Update on Foot & Ankle Sports Injuries

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Conflict of interest

- none related to this talk
- list of consulting in program

Talk objectives

- identify patho-anatomy of common foot and ankle sports injuries
- discuss treatment options
- discuss rehabilitation of the injuries

Foot & Ankle topics

- ankle injuries
- Achilles' tendon
- Jones fracture
- Lisfranc injury

Ankle instability

- acute sprains
- chronic instability

  concomitant pathology
- high ankle(syndesmotic) injury

Incidence

- 15-20% of all athletic injuries
- most common E.R. ortho injury
- 80-90% respond to rehabilitation

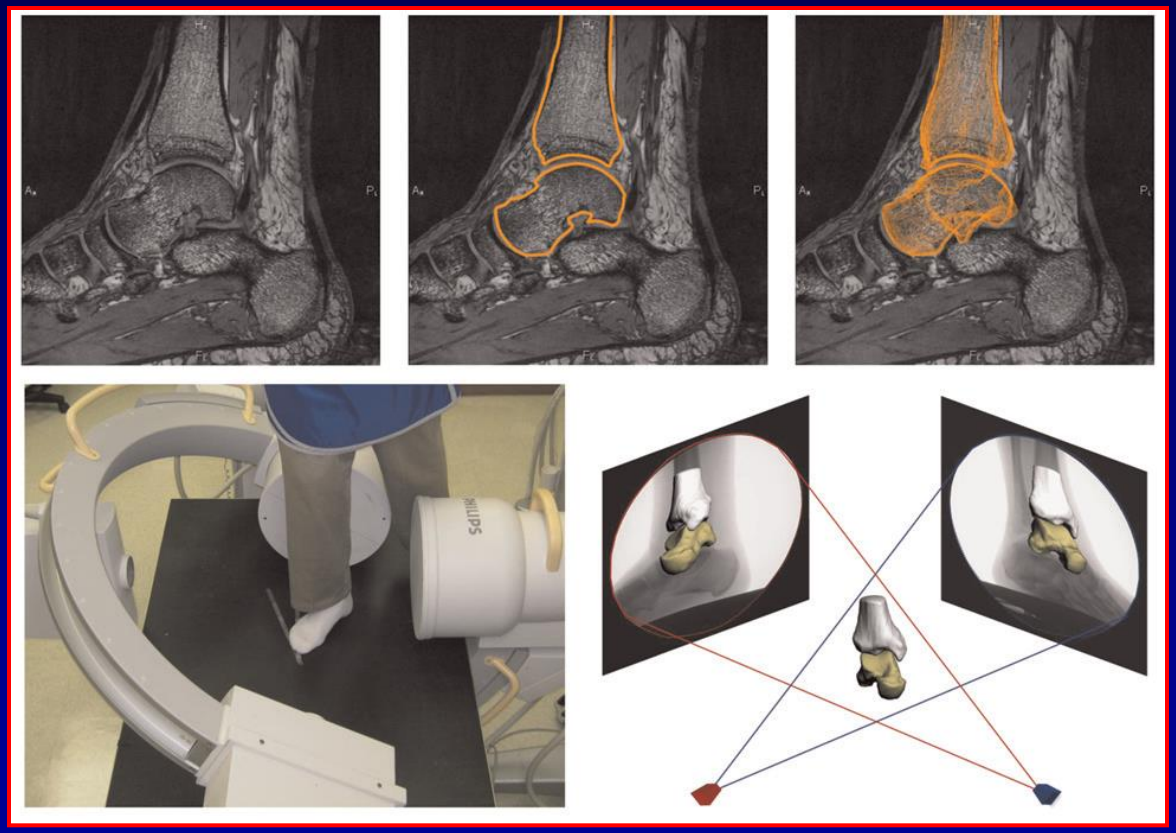
Sequelae of instability

- 72% arthritic changes in joint after 10 yr.
- 15% of ankle djd related to lig. injury

  85% due to lateral injury

- 2º to altered kinematics

MRI (+) bi-planar fluoro



Caputo, et al: AJSM 37; 2009
Wainright, et al: AJSM 40; 2012

Altered kinematics

- ↑ ant. translation talus (1 mm)
- ↑ int. rotation talus (6º)
- creates anteromedial shift of the peak cartilage contact strain
- Broström-Gould repair restores normal kinematics

Caputo, et al: AJSM 37; 2009

Wainright, et al: AJSM 40; 2012

Lateral ligament complex

- ATFL

  restricts int. rotation talus

  elongation in pf (138N)

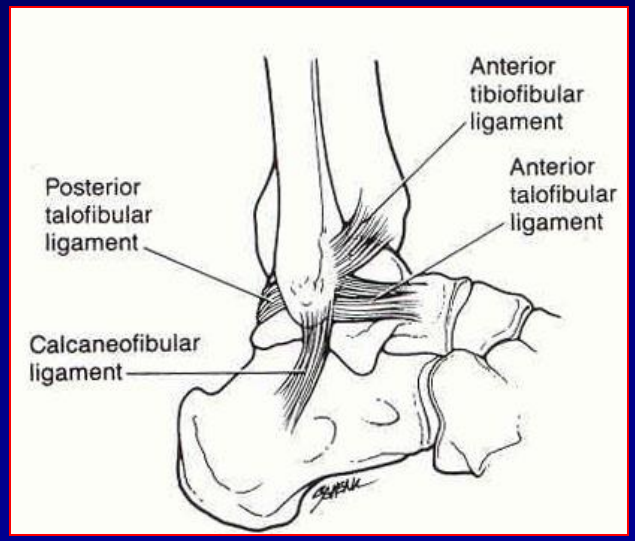
- CFL

  prevents adduction

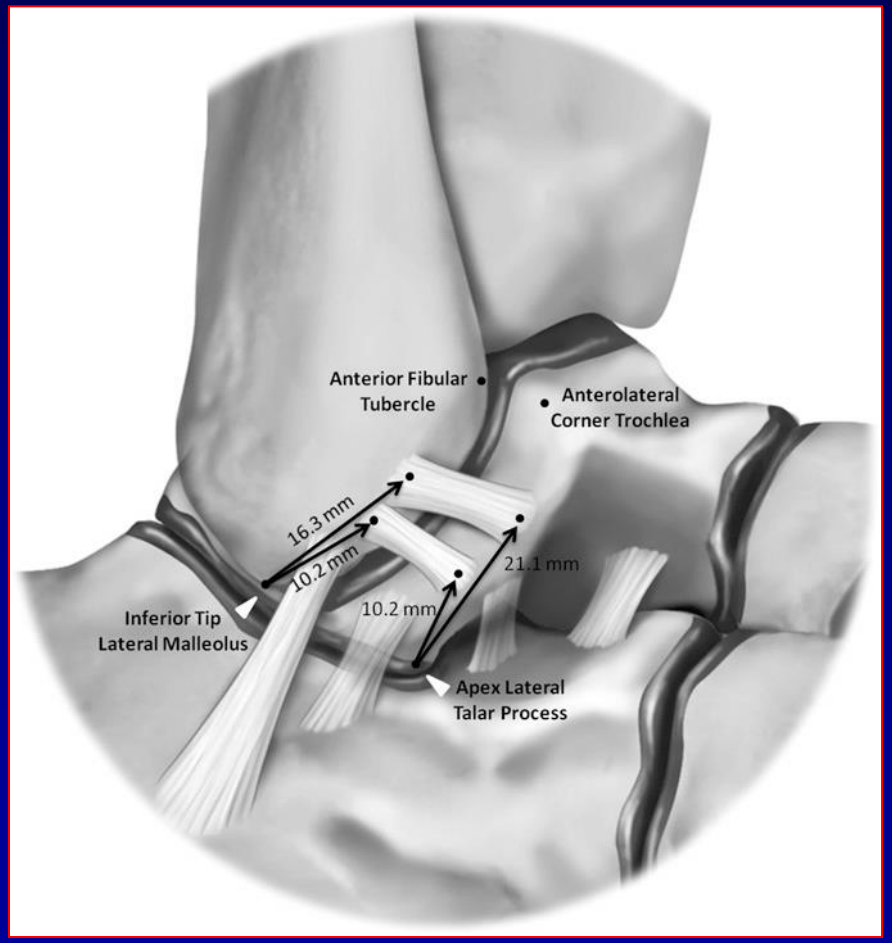
  active in neutral, df (345N)

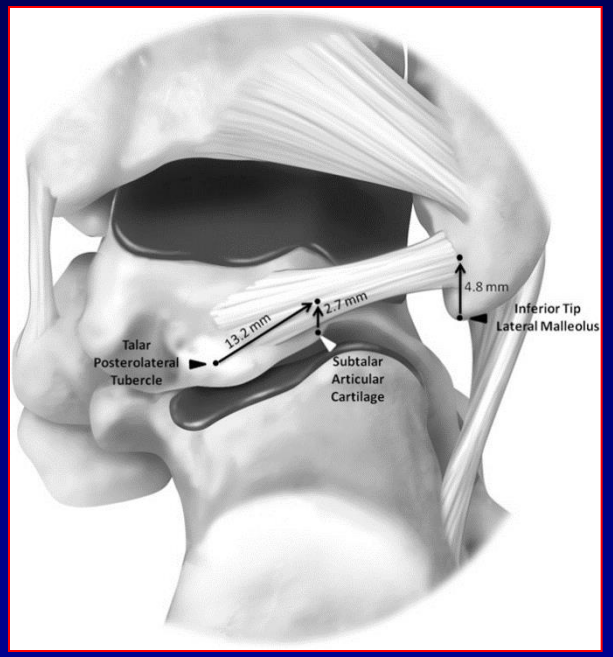
- PTFL

  limits int. rotation after ATFL rupture (261N)



Anatomy





Clanton, et al: JBJS 98A; 2014

Associated injuries

- OLT
- ALCI
- peroneal tendon
- fracture: lat. process talus
  ant. process calc.
  5th metarsal base

ALCI

Postraumatic

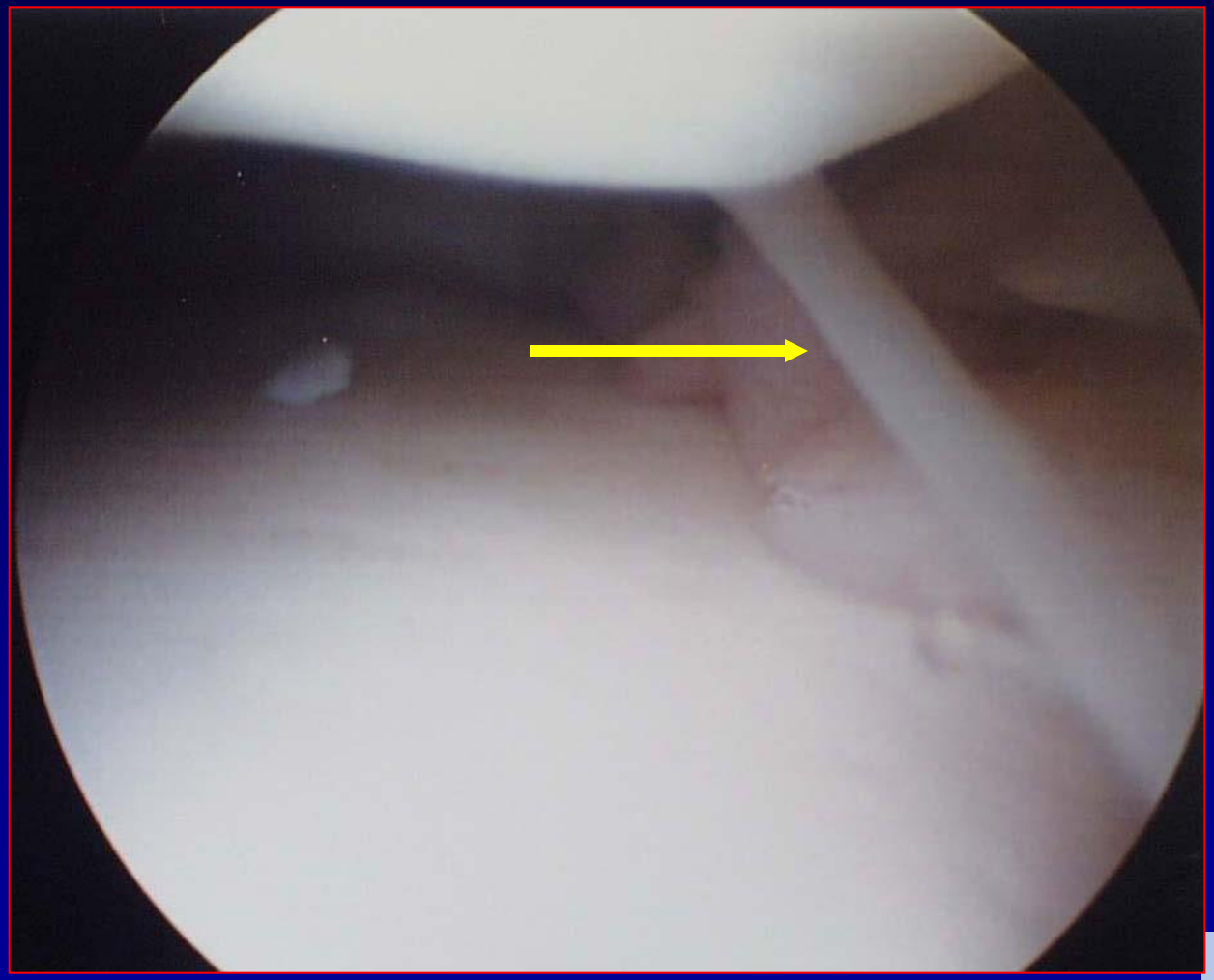
approx. 2% all sprains

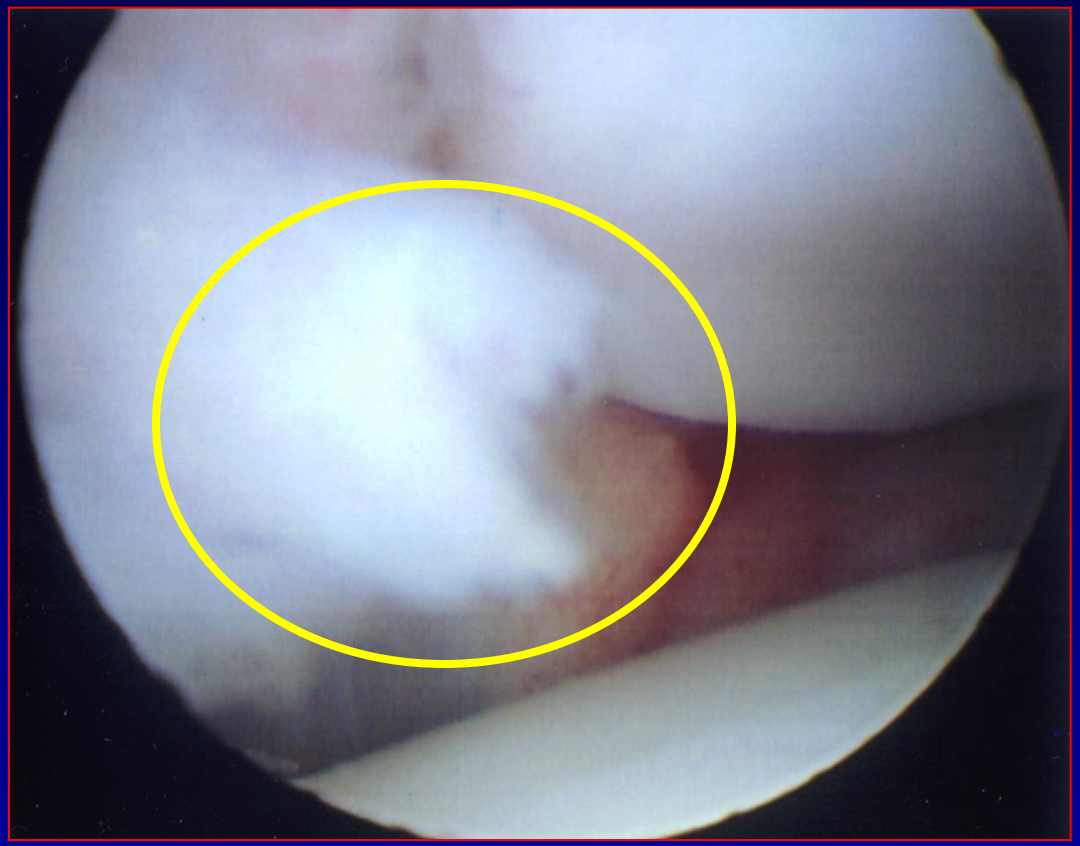
anterior-inferior tib-fib ligament

anterior talo-fib ligament

synovial proliferation

Bassett, et al: JBJS 72a; 1990
Ferkel, et al: AJSM 19; 1991
Meislin, et al: AJSM 21; 1993
Kim, Ha: JBJS 82b; 2000



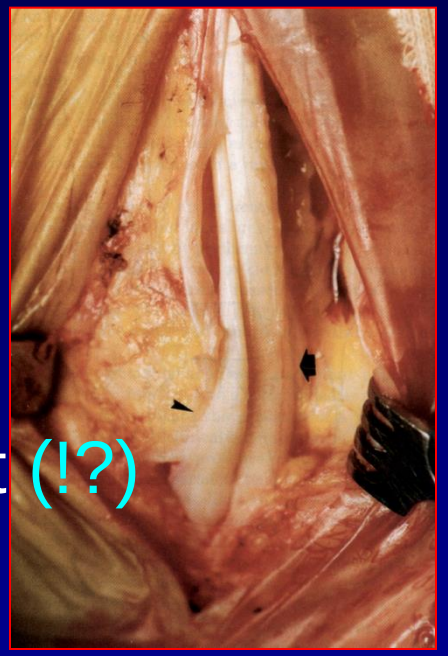


Peroneal tendinopathy

- split lesions noted at tip malleolus
- associated with instability
- #136 Broström

  53% req. peroneal debridement (!?)

  associated with females



Bonnin, et al: AJSM 25; 1997

Burrus, et al: FAI 35; 2014

Differential diagnosis

- OLT
- ALCI
- peroneal tear
- fracture
- varus heel
- coalition

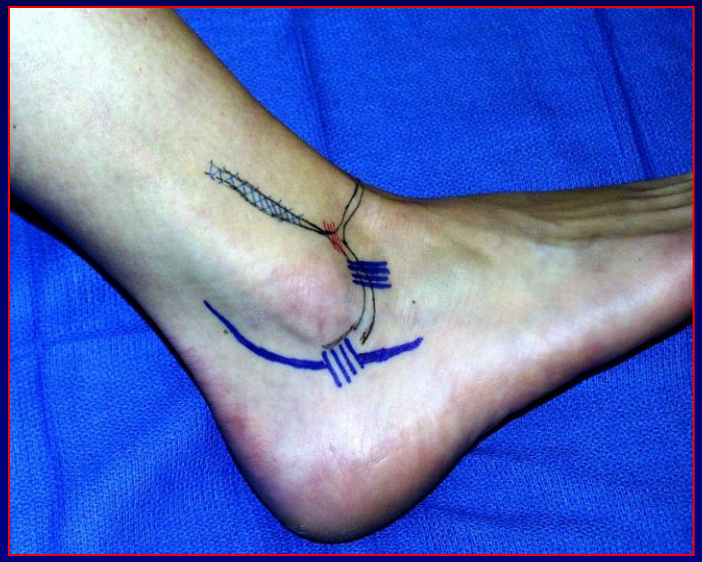
Examination

Standing

orientation

double, single heel raise

Examination



Sitting

ROM

peroneals

points of tenderness

ant. joint, medial joint, sinus tarsi

anterolat. corner, syndesmosis

ligaments: ATFL, CFL, deltoid

Examination

Provocative testing

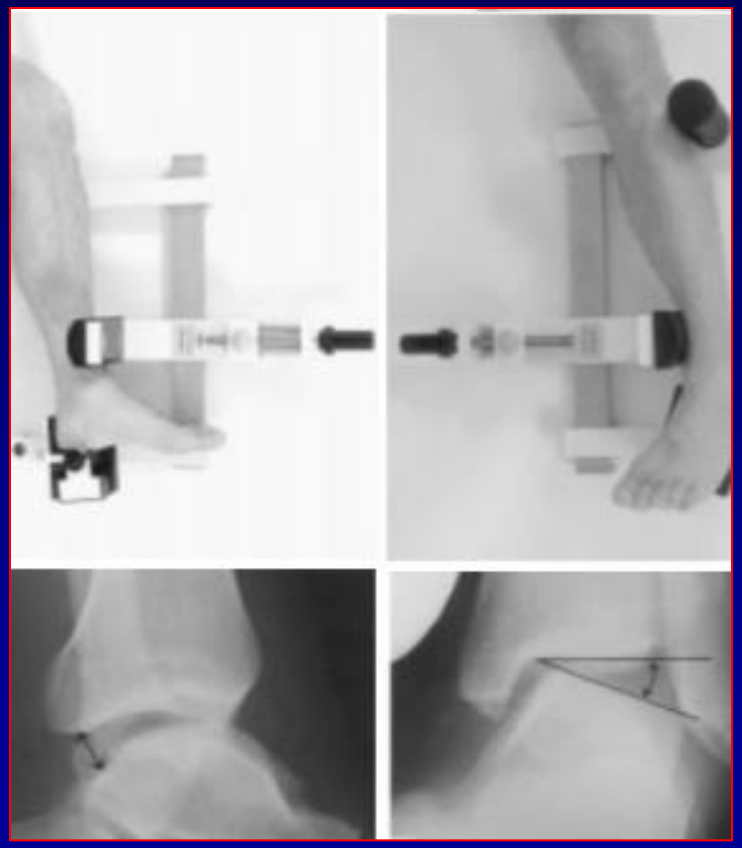
anterior drawer (pf)

talar tilt (neutral)

Radiographic evaluation

- ankle series
- foot series as indicated
- tibiocalcaneal view if heel varus
- stress views ?
- MRI not routinely obtained
    - reserve for ill-defined pathology

Stress views

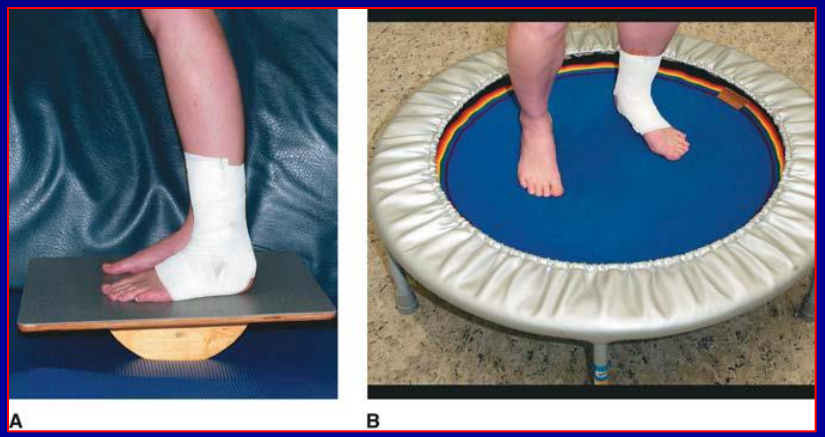


Initial treatment

- R.I.C.E.
- immobilization relative to injury
- P.T.

  proprioceptive exercises

  peroneal strengthening



Surgery indications

- chronic ankle (or) subtalar instability
- failure of rehabilitation

  4-6 months treatment

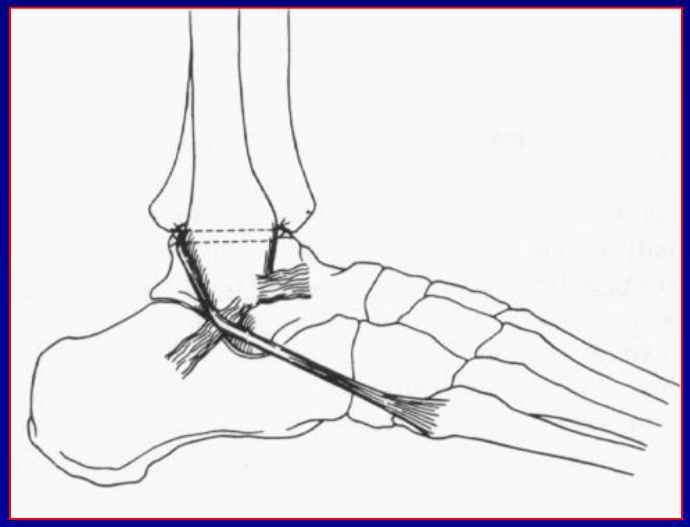
- acute grade III tears ?

Reconstruction options

- non-anatomic
  - tenodesis procedures
- anatomic
  - direct repair
  - anatomic auto-, allograft
- augmentation
  - suture-tac, speed bridge, juggerknot

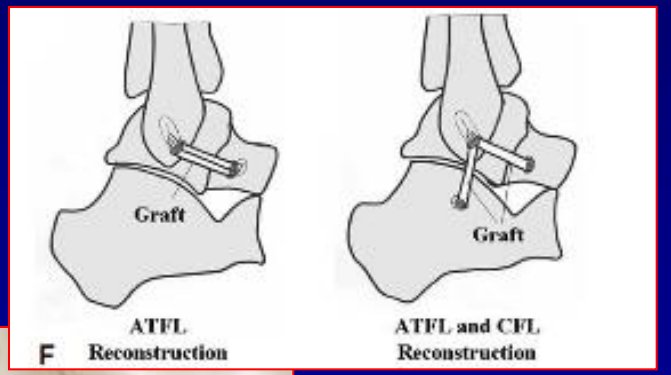
Evans (c.1953)

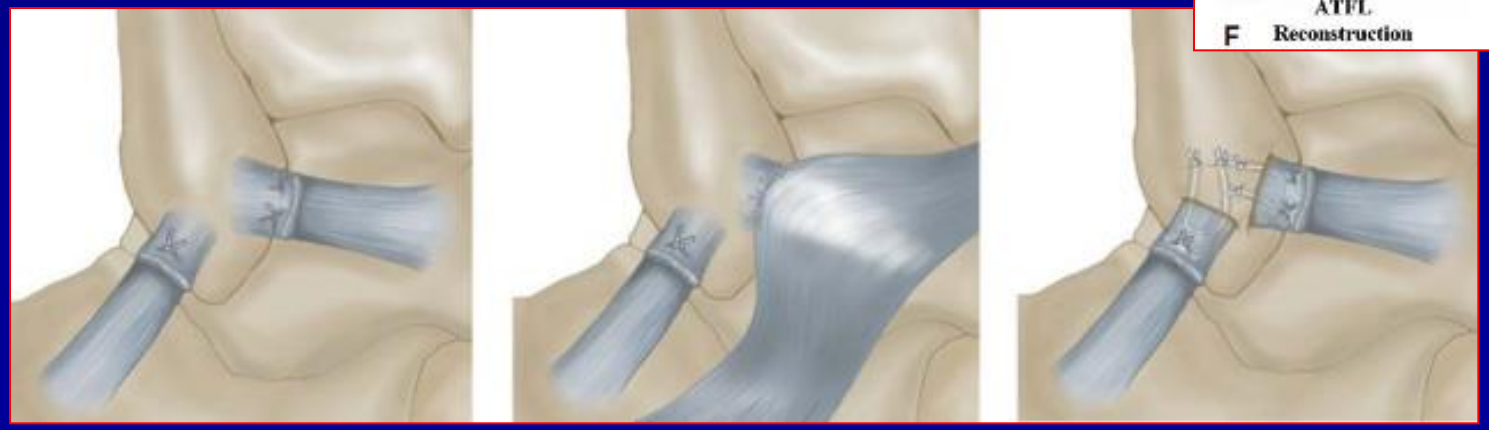
- p. brevis tenodesis to fibular via suture or bone tunnel
- good for inversion
- poor ant. translation control



Anatomic repair

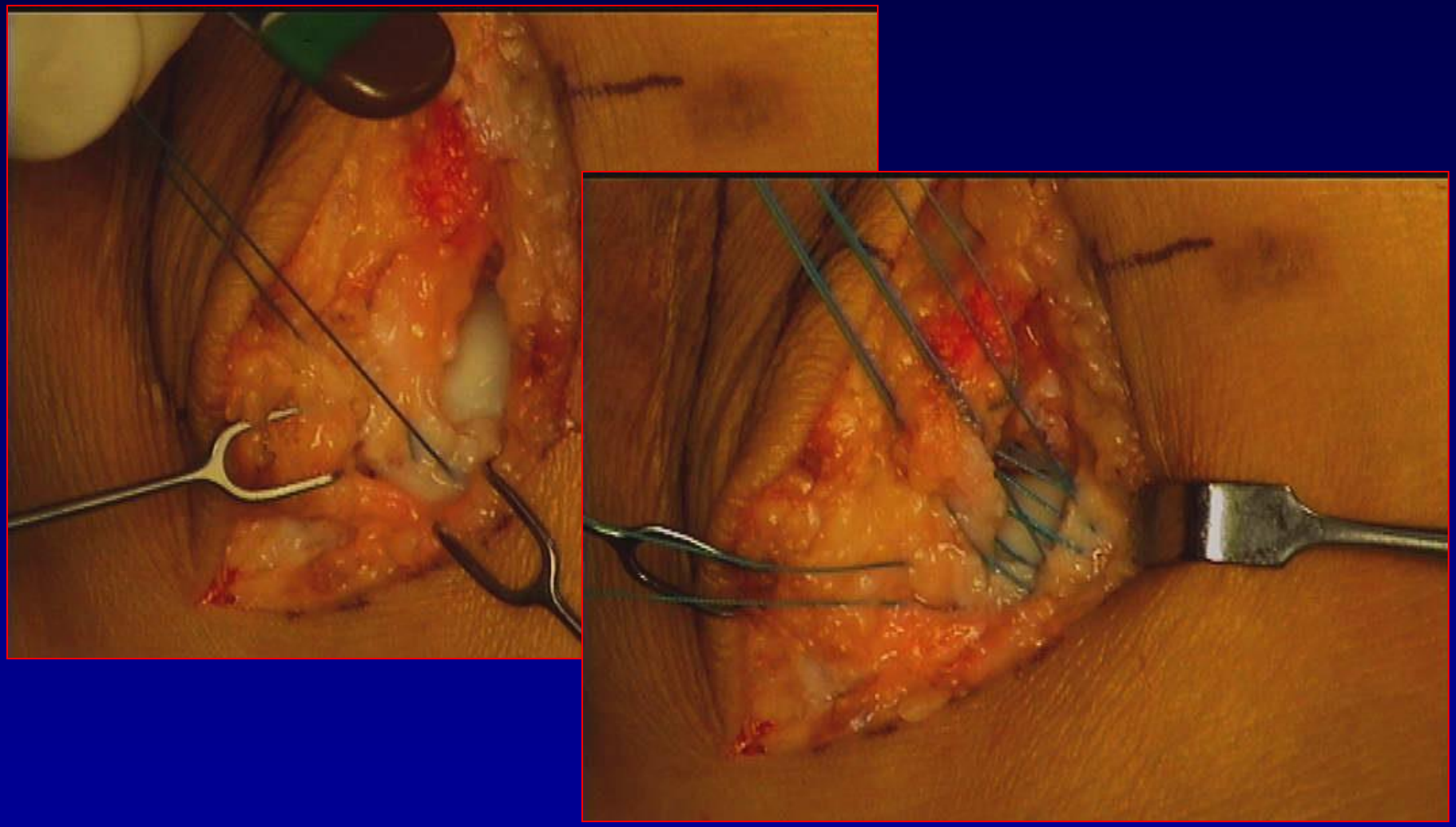
- pants-over-vest, detach/advance
- intra-osseous, suture anchor, bone tunnel
- arthroscopic
- role of pre-arthroscopy ?





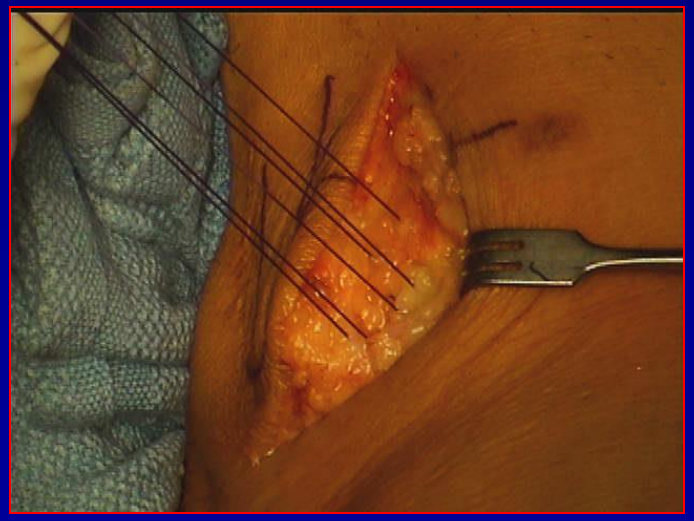
Broström-Gould
(preferred technique)

- repair ligaments
- advance retinaculum
- reinforce with suture anchor
- debride antero-lat corner



Ligament repair

- repair options
  - drill holes, suture anchor
  - shorten, “pants over vest”
- reinforce with anchor construct



Postoperative care

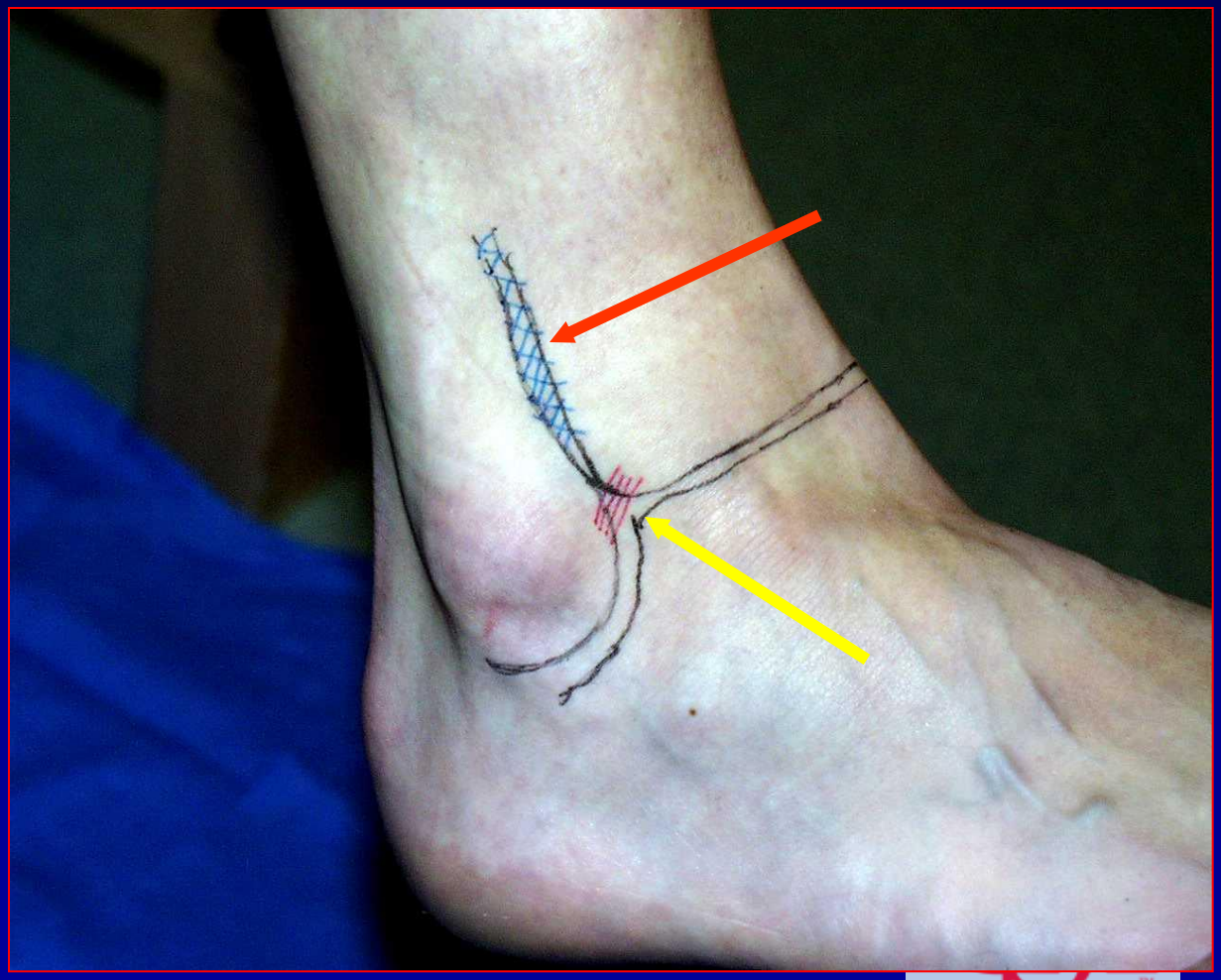
- bulky dressing, bi-valved SLC
- @10 days: boot/SLC, partial WB
- @ 4 weeks: boot; gradual WB
  PT instituted
- @ 8 weeks: wean from boot → stirrup splint
- full activities when peroneals strong

“High” ankle sprains

- represent syndesmotic involvement
- most common with pronation-external rotation injuries
- range from subtle pain vs. gross diastasis

Lateral ankle

- syndesmosis
- anterolateral impingement



High sprain diagnosis

- WB films (when tolerated)

  if diastasis, indication for surgery
- no diastasis

  consider MRI if symptoms persist
- check for medial sided symptoms

Syndesmosis

- ext rotation
- squeeze test

High sprain treatment

- prolonged healing vs. typical sprain
- if diastasis, medial clear space widening

  stabilization (screw vs. synd. suture)
- if stable x-ray, (+) symptoms

  off-load vs. “Alabama procedure”

  theoretically quicker RTP

Conclusions

- acute rehabilitation
- eval. for assoc. injury if no improvement
- anatomic repair
- reinforce retinaculum
- address assoc. pathology
- organized P.T. post-op

Achilles' tendon injury

- proximal injury
- mid-substance
- insertional

Etiology

- most common lower ext. tendon injury
- repetitive microtrauma

  assoc. with running, jumping
- gender: males >> females
- age: changes in collagen cross-linking

  ↓ size, density, cellularity

  ↓ in circulation

Etiology

Intrinsic factors

hypovascular zone

systemic conditions

tight heel cords, hamstrings

excessive subtalar motion

tibia varum, heel valgus

Etiology

Extrinsic factors

improper training

duration, intensity, frequency

improper shoewear

steroids - systemic (or) injection

fluoroquinolone antibiotics

Inclusive classification

I. Tendinopathy (peri-, pantendinopathy)

- acute (< 3 mo.)
- chronic (> 3 mo.)

II. Rupture

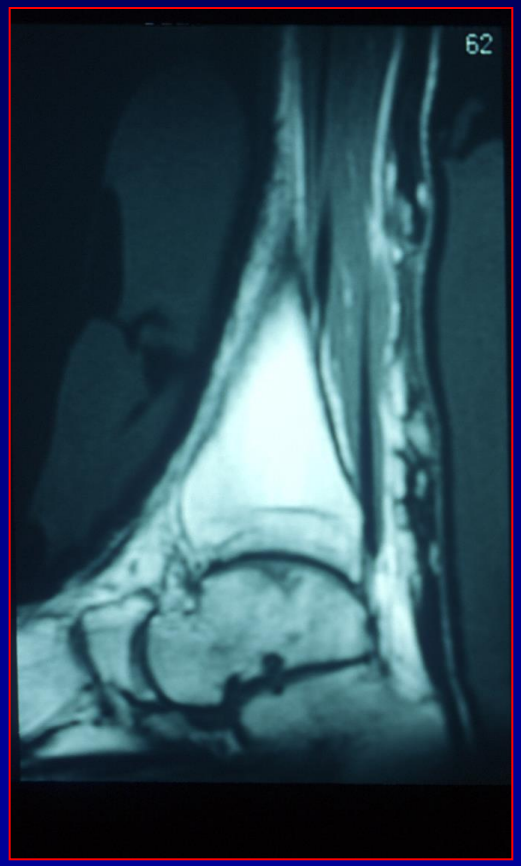
- acute
- chronic

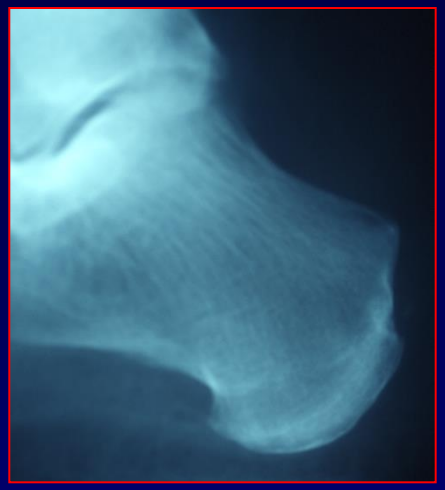
III. Insertional (impingement, enthesopathy)

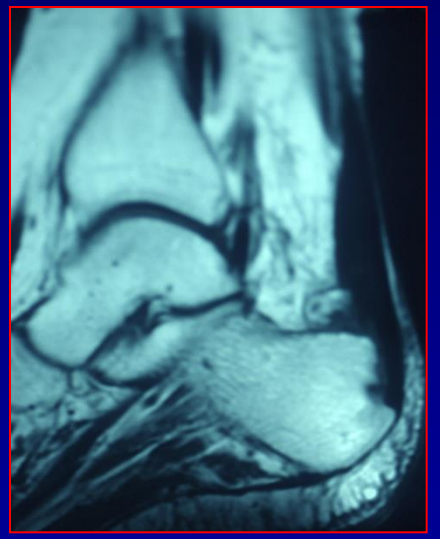
- acute (< 3 mo.)
- chronic (> 3 mo.)

R Marks
IFFAS, 1998
AusOFAS, 2007

Classification







Examination

- angular/rotational deformity
- planovalgus/cavovarus feet
- ankle ROM – heel neutral, knee flex/extend
- subtalar, transverse tarsal motion

Proximal injury

- musculotendinous junction
  - well-perfused
  - high healing potential
- treatment: protected motion
- Durant ??

Treatment

Acute tendinopathy

restriction of activities

heel lift (or) boot in equinus

NSAIDs, modalities

heavy load eccentric stretching

? PMF

*avoid steroid injections

Rehabilitation

- stretch, strengthen
- modify training
- address structural abnormalities

  wedges, orthoses

- 65-95% success

Acute/chronic tendinopathy

Heavy-load eccentric calf strengthening

eccentric load with knee flexed, extended

no concentric load

weight added as tolerated

Alfredson, et al

AJSM 26, 1998

Acute/chronic tendinopathy

Heavy-load eccentric training

#15, avg 18 mo. symptoms

100% return full activities

isokinetic peak torques equal

better strength vs. surgical pt.s @ 24 wk

Alfredson,et al:
AJSM, 1998

Nitrodur Patch for Chronic Achilles' Tendinopathy

- #65 pt.s, (84) tendons
- ¼ nitrodur patch applied q 24 hr.
- nitric oxide may stimulate collagen synthesis in fibroblasts

Paoloni, et al
JBJS 86a, 2004

Nitrodur Patch for Chronic Achilles' Tendinopathy

- reduced pain @ 3, 6 mo.s
- decr. pain scores after hop test @ 6 mo.
- 78 % asymptomatic @ 6 mo.s
  vs. 49% for control group

Paoloni, et al
JBJS 86a, 2004

Surgical technique

- medial incision
- excise adhesions
- no undermining
- min. ant. dissection

Rehabilitation

- early motion within “safe zone”
- no difference 2 vs. 6 wk immob.
- lower concentric peak torques
- strength not related to subjective outcome

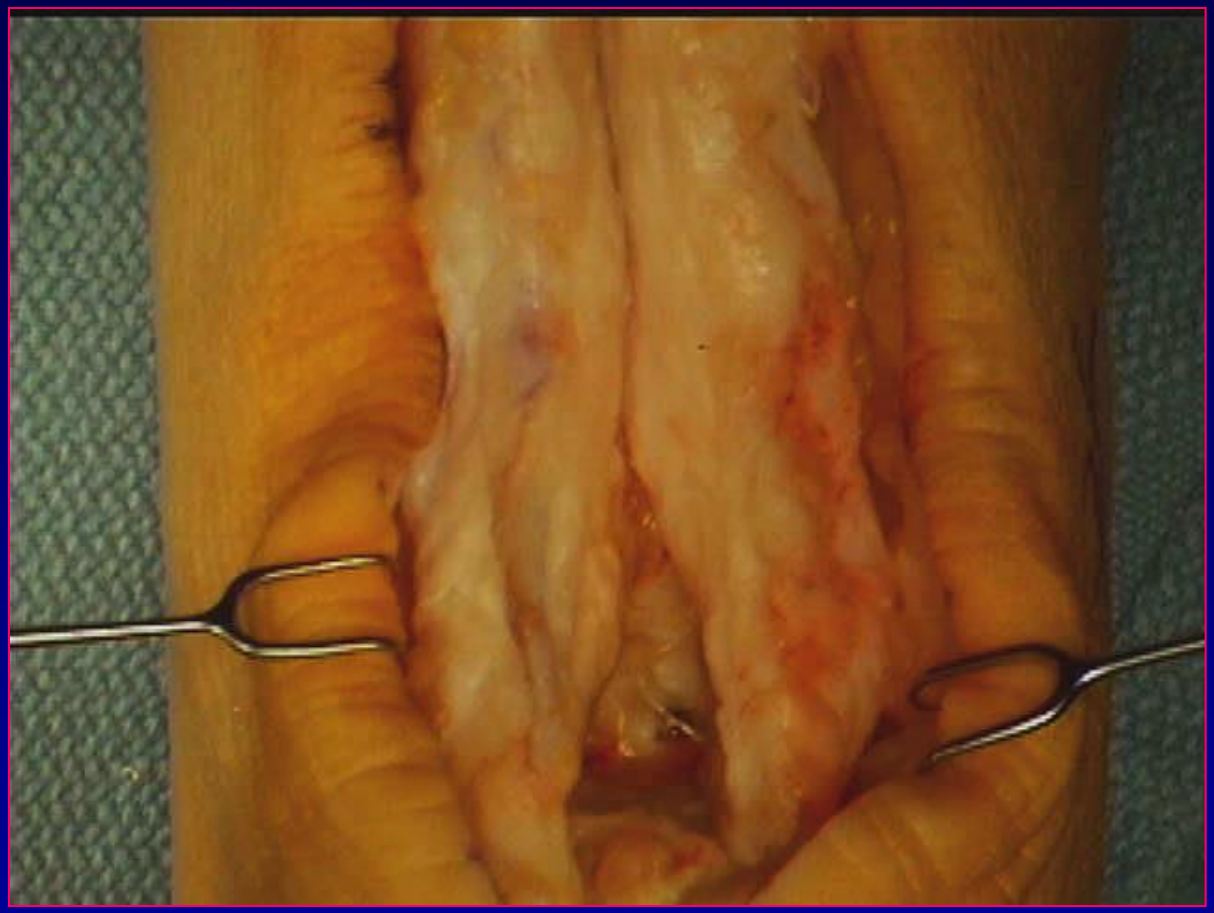
Chronic extensive tendinopathy

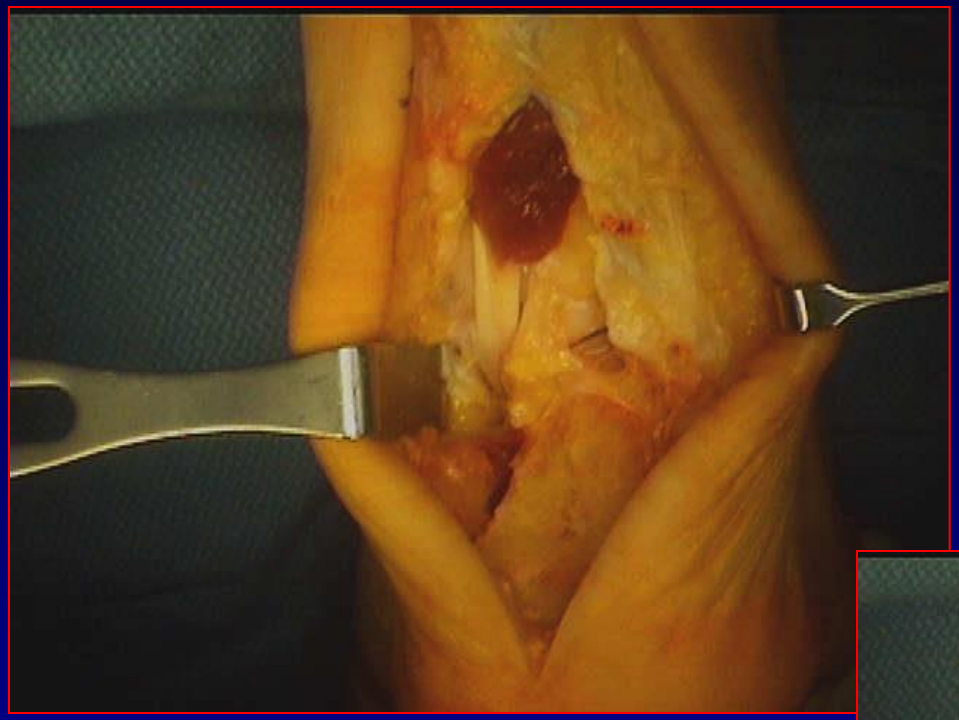
FHL tendon transfer

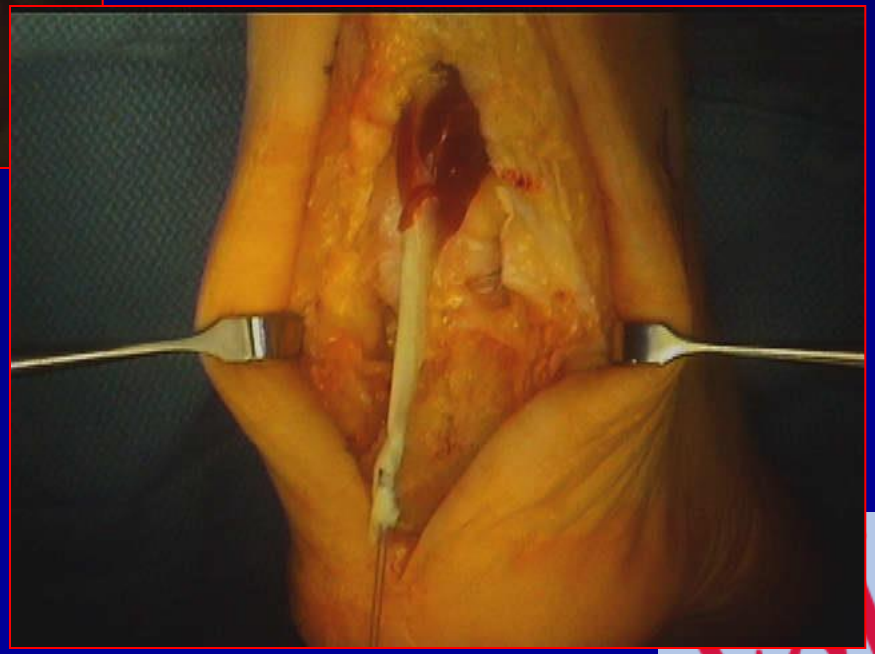
"in phase", proximity to Achilles

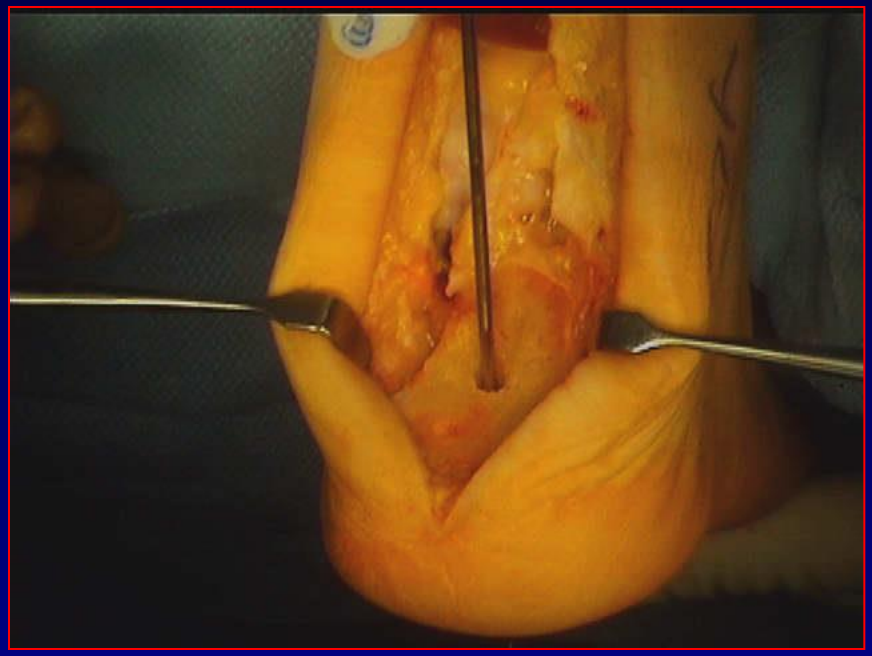
one incision technique

attach with biotenodesis screw







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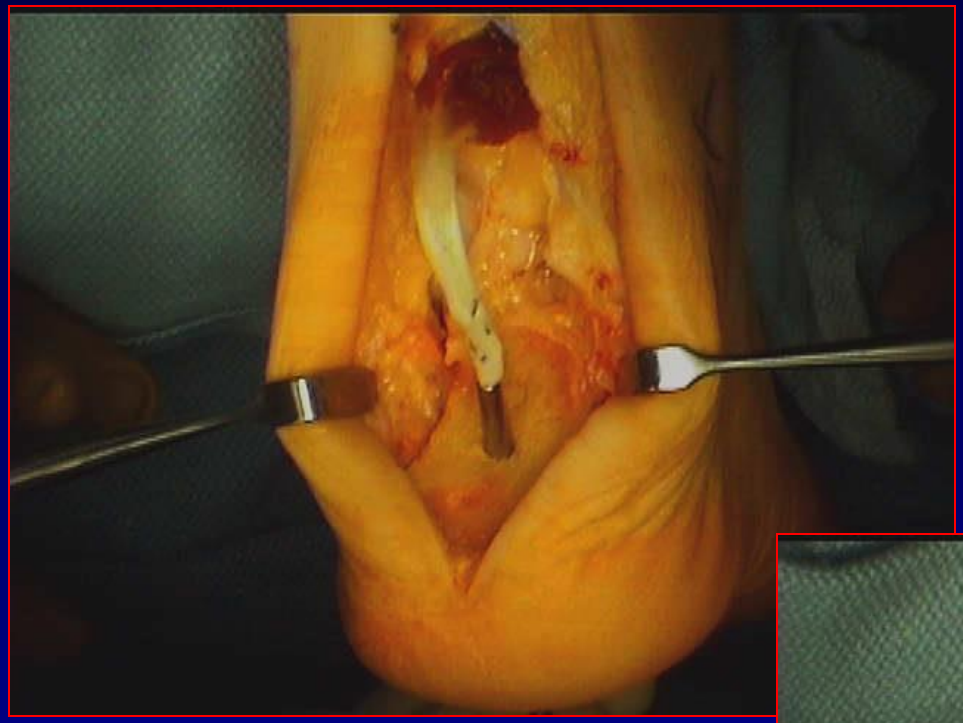


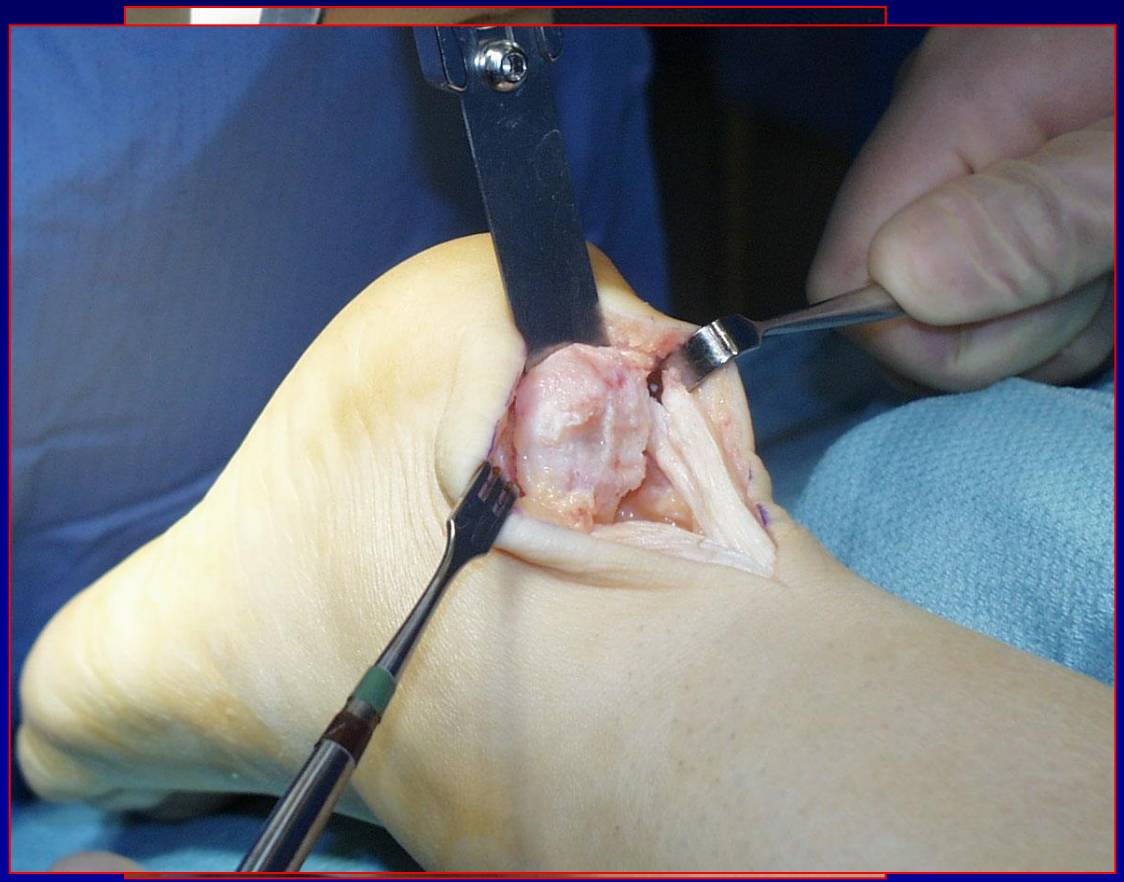
Insertional disorders

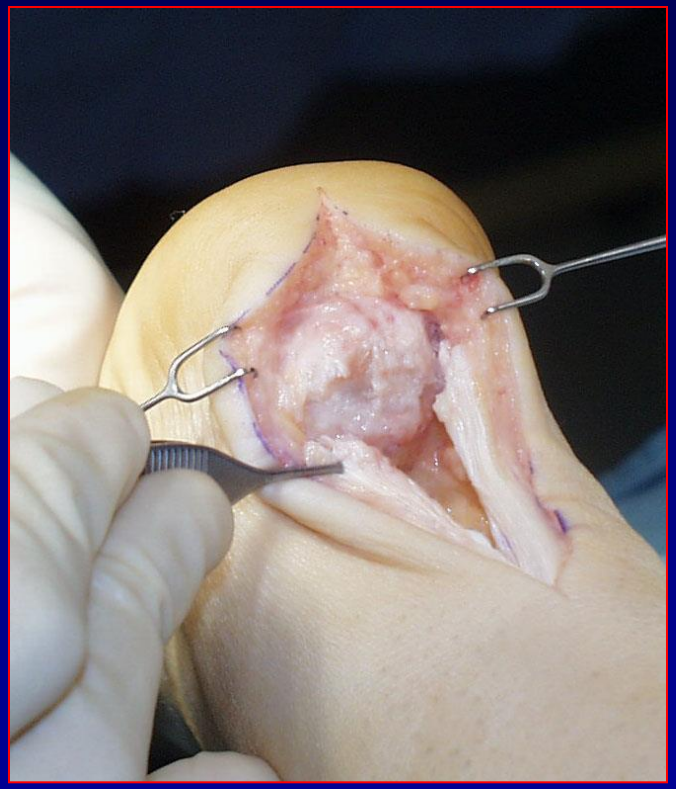
Differentiate:

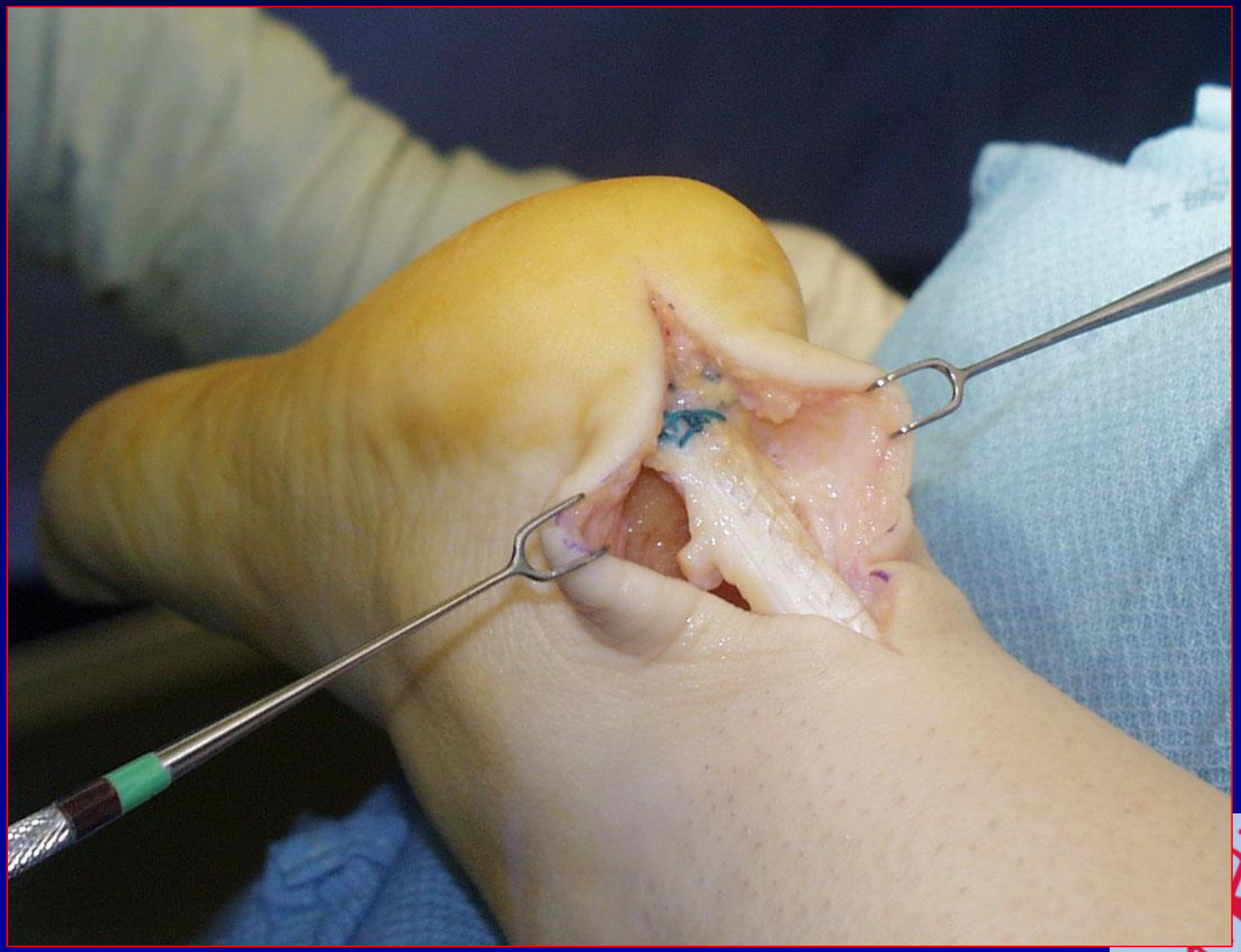
Haglund's vs. enthesopathy

Haglund's impingement

Enthesopathy







Acute Achilles' rupture

- pre-existing symptoms ?
  - indicative of degeneration
  - MRI to determine extent degeneration
- examination
  - Thompson test
  - ↑ prone dorsiflexion

Acute rupture treatment

- casting
  - reserved for poor candidates
- surgery
  - mini-open techniques
  - early R.O.M.
- functional treatment
  - protected plantar-flexion
  - early R.O.M.

Functional treatment

- tendon gap < 5 mm.

  U.S., MRI
- removable boot in equinus

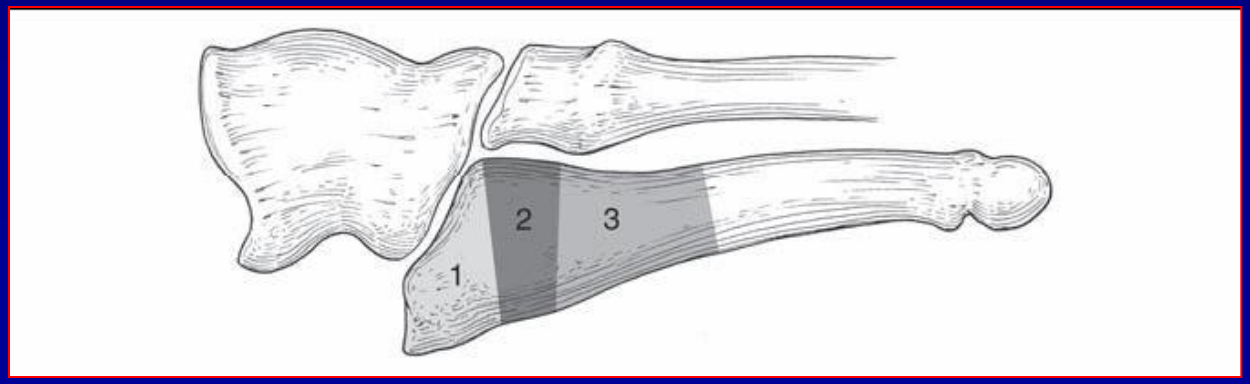
  heel lifts gradually diminished
- gradual WB
- good results
- not used for competitive athletes

Jones fracture

- contributing factors
- treatment
- return to play

Classification

- tuberosity avulsion (zone I)
- metaphyseal-diaphyseal junction (zone II)
- diaphyseal (zone III)



Classification

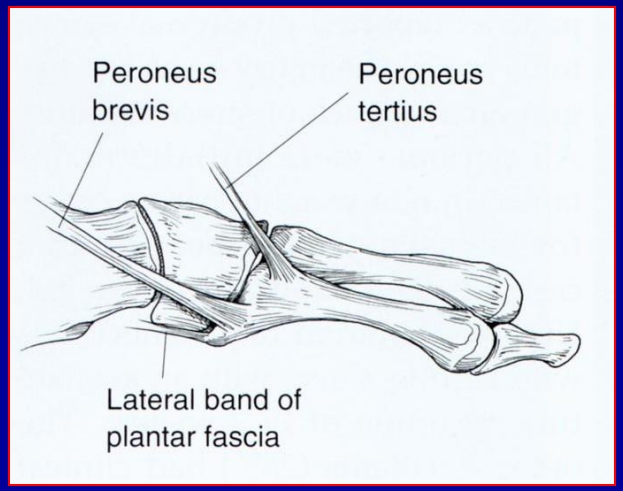
Tuberosity avulsion (zone I)

"tennis fracture"

p. brevis, plantar ligament avulsion

presentation variable

may involve articular surface



Treatment

Tuberosity (I)

symptom driven

shoe, boot, cast

NWB, WBAT

displacement us. not significant

rarely fix

rarely late excision

Classification

Metaph.-diaphyseal junction (zone II)

"Jones"

acute fracture

transverse pattern

15 mm distal to tuberosity

2° to adduction force

Treatment

Metaphyseal-diaphyseal (II)

cast

- NWB, min. 6 weeks

ORIF

- high performance athlete
- desire to RTW/play sooner

Classification

Diaphyseal (zone III)

"march fracture"

stress fracture

assoc. with cavovarus

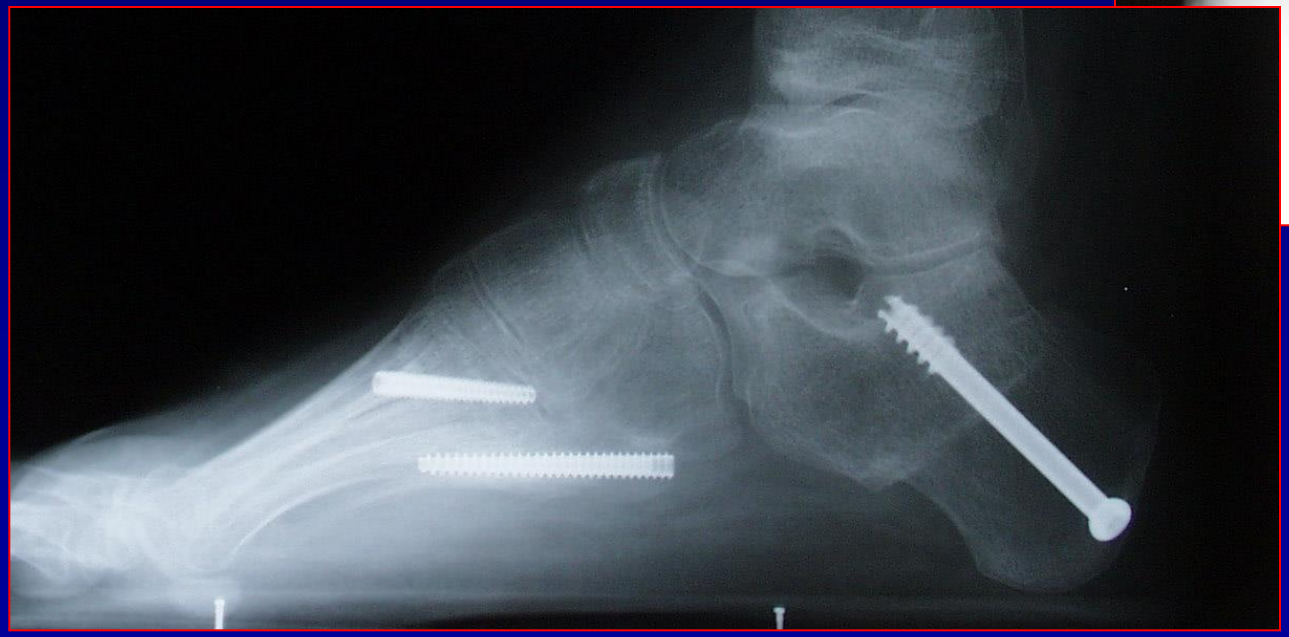
met. adductus

Special consideration

Angular deformity ?

varus heel

cavovarus foot



Post-operative course

- NWB 6 weeks*
- cast vs. boot
- gradual WB 6 – 8 weeks*
- clinical healing > radiographic healing
- RTP...

Lisfranc

- mechanism
- diagnosis
- treatment options

- rare injuries
  - 1:55,000
  - 4% football players

Anatomy

3 column concept:

medial: 1st MT – med. cuneiform

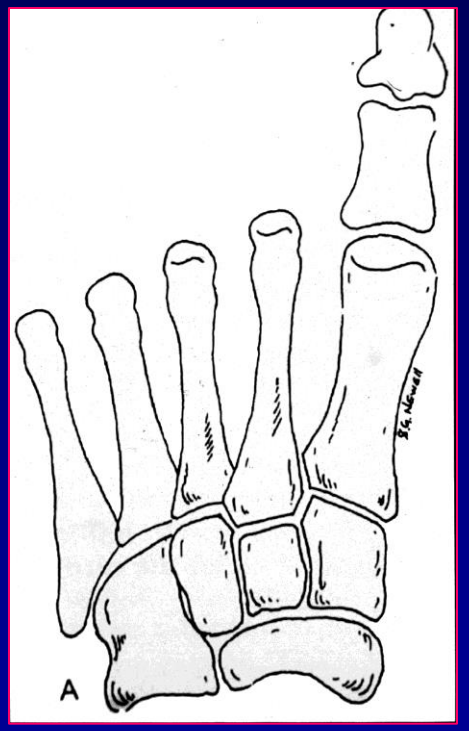
3.5 mm. motion

middle: 2nd, 3rd MT – C_2, C_3

more rigid

lateral: 4th, 5th MT – cuboid

flexible



Osseous anatomy

2nd metatarsal

"keystone"; roman arch concept

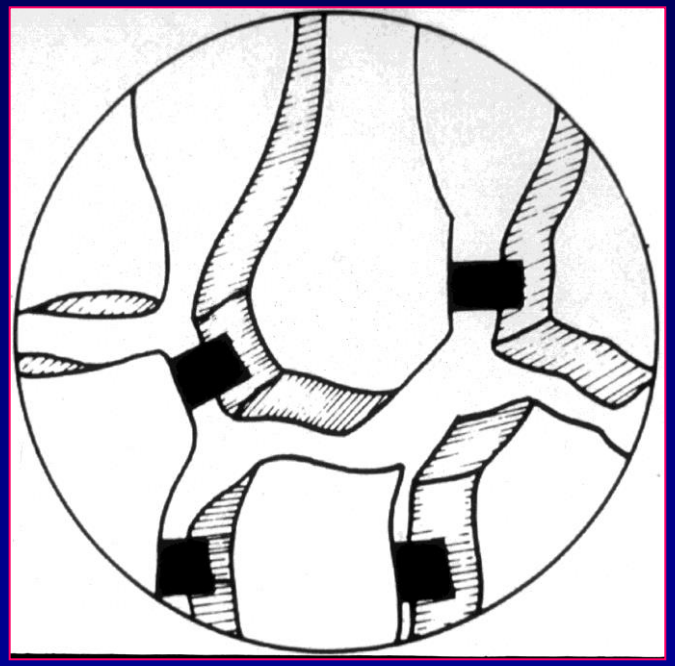
5 osseous articulations

recessed between cuneiforms

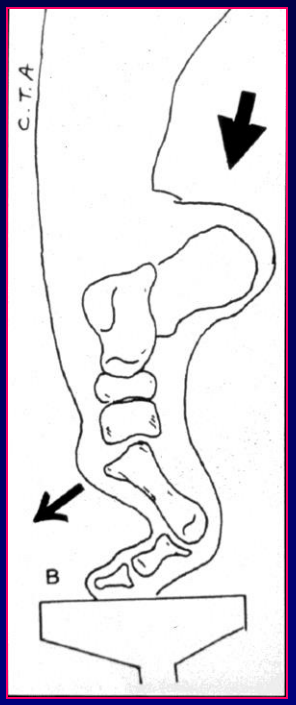
constrained in sag. plane, pron/sup.

Ligamentous anatomy

- dorsal ligaments
- interosseous ligaments
  - no M_1-M_2 ligament
  - Lisfranc: C_1-M_2,M_3
- plantar ligaments
  - strongest



Mechanism



Indirect

plantar-flexed ankle

- foot becomes long lever of leg
- transmission of forces through foot

plantar-flexed foot

- midfoot pushed in cavus
- dorsal capsule ruptures
- results in 1º dorsal displacement

Mechanism

Direct

high energy

associated with open injury

concomitant fractures

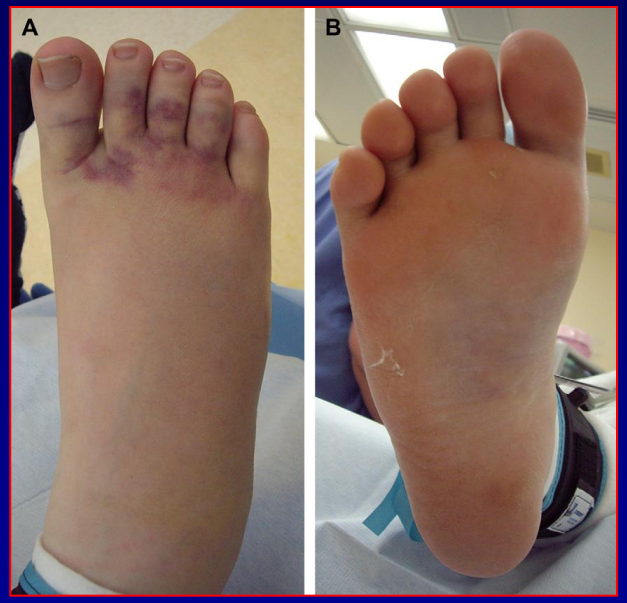
MT shafts,naviculum, cuboid

vascular compromise

compartment syndrome

Examination

- ~ 20% initially missed
- direct palpation over midfoot
- medial-lateral compression
- abduction stress
- “shuck” test involved columns
- stress under anesthesia ??



Physical exam tests

- Sagittal stress

- Pronation-abduction

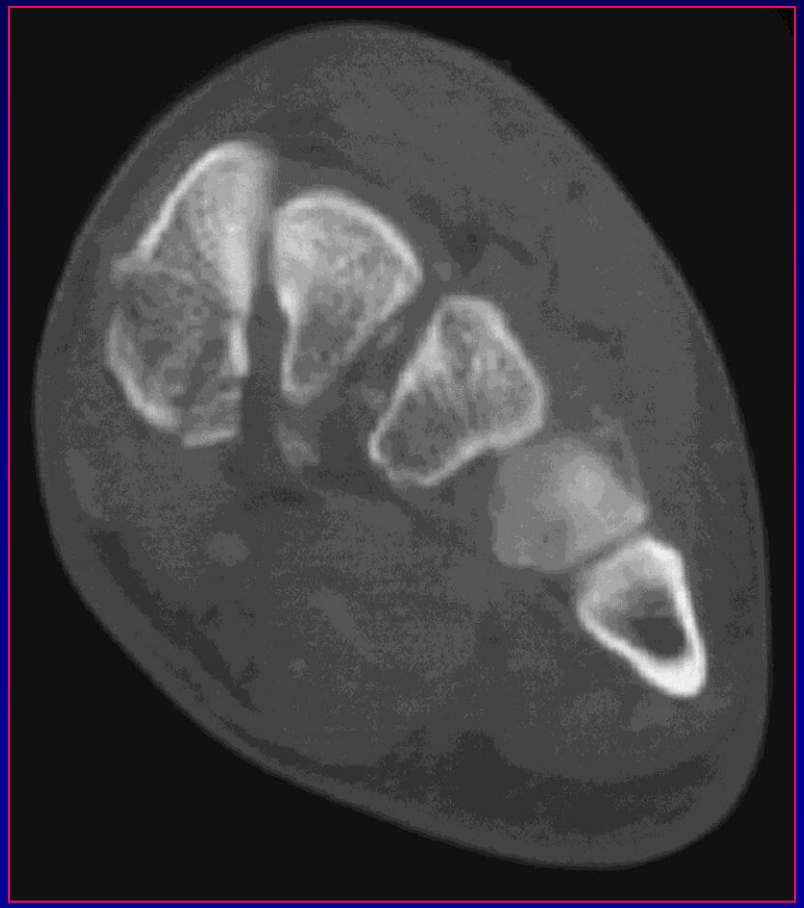
Radiography

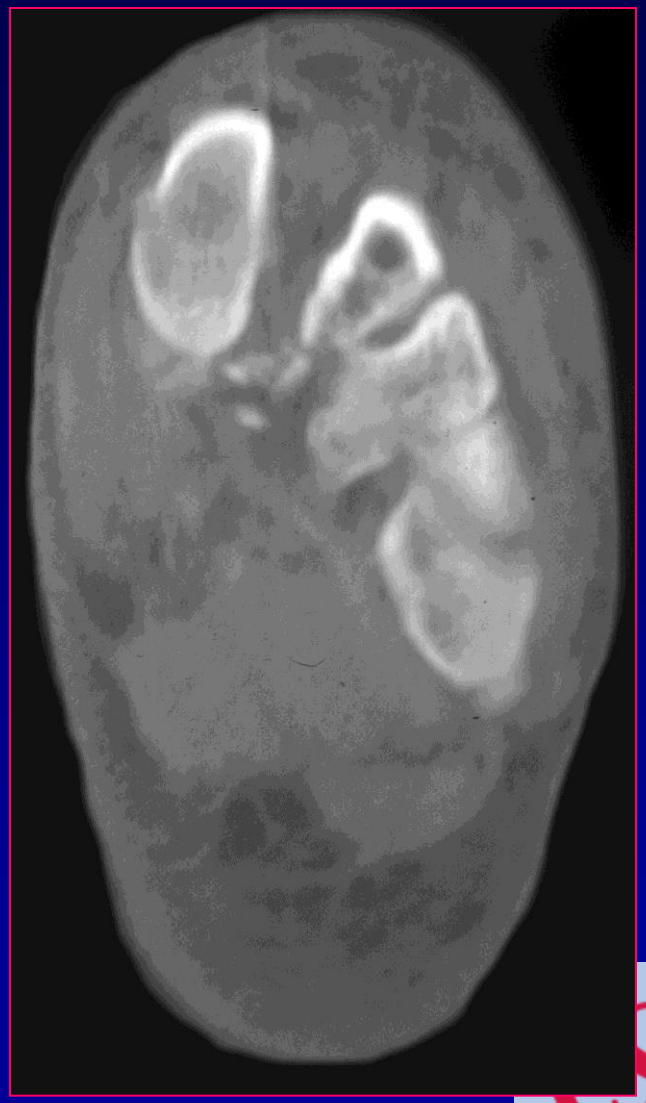
- weightbearing films (when possible)
- if unable to WB, → splint

  return for WB films in 5-7 days
- C.T. scan

  helps eval. comminution, sag. disp.
- MRI

  eval. instability in ligamentous injury





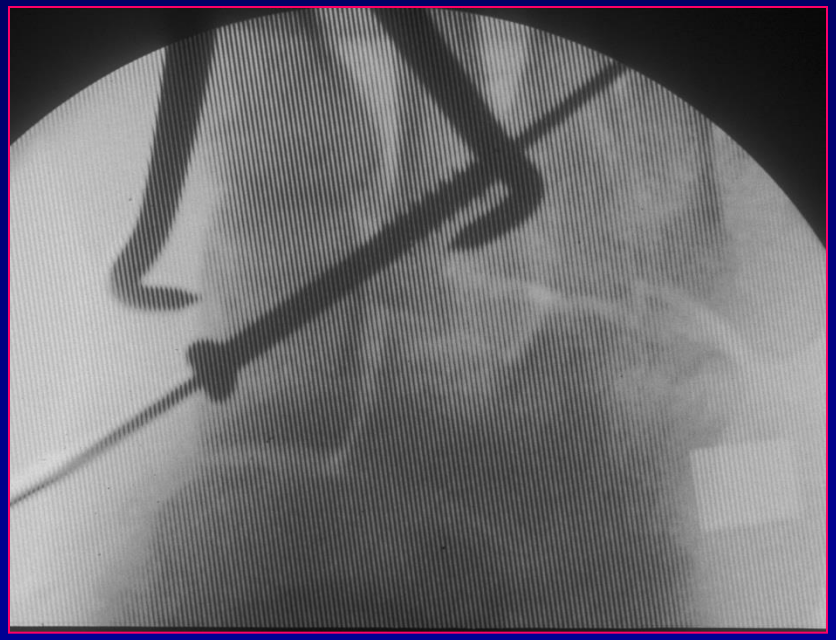
Radiography

- “fleck” sign
- associated MT fracture: 74%
- navicular, cuboid fracture: 39%
- lateral film: M_5 – C_1

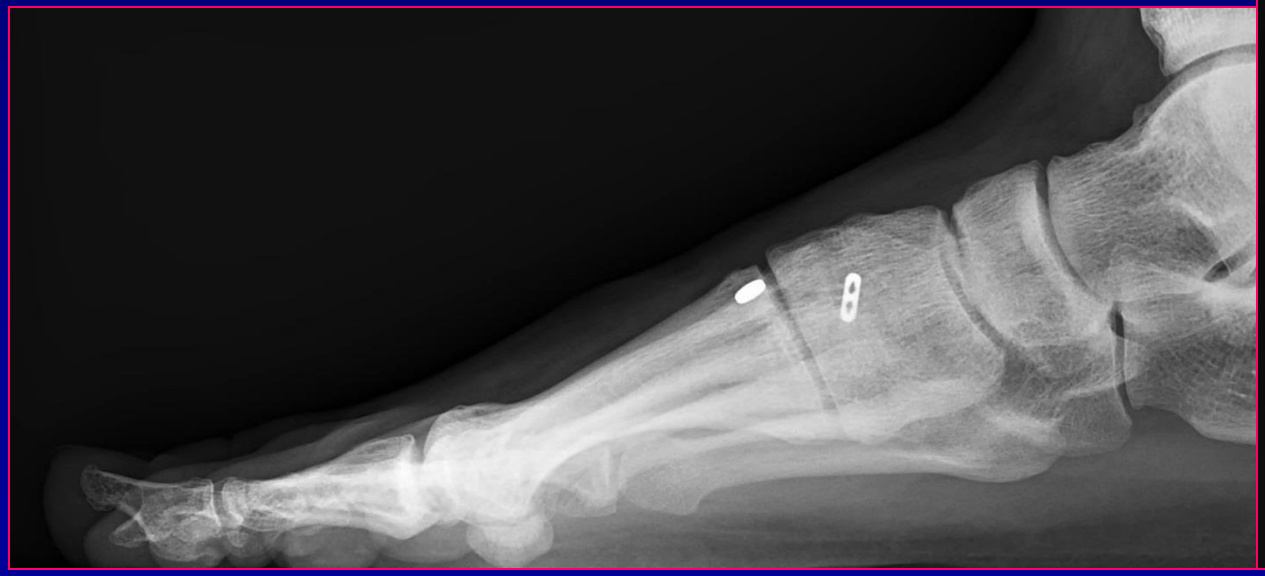
    (-) relationship with midfoot injury

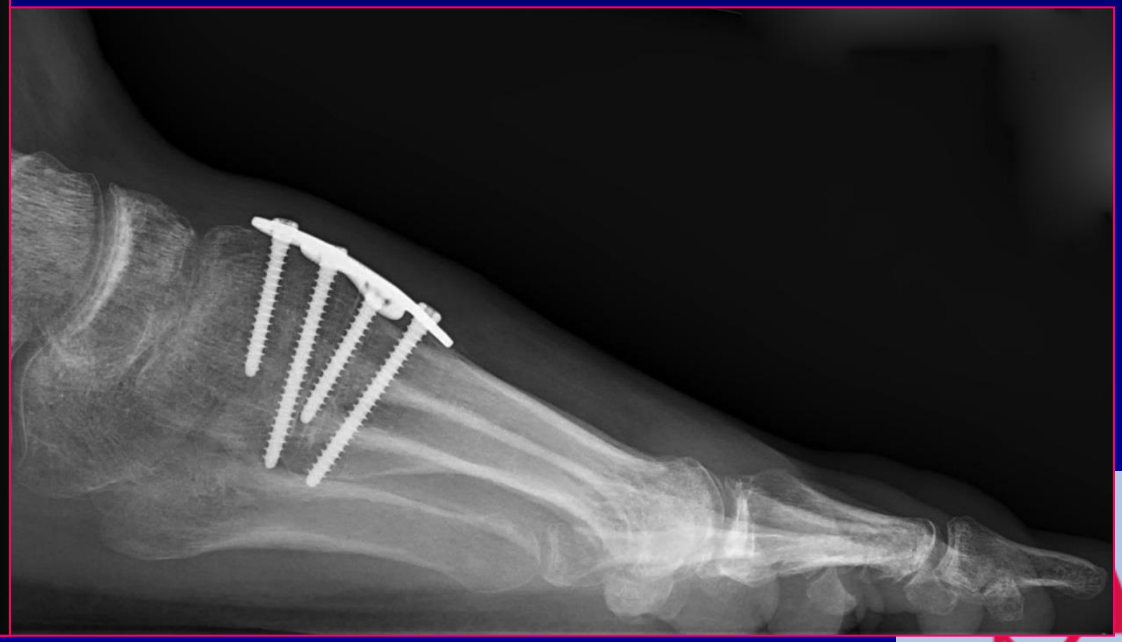
Surgical choices

- closed reduction vs. open reduction
- fixation:
  - trans-articular screw
  - dorsal plating
  - suture button
- primary arthrodesis



Suture button fixation





Conclusions

- high index of suspicion (20% missed)
- WB “stress” x-rays
- ?: role of stress films
- outcome related to accuracy reduction
- suture button = screws ($$)
- primary fusion may be indicated