-12 weeks
- Minimize narcotics. Selective on NSAIDS. Anticoagulation 4 weeks.
- MVI, Vit. D 2000U, Vit. C 1000 mg

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Thank you