THE PAINFUL FLATFOOT

Norman Espinosa, MD

Department of Orthopaedics
University of Zurich
Balgrist
Switzerland
www.balgrist.ch

Universität Zürich

uniklinik balgrist

WHAT TO DO?

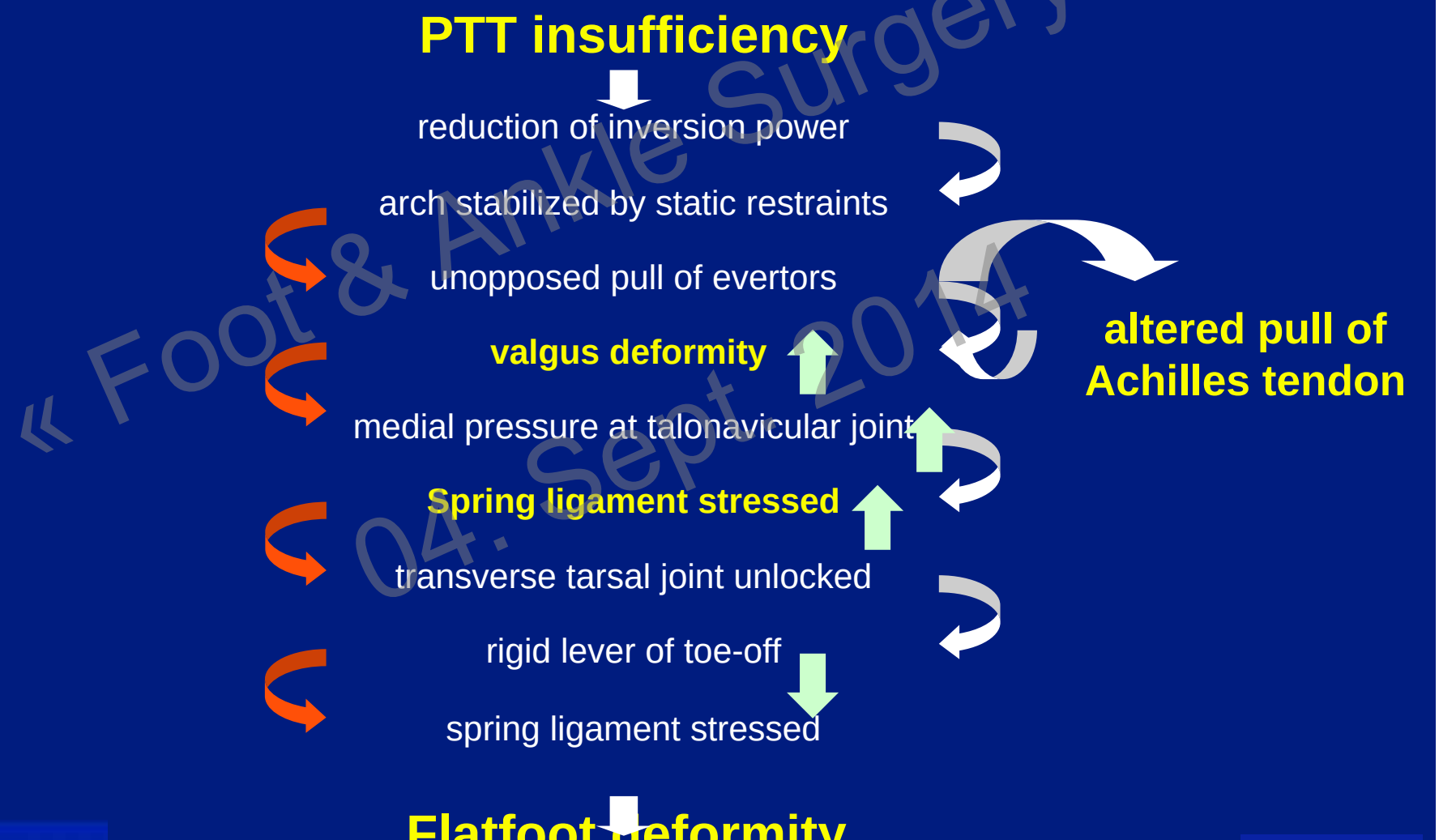
ETIOLOGIES

INTRINSIC > EXTRINSIC

- Repetitive microtrauma combined with inflammation (age dependent)
- Degeneration (shift of collagen I to III)
- Inflammatory disease (younger patients)
- Vascular causes (obesity, hypertension, diabetes, steroid use)
- Constriction through synovial enlargement
- Accessory navicular

Multifactorial causes involved in failure of posterior tibial tendon

PATHOPHYSIOLOGY



THE PROBLEM

STAGE I ***(Tenosynovitis without deformity)***

A: Inflammatory disease

B: Partial PTT tear with normal hindfoot anatomy

C: Partial PTT tear with hindfoot valgus

STAGE II ***(PTT rupture and flexible flatfoot)***

A: Hindfoot valgus

B: Flexible forefoot supination

C: Fixed forefoot supination

D: Forefoot abduction

E: Medial ray instability

STAGE III ***(PTT rupture and rigid flatfoot)***

A: Hindfoot valgus

B: Forefoot abduction

STAGE IV ***(Ankle valgus)***

A: Flexible ankle valgus

B: Rigid ankle valgus

Johnson KA and Strom DE, CORR 239: 196-206, 1989

Bluman EM et al., Foot Ankle Clin N Am 12: 233-249, 2007

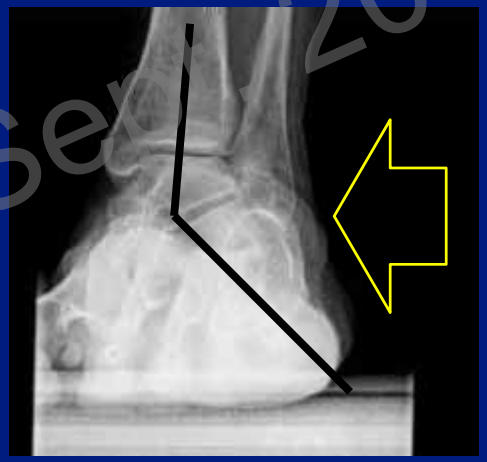
CLINICAL PRESENTATION

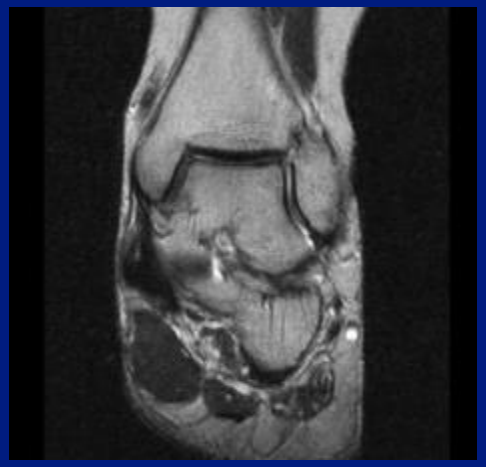
- Hindfoot valgus
- Derotated subtalar joint
- Pain along PTT
- Swelling along PTT
- Too many toes sign
- Loss of strength
- Positive single heel rise test

Lapidus, CORR; 16:119-135, 1959
Clark et al., Bull Hosp Jt Dis Orthop Inst; 47: 109-122, 1987

DIAGNOSTICS

- **Clinical examination**
- **Radiology**
  - ***Conventional x-rays***
  - ***Ultrasound***
  - ***Magnetic resonance imaging (not routinely)***





CONSERVATIVE TREATMENT

Rest (4-6 weeks)

- Rigid stirrup brace
- Lace-up sport brace
- CAM (controlled-ankle-motion) walker boot
- Below-knee cast
- Orthotic or brace (semi-rigid +/-medial heel wedge/med. column post)
- Total contact rigid orthotic (stage 2)
- Accomodative braces required for stage 3

CONSERVATIVE TREATMENT

Antiinflammatory medication

- Used simultaneously with resting measures
- Complete 2-week course
- Do not prescribe oral/injectable steroids

Physical therapy

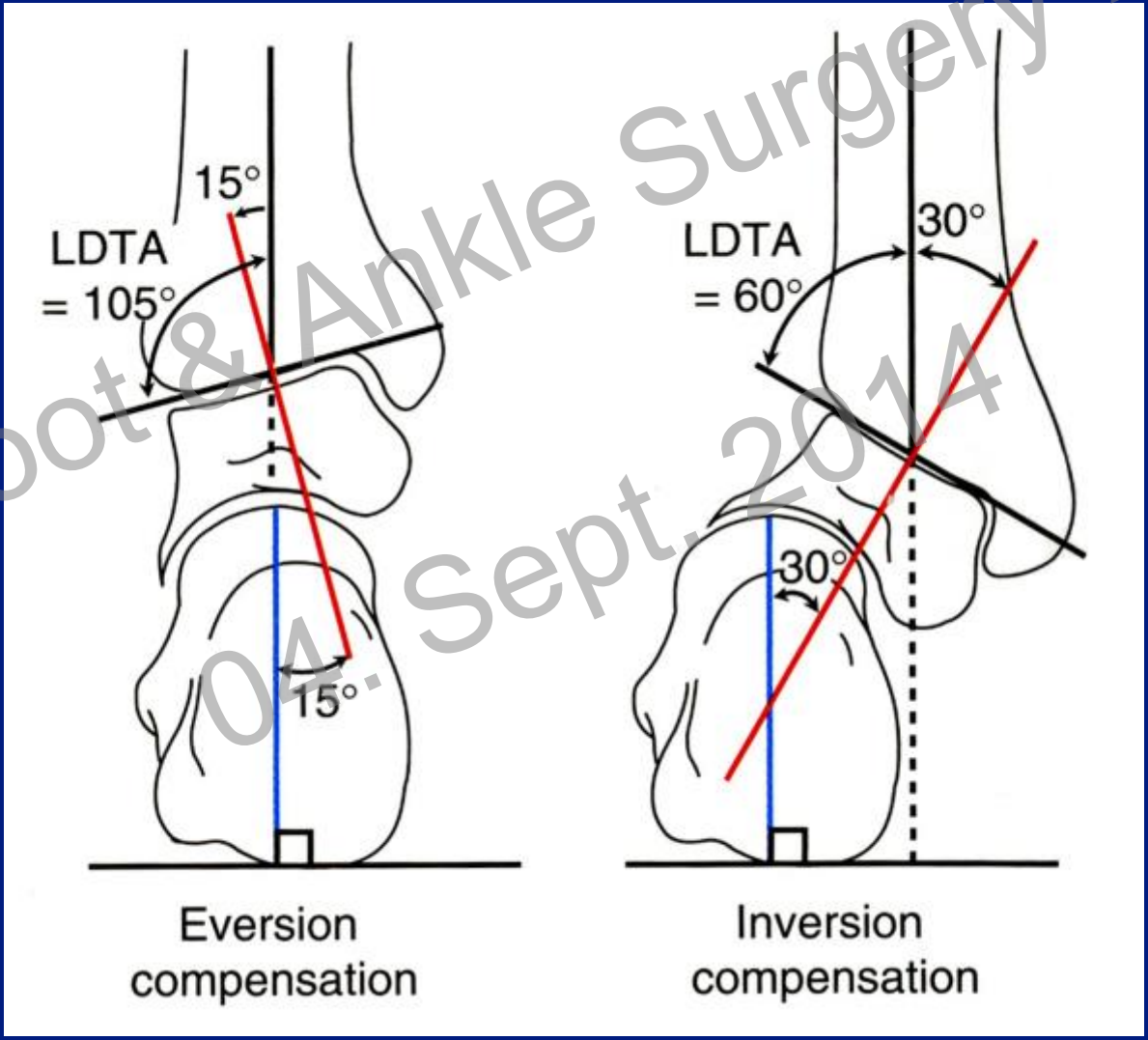
- Iontophoresis
- Cryotherapy
- Ultrasound or pulsed ultrasound
- Isolated strengthening of the posterior tibial tendon

PRINCIPLES OF SURGERY

- Preserving integrity and movement of joints has become important
- In the hindfoot subtalar joint plays central role in walking dynamics
- Hindfoot adapts to ground by way of calcaneal tuberosity positioning
- Alterations of tuberosity support influence hindfoot and forefoot

Malerba F and De Marchi F. Foot Ankle Clin N Am; 10: 523-40, 2005
Espinosa N and Rothenfluh E. In preparation

THE POWER OF THE SUBTALAR JOINT



Paley D. In: Principles of deformity correction. Ed. Paley D. Springer, New York, 2002

PRINCIPLES OF SURGERY

Static correction

- Calcaneal osteotomy
- Cuneiform Osteotomy
- TMT-I-fusions
- Spring-ligament repair

Dynamic correction

- FDL-Transfer

MEDIALIZING CALCANEAL OSTEOTOMY (MCOT)

+

FLEXOR DIGITORUM LONGUS TENDON TRANSFER

SURGICAL TREATMENT
STAGE I

Tenosynovectomy

- Subjective and objective improvement
- Good to excellent results in 84%-88%
- Patients with seronegative disorders require earlier
- Surgical debridement when failure of conservative measures.

Complications

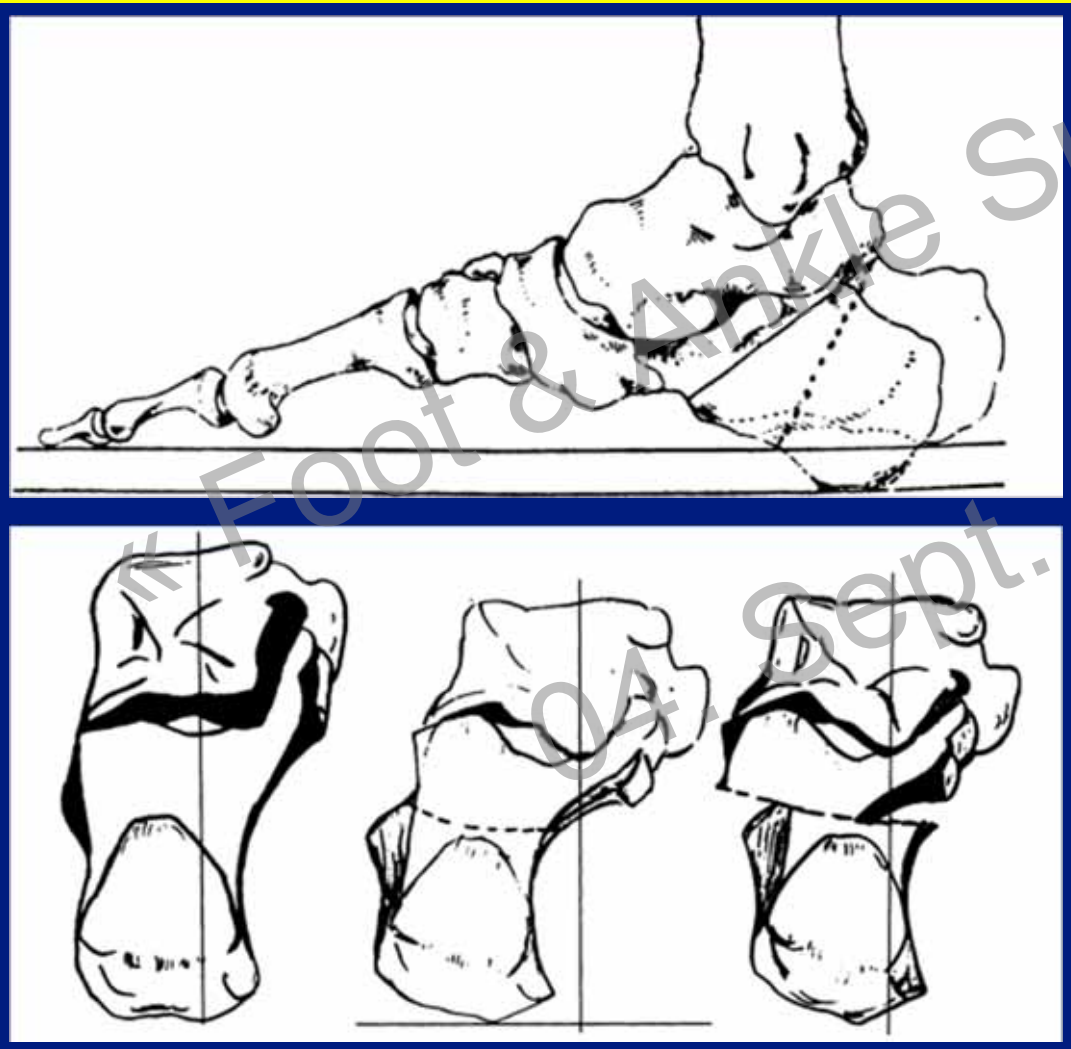
- Infection
- Nerve damage
- Incisional wound necrosis
- Progression of deformity and tendon disease
- Deep venous thrombosis.

Funk DA et al., JBJS-A 68: 95-102, 1986
Myerson MS et al., Foot Ankle 9: 219-225, 1989

STAGE II
SURGICAL INDICATIONS

- Symptoms cannot be controlled by nonoperative means acceptable to the patient
- Absence of hindfoot arthritis
- Excessive hindfoot valgus >30 °

CLASSIC MEDIALIZING OSTEOTOMY CONCEPT HAS NOT MUCH CHANGED



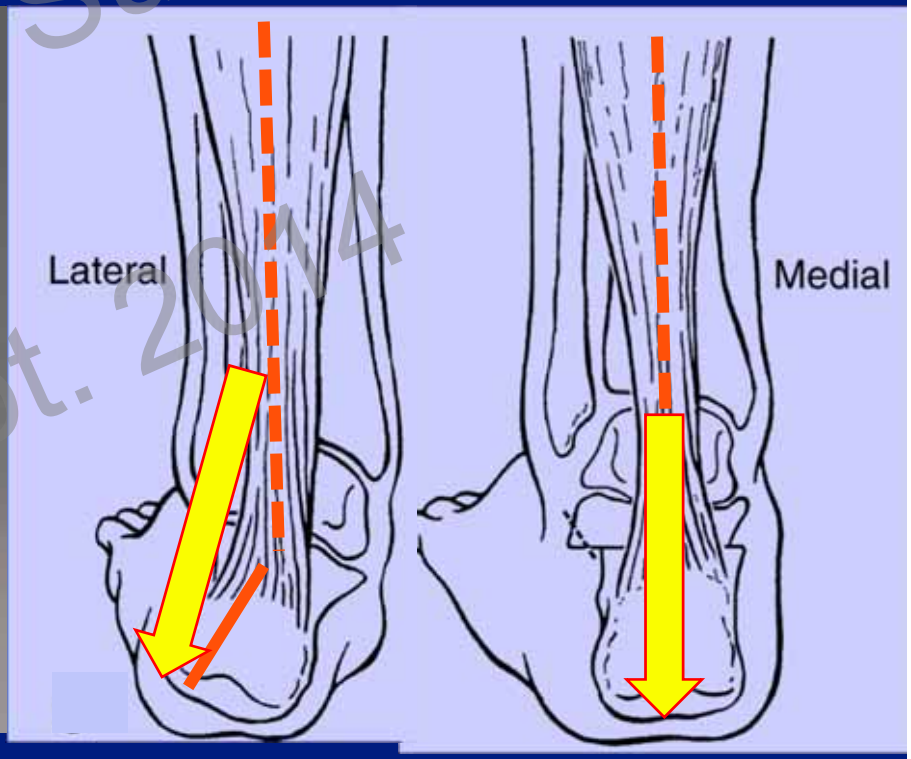
- To correct deformities in the frontal plane
- Effective for patients with marked hindfoot valgus but without significant forefoot abduction

Gleich A. Arch Klein Chir; 46: 358-362, 1893
Koutsogiannis E. J Boint Surg-B; 53,:96-100,1971

ASPECTS OF MEDIALIZING CALCANEAL OSTEOTOMY

- Technically simple
- Structured but flexible deformity
- In conjunction with other procedures
- Absence of arthritic changes at subtalar joint is prerequisite

WHAT IS THE GOAL OF CALCANEAL OSTEOTOMY?



Abnormal pulling vector of Achilles = Deforming force

Malerba F and De Marchi F. Foot Ankle Clin N Am; 10: 523-40, 2005

WHAT IS THE GOAL OF SURGERY?

MEDIALIZING CALCANEAL OSTEOTOMY

Sands and Tansey, Foot Ankle Clin N Am; 12, 2007

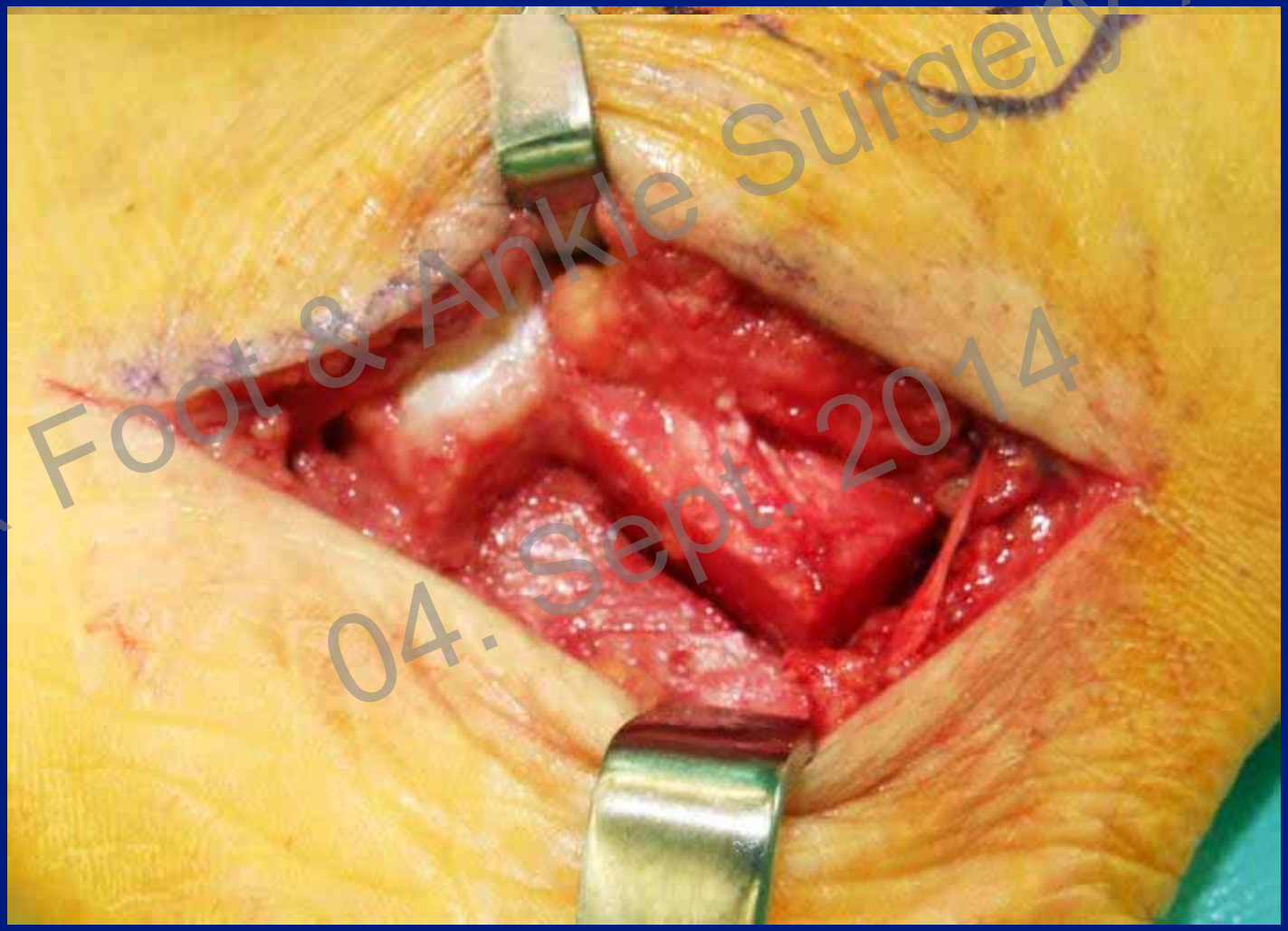
MEDIALIZING CALCANEAL OSTEOTOMY

EFFECTS OF MEDIALIZING CALCANEAL OSTEOTOMY

- **Radiographic height and alignment ↑**
- **Outer appearance not altered**
  - Difference in 50%
    - Significant only in 4%
- **Medialization of Achilles tendon**
  - Medialization to subtalar axis=valgus moment removed → abduction force exerted by peroneal tendons reduced but plantar moment of PL increased→ medial arch height increased
- **Stress on spring ligament = Reduced**
- **Role on ankle remains unclear**

Guyton GP et al. Foot Ankle Int; 22: 627-636, 2001
Horton GFA et al. Foot Ankle Int; 19: 370-373, 1998
Niska M et al. Foot Ankle Int; 22: 278-282, 2001
Otis JC et al. Foot Ankle Int; 20: 222-226, 1999

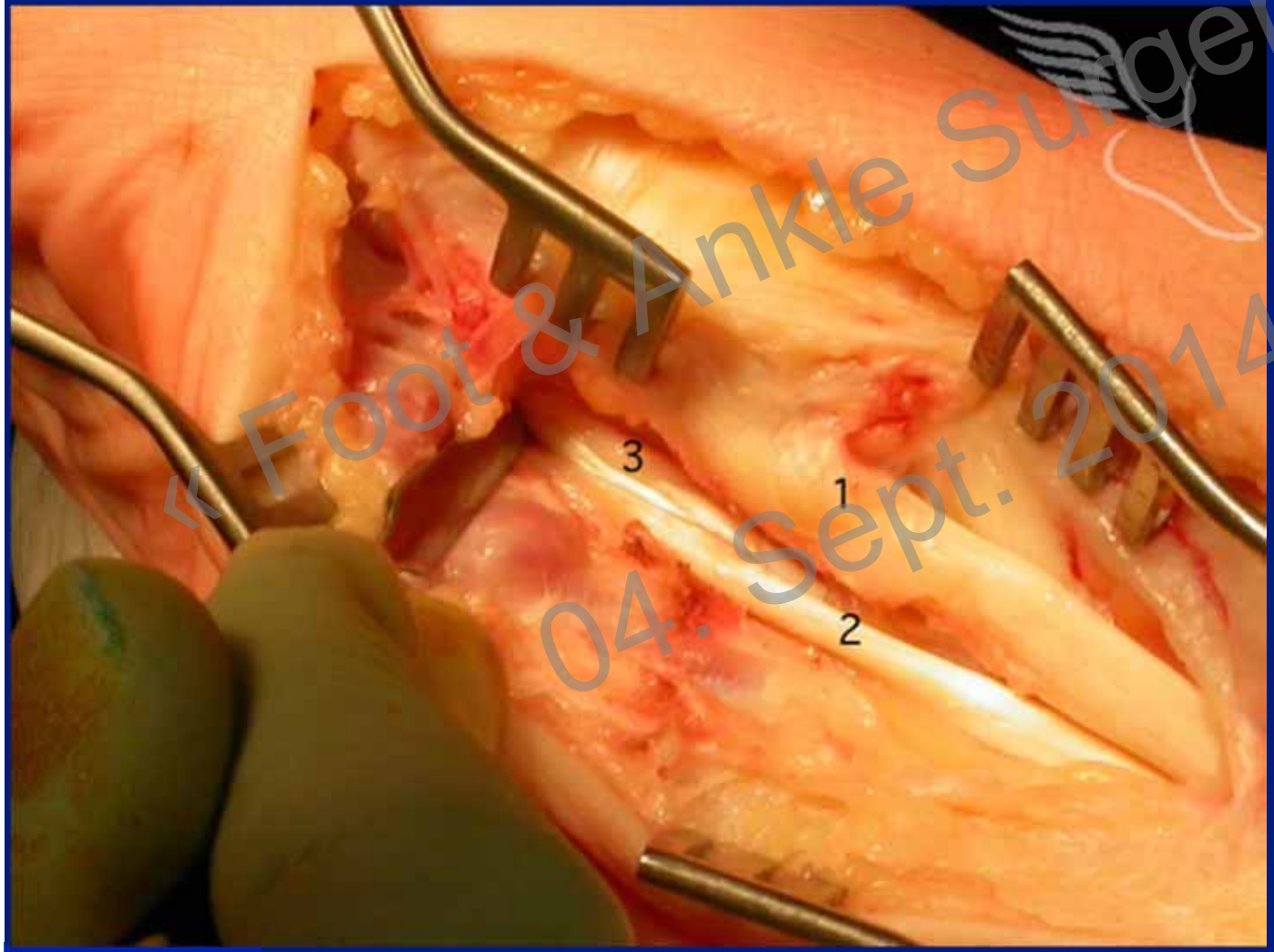
Z-SHAPED MEDIALIZING CALCANEAL OSTOETOMY



MEDIAL DISPLACEMENT CALCANEAL OSTEOTOMY PITFALLS

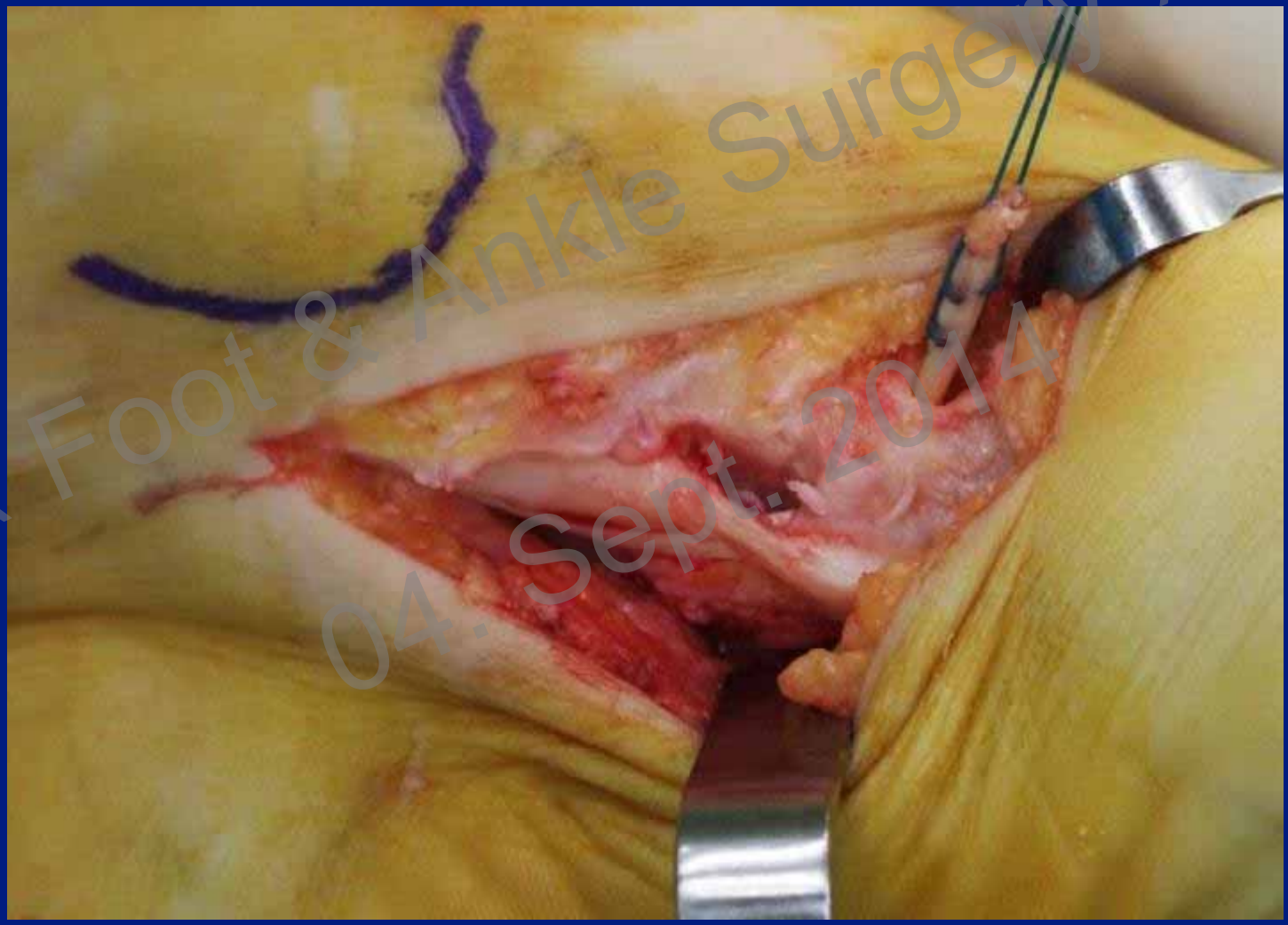
- Avoid placing osteotomy into origin of plantar fascia
- Displacement is only achievable if tuberosity is adequately distracted
- Check screw placement with fluroscopy
- Injury to the medial structures due to medial saw penetration
- Lateral pain due to prominent rim
- Sural nerve injuries on lateral side
- Undercorrection

FDL TRANSFER

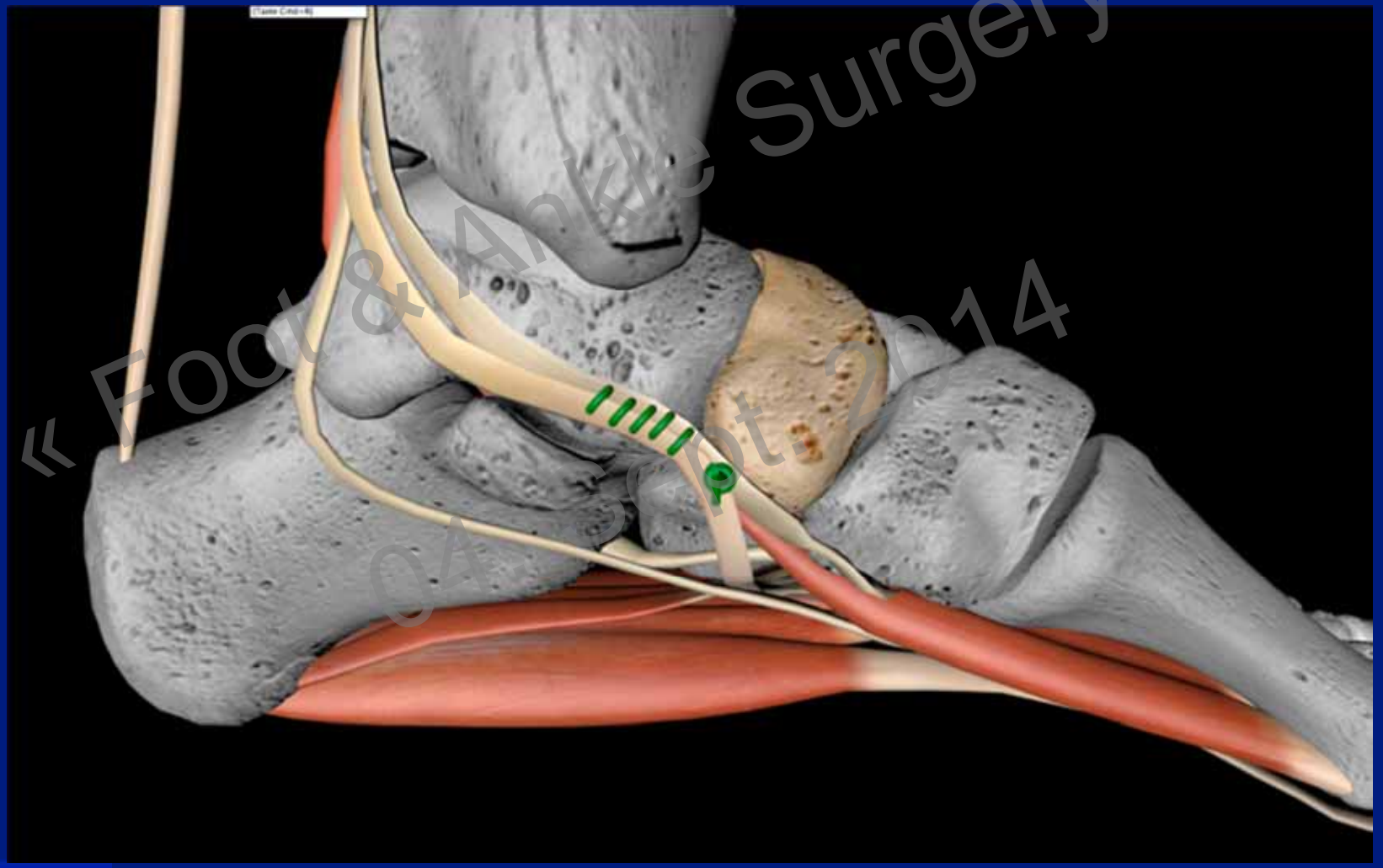


1. PTT
2. FDL
3. Henry-Knot

FDL-TRANSFER
THE CLASSIC WAY



FDL-TRANSFER
ALTERNATIVE WAY



FDL-TRANSFER
ALTERNATIVE WAY