

# ACUTE SYNDESMOTIC INJURIES

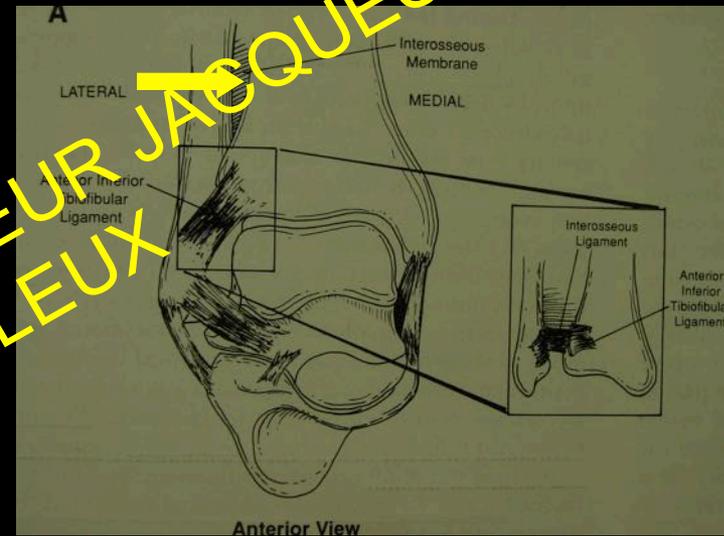
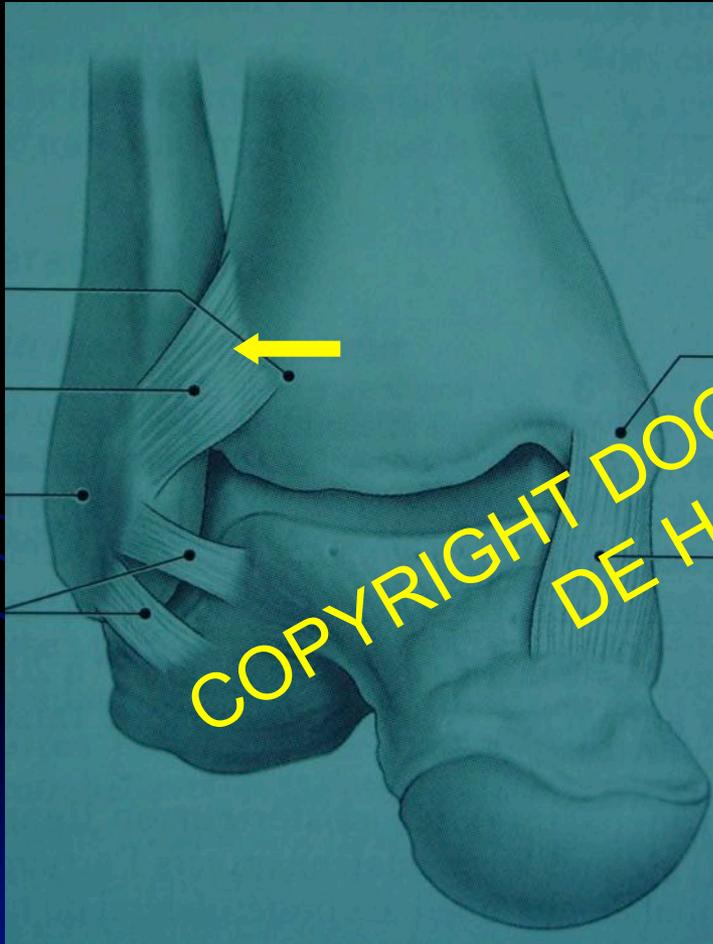
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23-10-2004

Dr J de Halleux

# ANATOMY

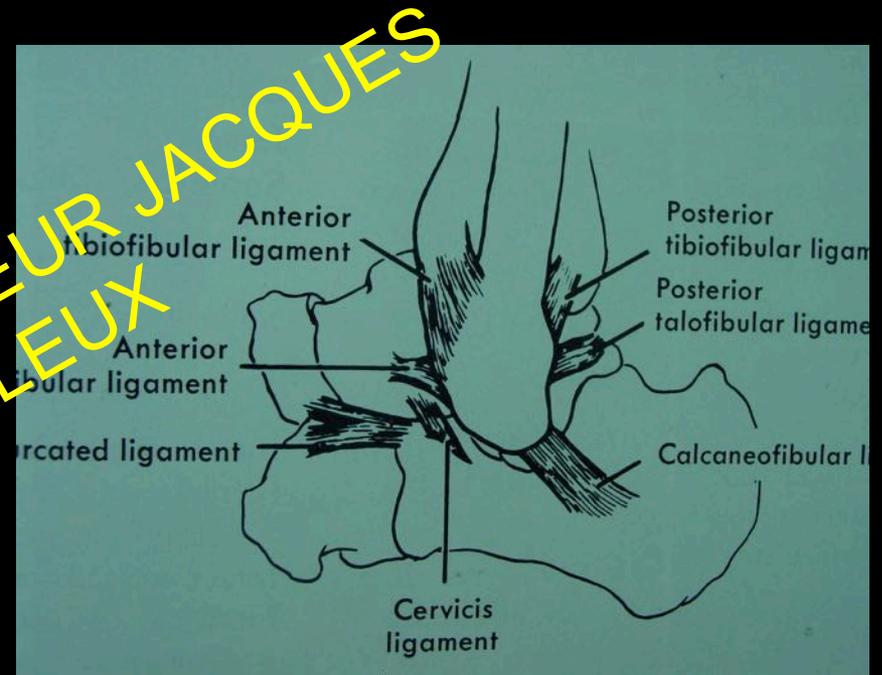
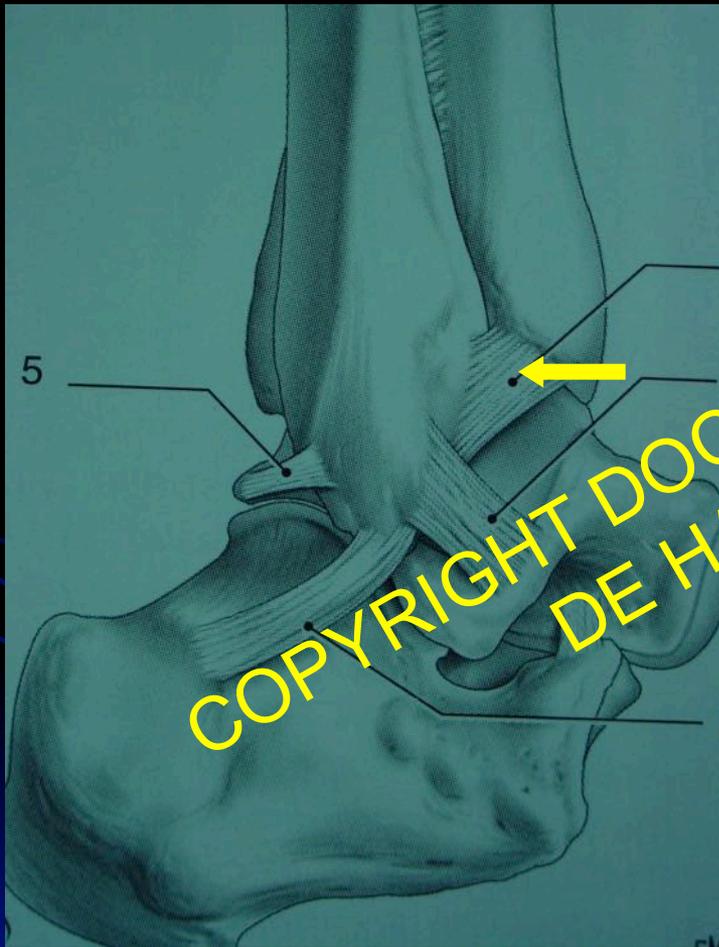
anterior view



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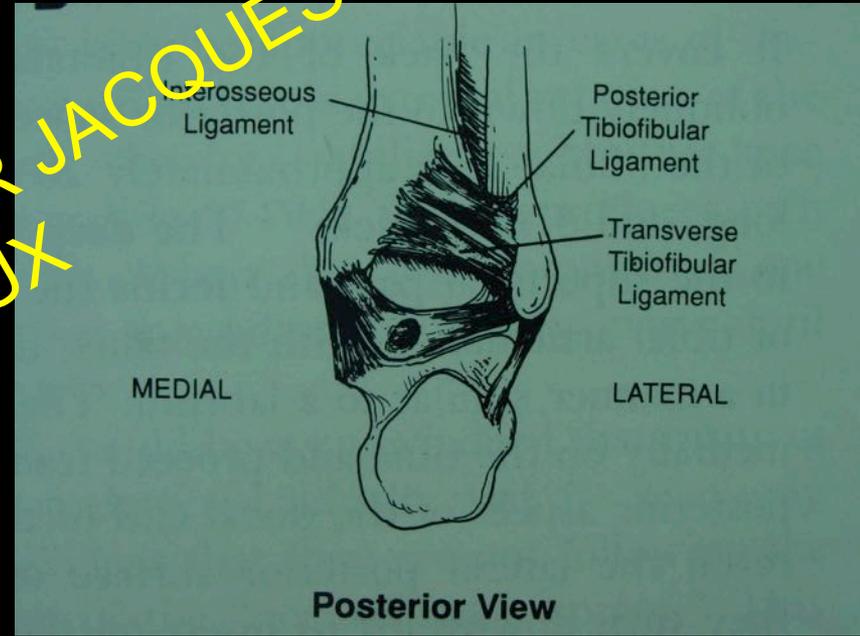
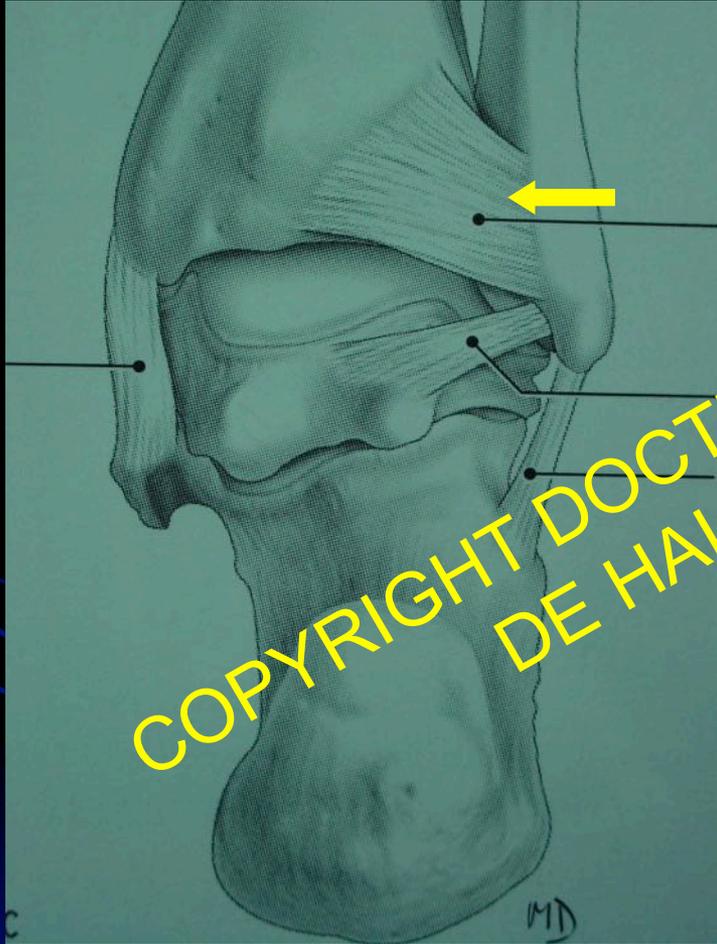
# ANATOMY

lateral view



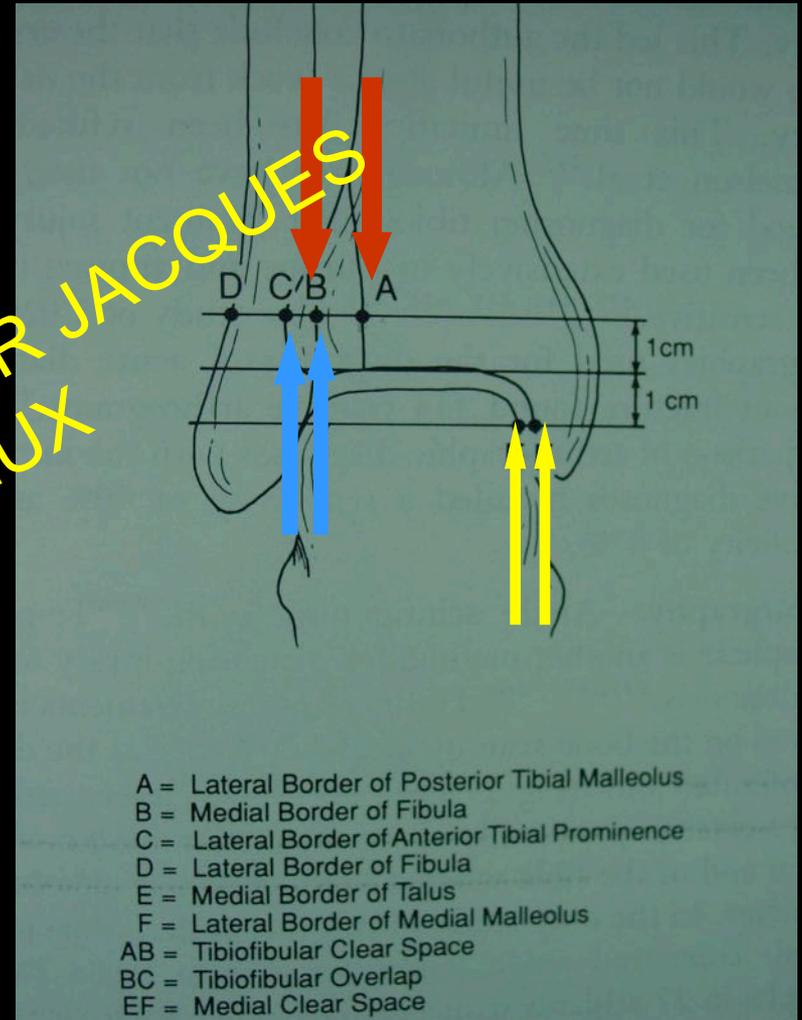
# ANATOMY

posterior view



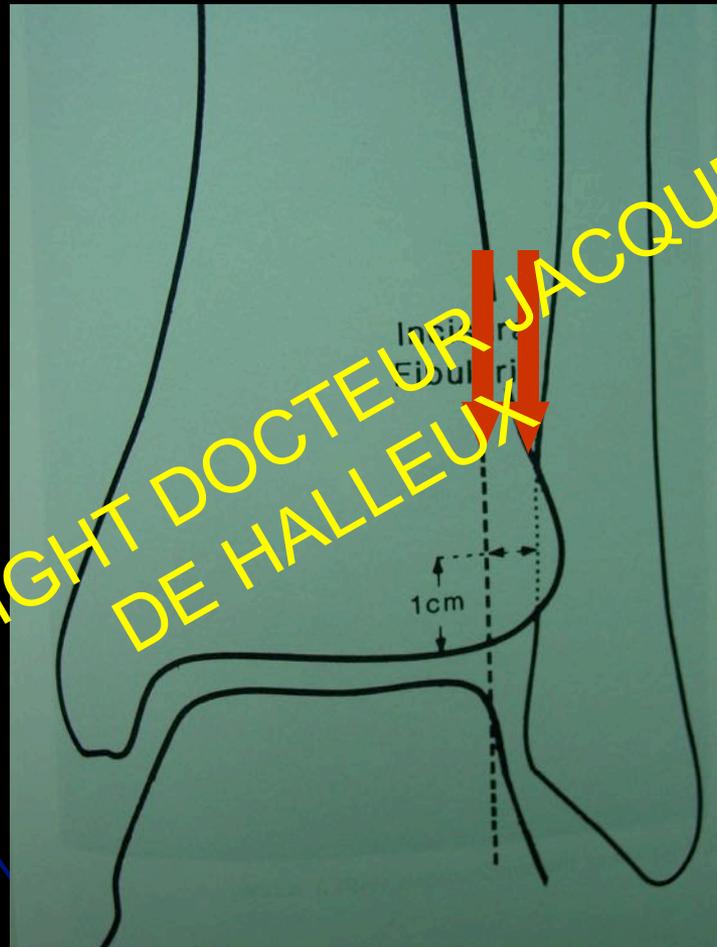
# X-Ray

- tibiofibular clear space (A-B) = 3 to 6 mm
- medial clear space (E-F) = 2 to 4 mm
- tibiofibular overlap (B-C) = >6 mm



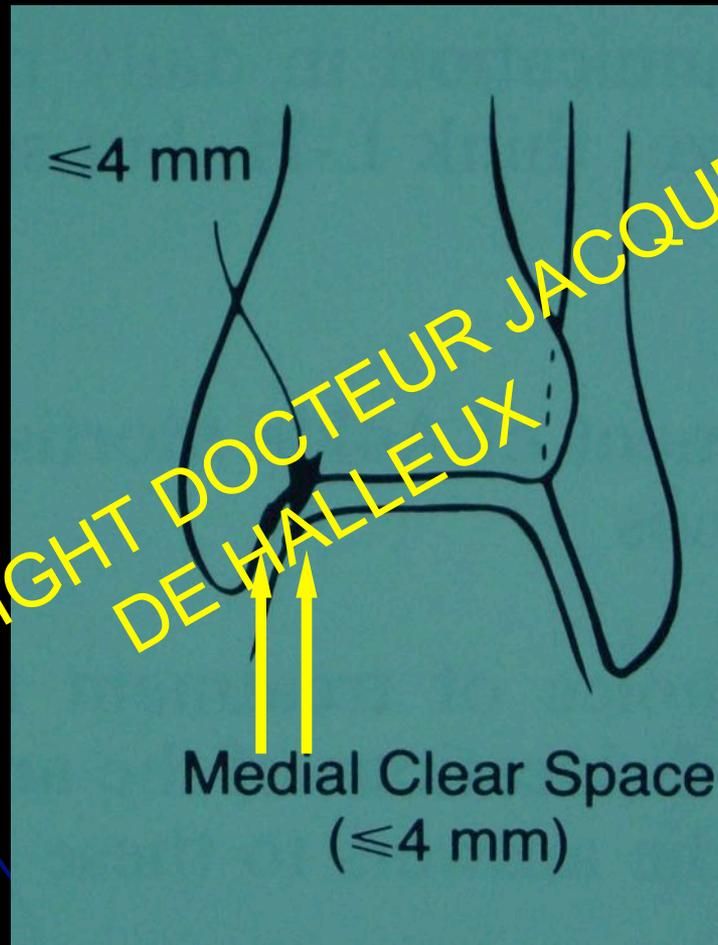
# RADIOLOGY :

tibiofibular clear space = 3 to 6 mm



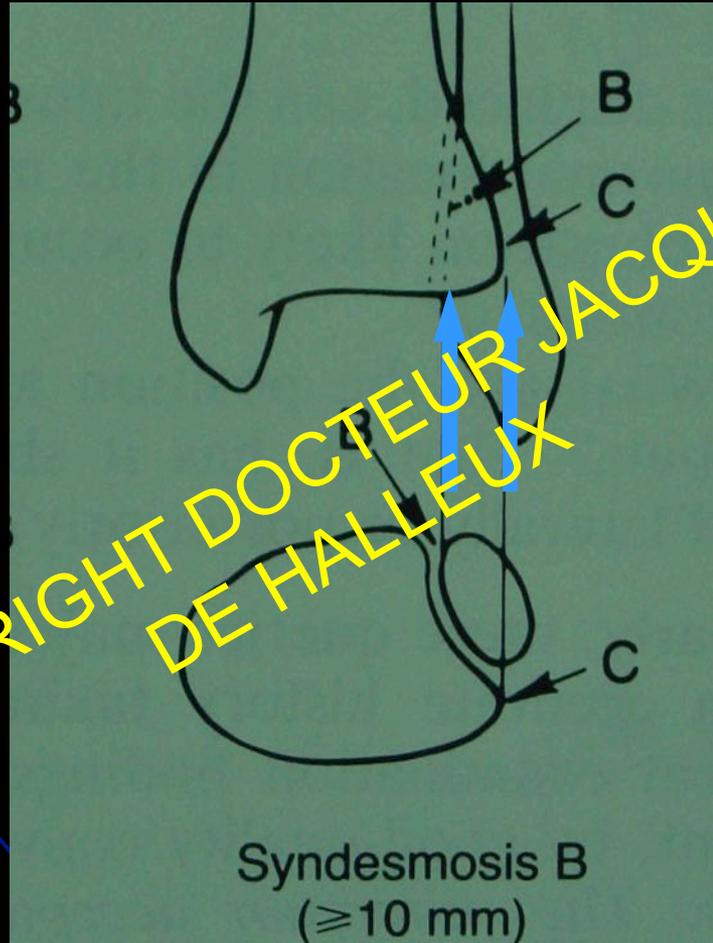
# RADIOLOGY :

Medial clear space < 4 mm



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# RADIOLOGY :



Overlap tibia/fibula at least 6 mm

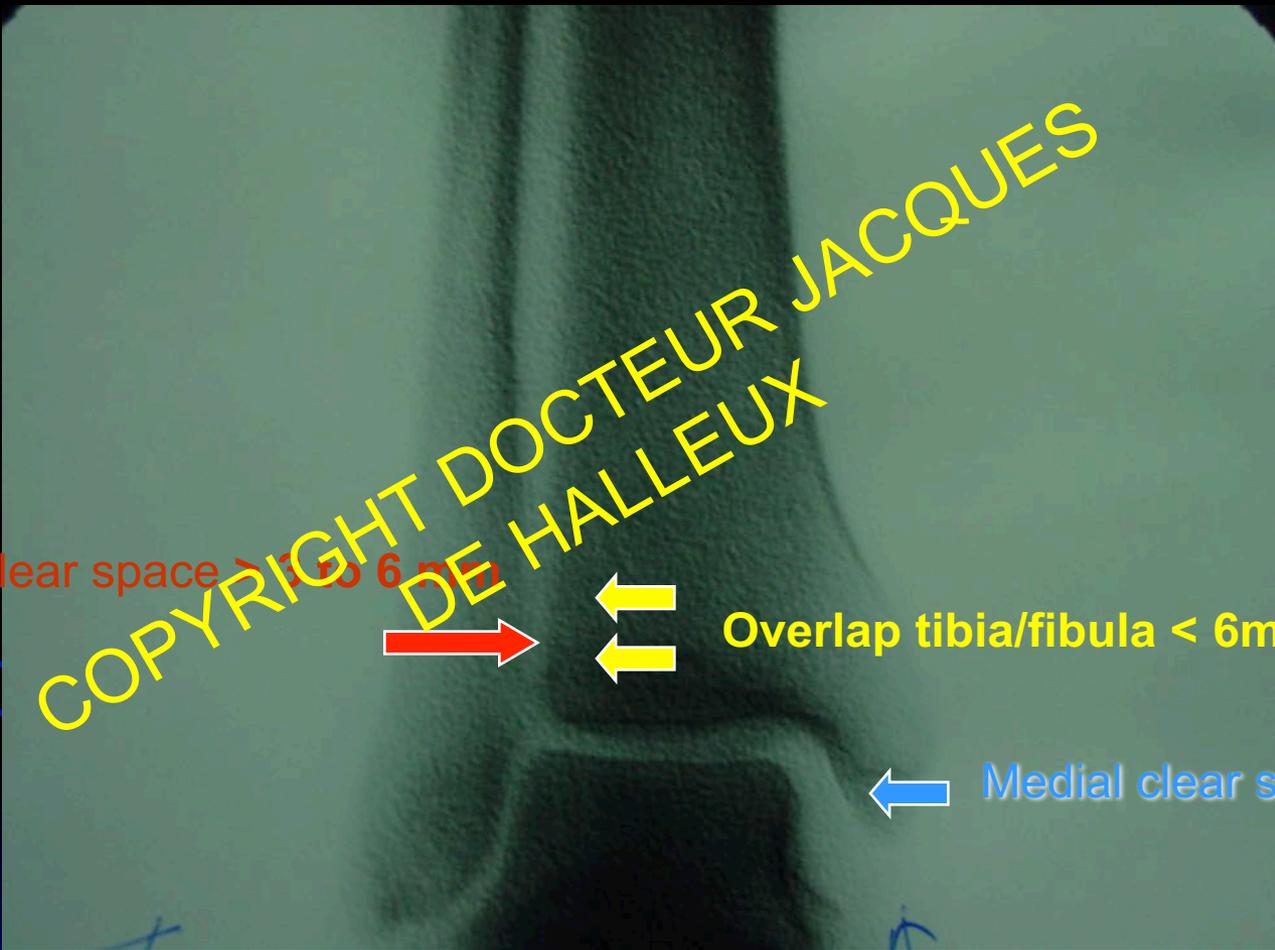
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tibiofibular clear space > 5 to 6 mm



Overlap tibia/fibula < 6mm

Medial clear space > 4 mm



# ETIOLOGY

## of tibiofibular syndesmosis injuries

- Usually associated with ankle fractures
- Rarely isolated syndesmotic sprains
- 1 % \* to 10% \*\* of all ankle sprains

\*

(Hopkinson, Foot Ankle, 1990)

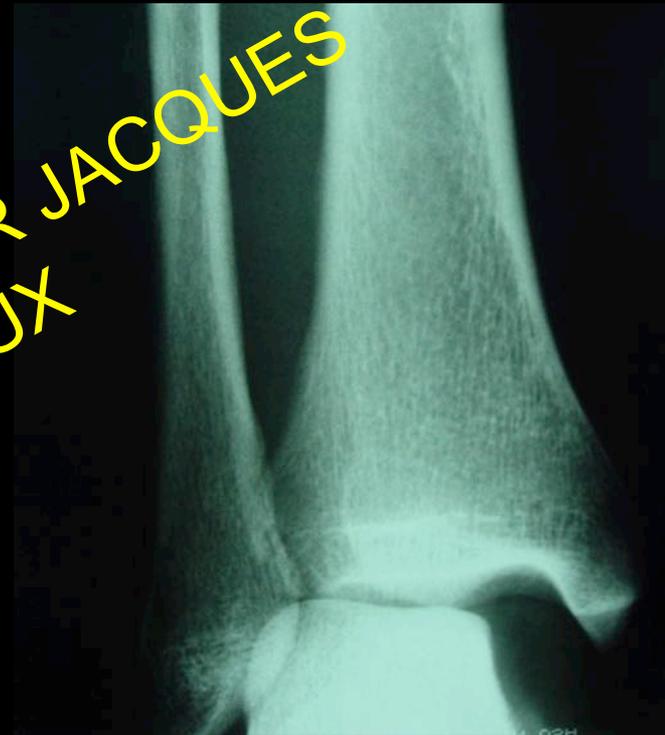
\*\*

(Broström, Acta Chir Scand, 1965; Cedel, Acta orthop Scand, 1975)



# SPRAIN OF THE SYNDESMOSIS

- **Mechanism :**
  - external rotation force
- **Tenderness over**
  - deltoid ligament
  - Lateral collateral ligaments
  - Tibio-fibular syndesmosis
- **Palpation fibula:**
  - Maisonneuve fracture



# Maisonneuve fracture



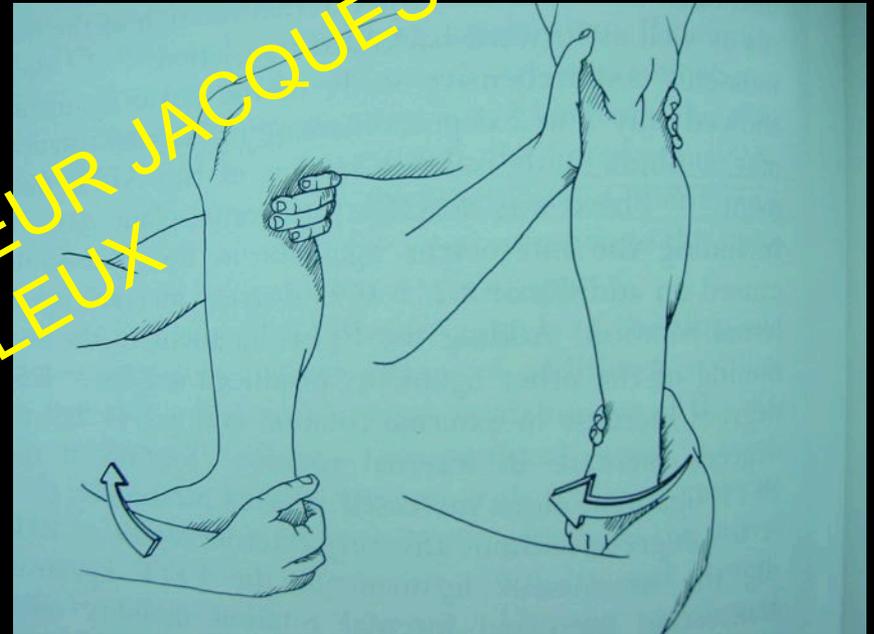
2004/10/07

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# Physical examination:



Squeeze test



Abduction + external rotation

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# CLASSIFICATION OF SPRAINS OF SYNDESMOSIS :

Edwards and DeLee :

- **Latent** : only by stress external rotation radiographs
- **Frank** : abnormal findings on standard X-ray

4 Types

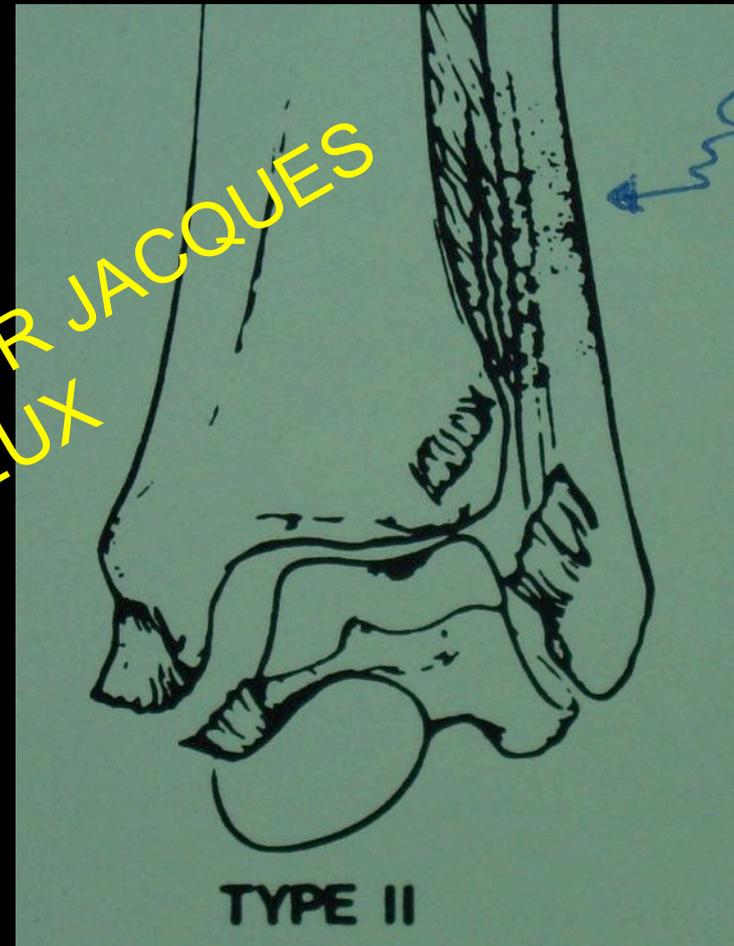


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# Frank Ankle diastasis



Lateral fibular subluxation



idem + plastic deformation fibula

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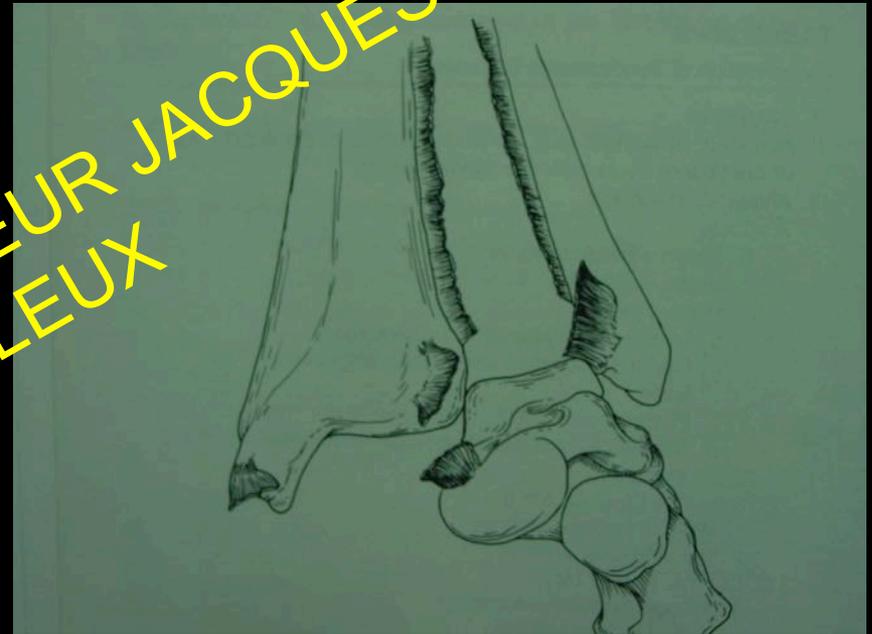
# Frank Ankle diastasis

**TYPE 3**



**rotatory subluxation fibula**

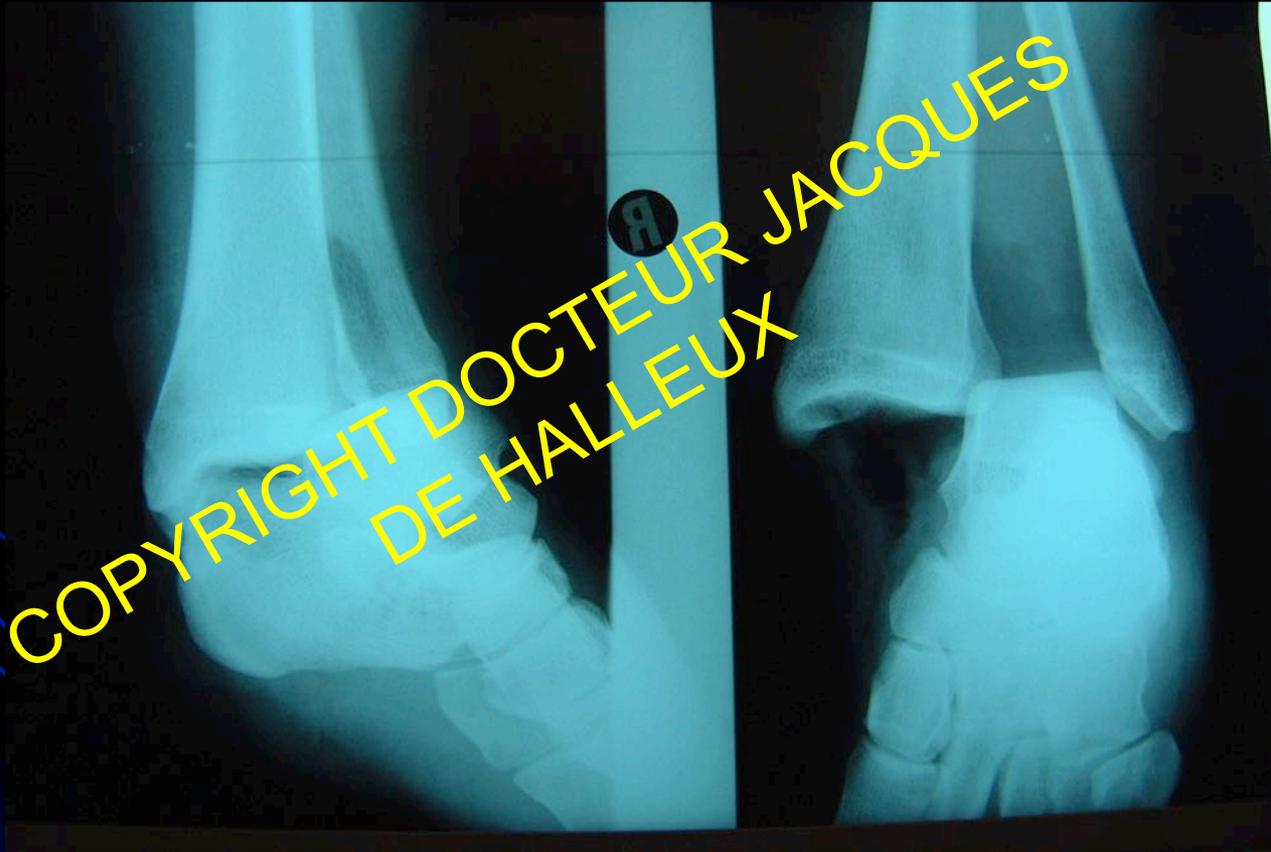
**TYPE 4**



**superior dislocation talus**

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# Frank 4



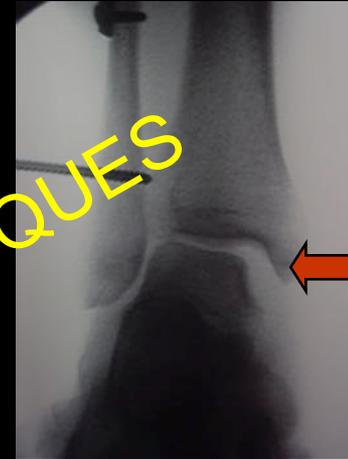
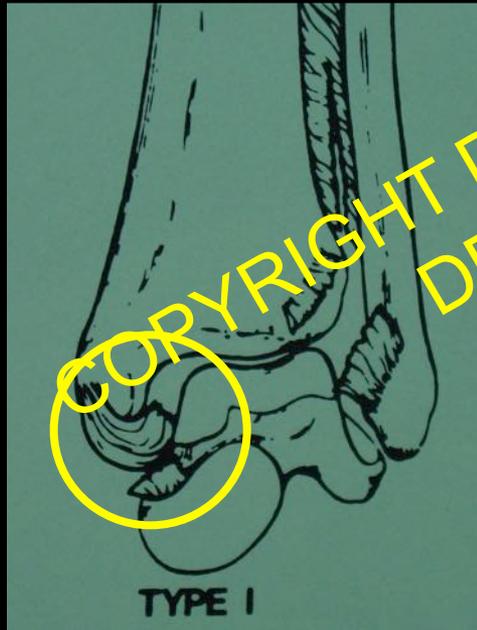
# TREATMENT OF SYNDESMOSIS INJURY

- **If no instability and no diastasis**
  - Conservative ( rest, ice, cast...)
- **If instability and no frank diastasis**
  - Cast or brace 12 weeks (6 nonweightb, and 6 weightb)
  - Before weightb, stress X-ray !!!
- **If instability and frank diastasis**
  - Surgical syndesmotic fixation

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# Syndesmotic reduction and fixation

- Repair of the **deltoid ligament** only if reduction of the mortise is impeded by the torn ends of the ligament



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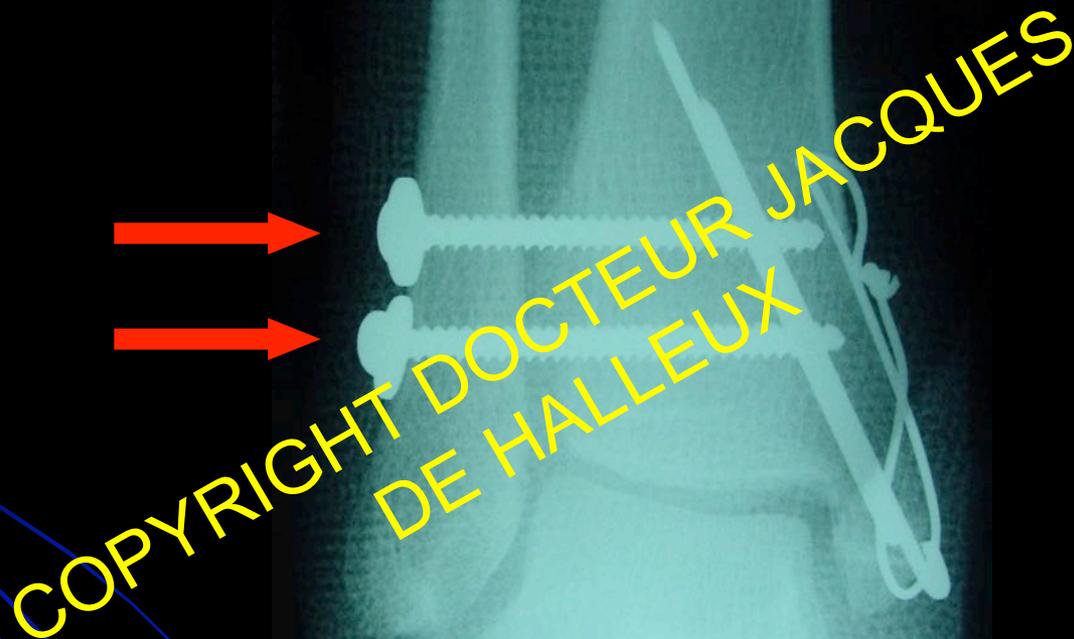
# Syndesmotic fixation : 1 screw

With the ankle dorsiflexed  
( talus wider anteriorly)

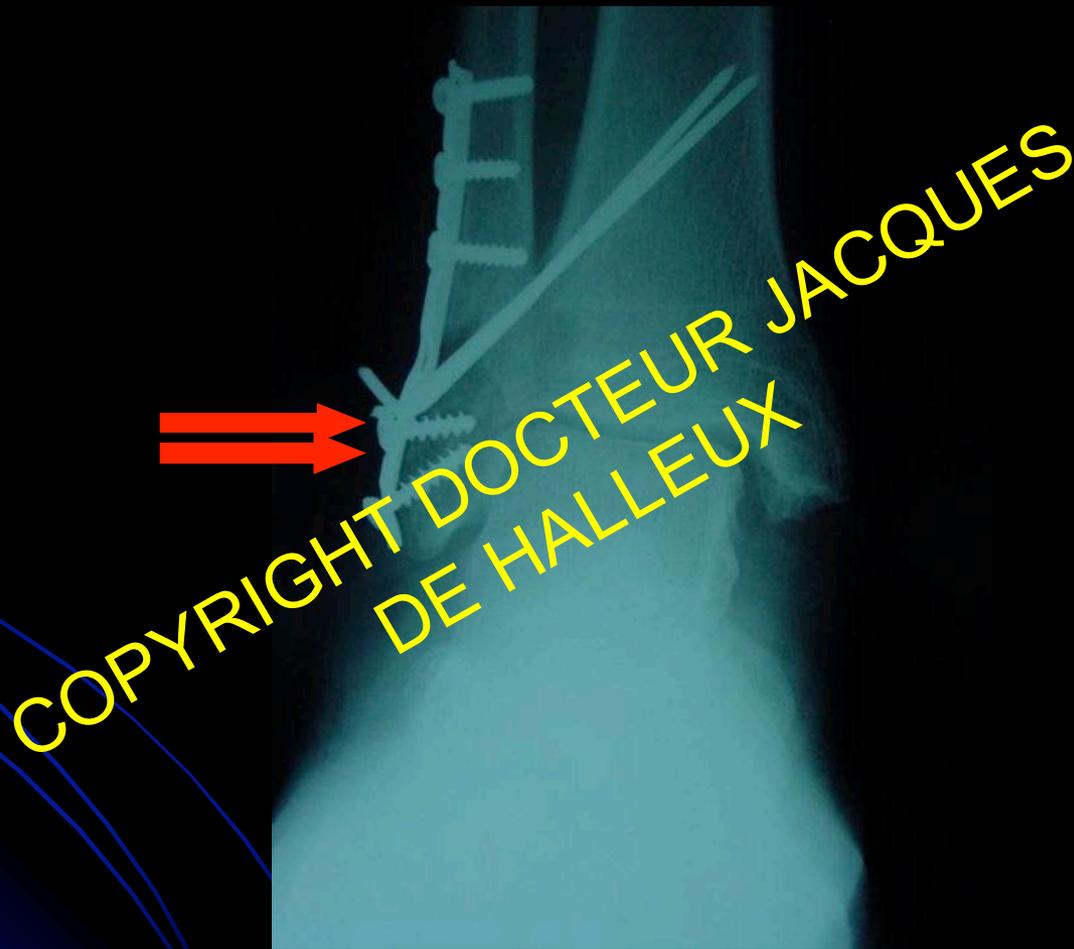


2 cm proximal  
and parallel to the ankle joint

# Syndesmotic fixation : 2 screws



# Syndesmotic fixation : 2 K-wires



*R.E. Peter and all, journal of Orthopaedic Trauma,  
vol 8, n° 3, pp 215-219, 1994*

# Biomechanical effects of internal fixation of the distal TF Syndesmotic joint : comparaison of 2 fixation techniques \*

- During motion of the ankle joint from plantar to dorsiflexion,
  - the normal syndesmotic joint widens up to 1,25 mm
  - lateral maleolus rotates externally up to 2°
- Transverse 3,5 mm screw / Two 1,5 mm Kirshner wires introduced obliquely across the distal TF syndesmosis
- **Results :**
  - Adequate stability for 2 groups
  - No fatigue or loosening with K wires (???)
  - Equivalent from a biomechanical perspective

\* R.E. Peter, *Journal of Orthopaedic Trauma*, vol 8, n° 3, pp 215-219, 1994

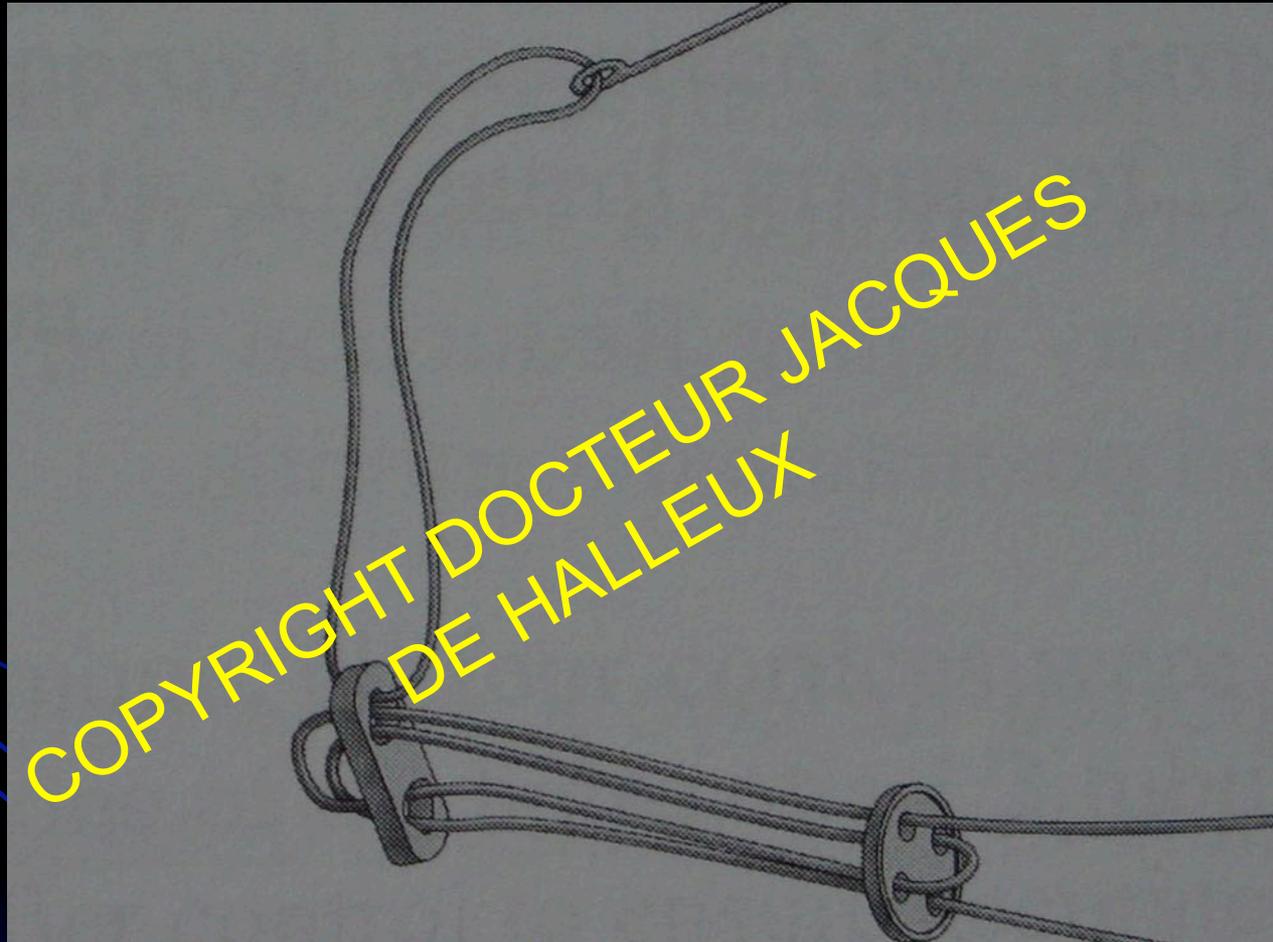
# Syndesmotic fixation

- Screw removal after 8 to 12 weeks

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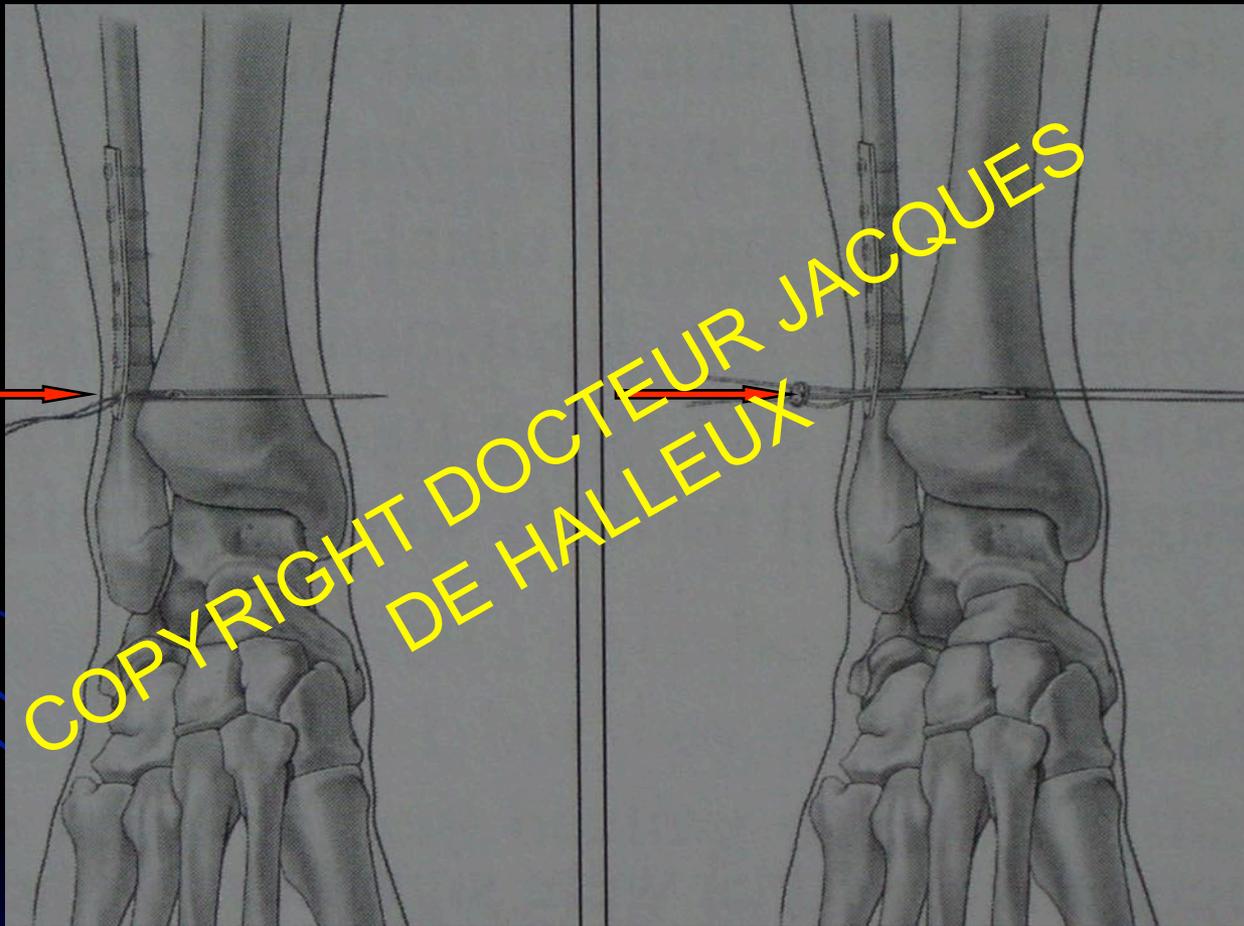


# Syndesmotic fixation : suture- endobutton

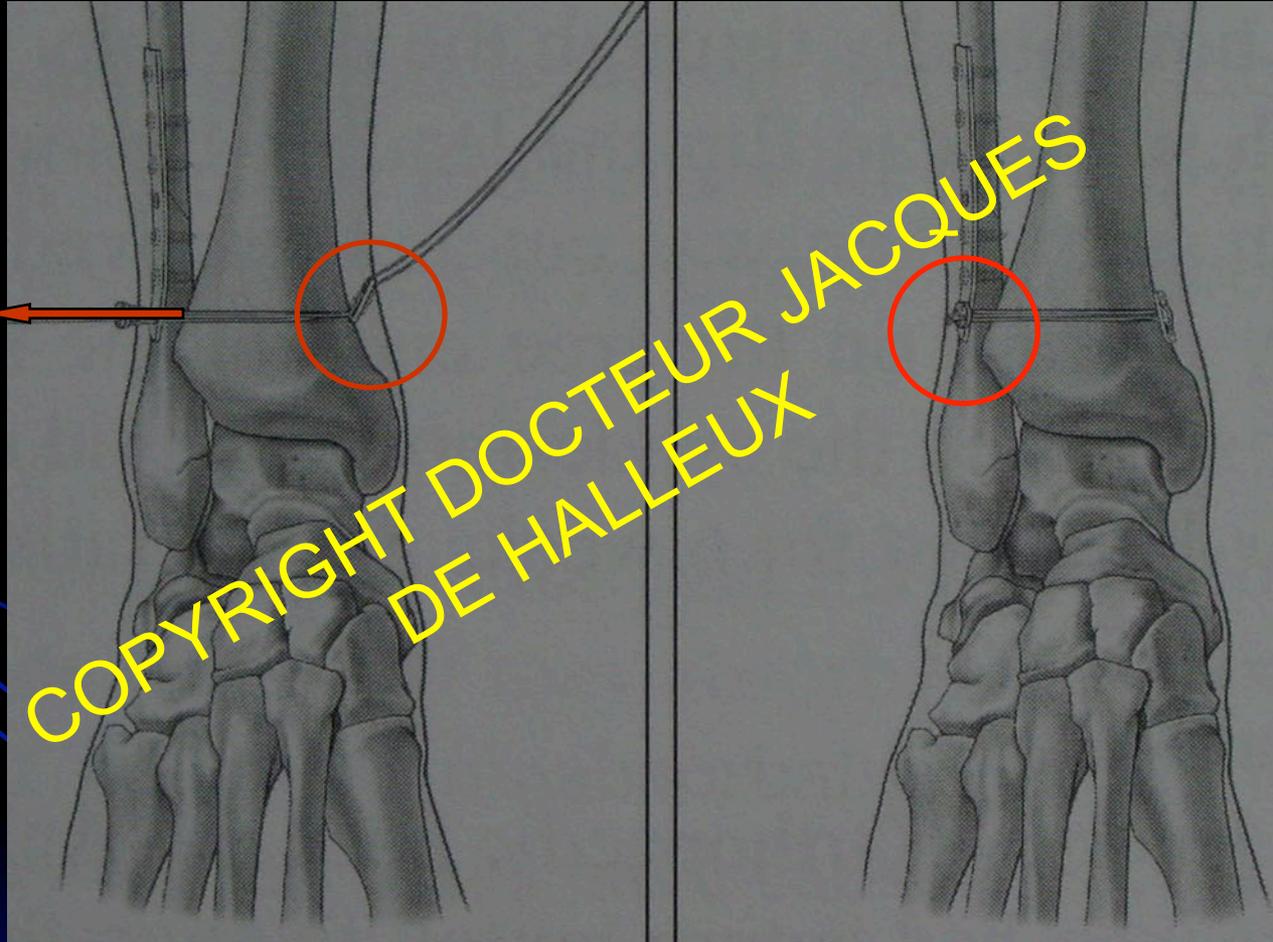


\*Tightrope, Arthrex

# Syndesmotic fixation : suture-endobutton

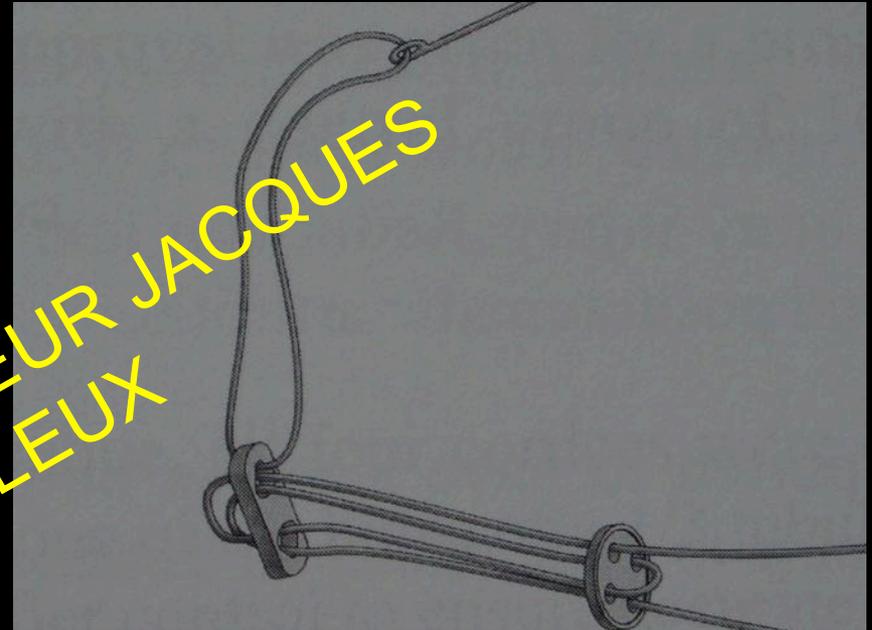


# Syndesmotic fixation : suture-endobutton



# Syndesmotic fixation : suture-endobutton

- follow-up = 12 months
- n = 16
- 2 groups : endobutton / screw
  - AOFAS score better for endobutton
    - ( 91 / 80 at 3m; 93 / 83 at 12 m)
  - No routine removal
  - Overreduction no possible



\*Brian Thomes, *Instability of ankle syndesmosis*, Advanced foot and Ankle course, EFAS, september 2004

\*Brian Thomes and al, *Suture endobutton fixation of ankle tibio-fibular diastasis : a cadaveric study*, Foot&Ankle intern, vol 24, number1, January 2003

# Tibiofibular syndesmosis injuries in association with ankle fractures

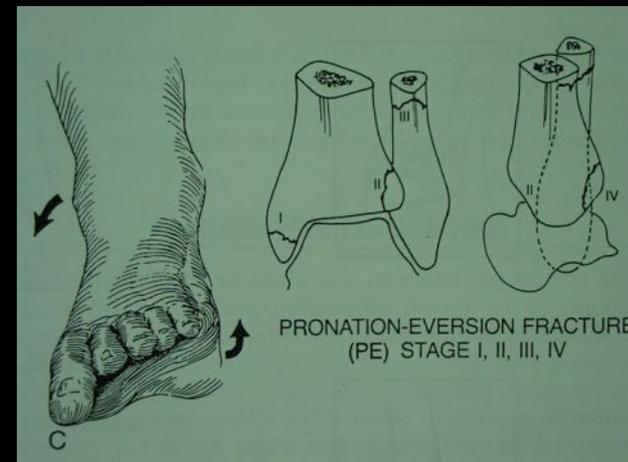
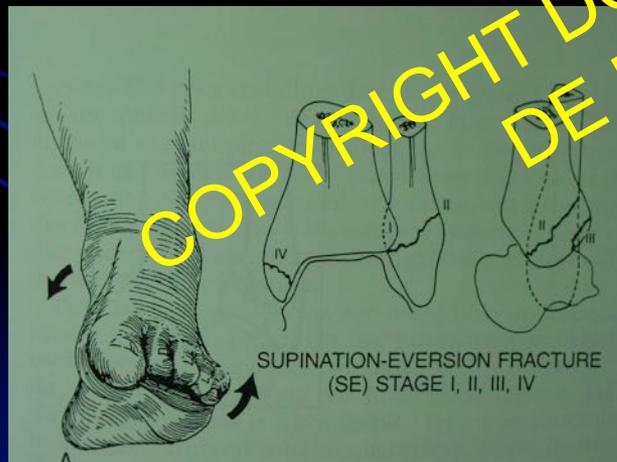
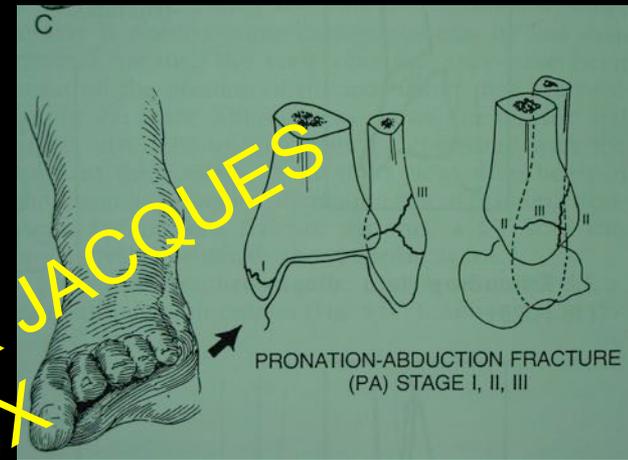
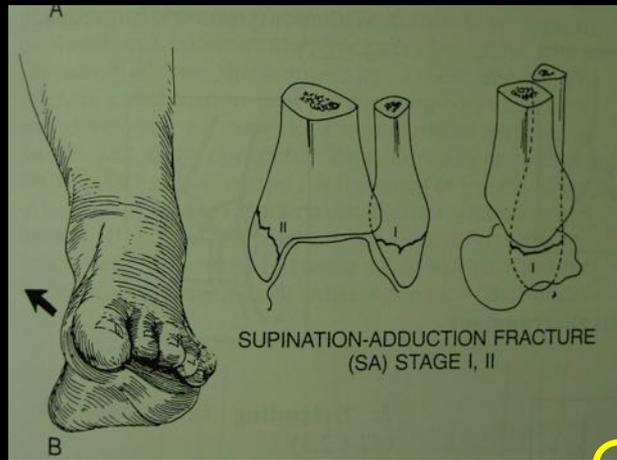
- Classification of ankle fractures

- Lauge-Hansen
- Danis-Weber AO system

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# Classification of ankle fractures : Lauge-Hansen



# description in terms of causative forces

# Classification of ankle fractures : Lauge-Hansen

# description in terms of  
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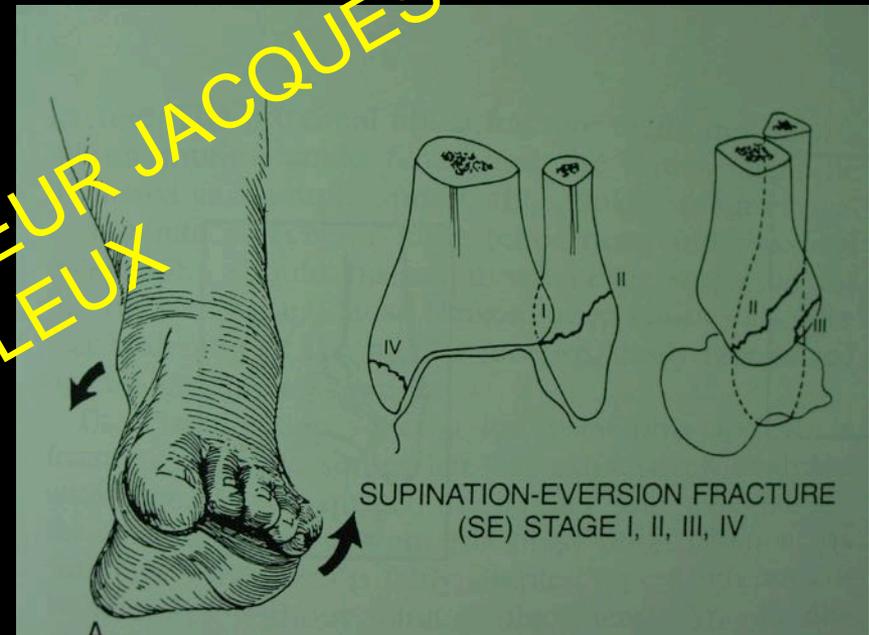
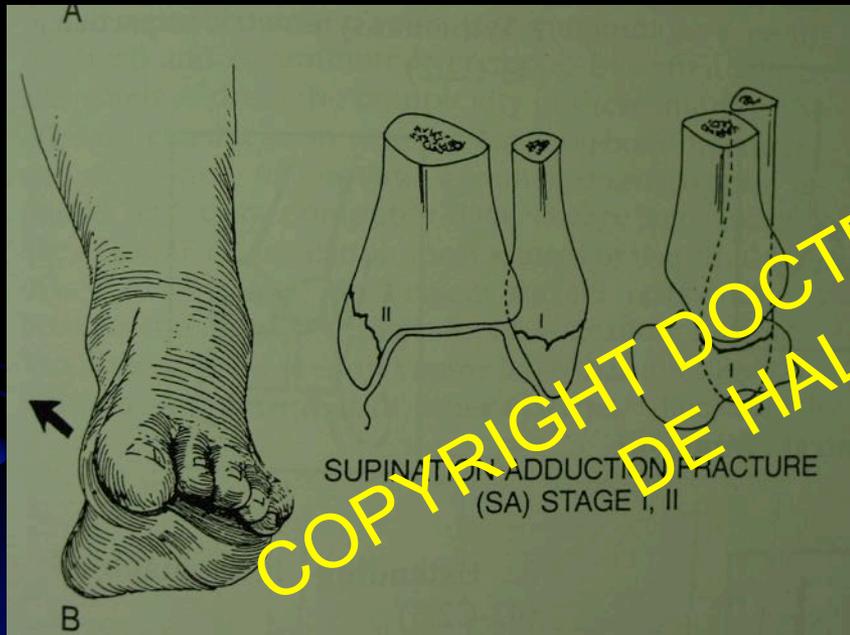
( based on the mechanism of  
the injury)

- Native language of LH  
was danish →  
translation in English
  - Ext rot = eversion
  - Int rot = inversion



Supination forefoot - adduction hindfoot  
= single motion

Supination-eversion =  
terms mutually contradictory



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# Suggested changes in the terminology of the L-H system \*

## OLD TERMINOLOGY

## NEW TERMINOLOGY

- Supination adduction #

- Varus #

- Pronation-abduction #

- Valgus #

- Supination-eversion #

- Varus-external rot #

- Pronation-eversion #

- Valgus-external rot #

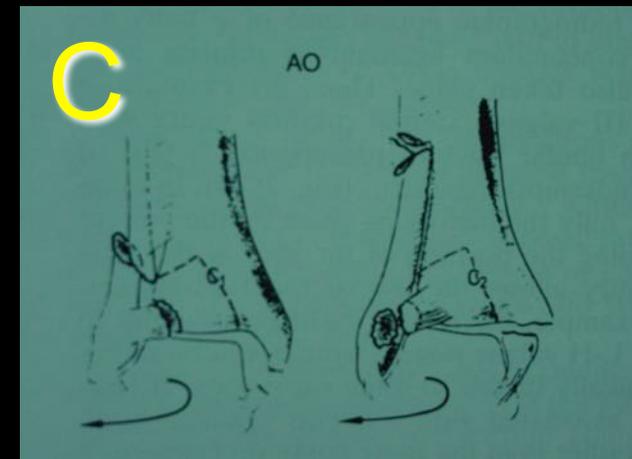
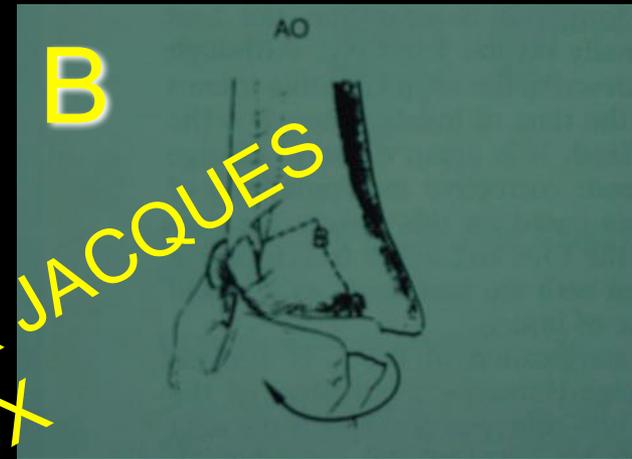
\* Miller M, operative Foot Surgery, Gould, 1994

# Classification of ankle fractures : Danis-Weber AO system

- Based on the **level of the fibular fracture** relative to the **tibiofibular syndesmosis**



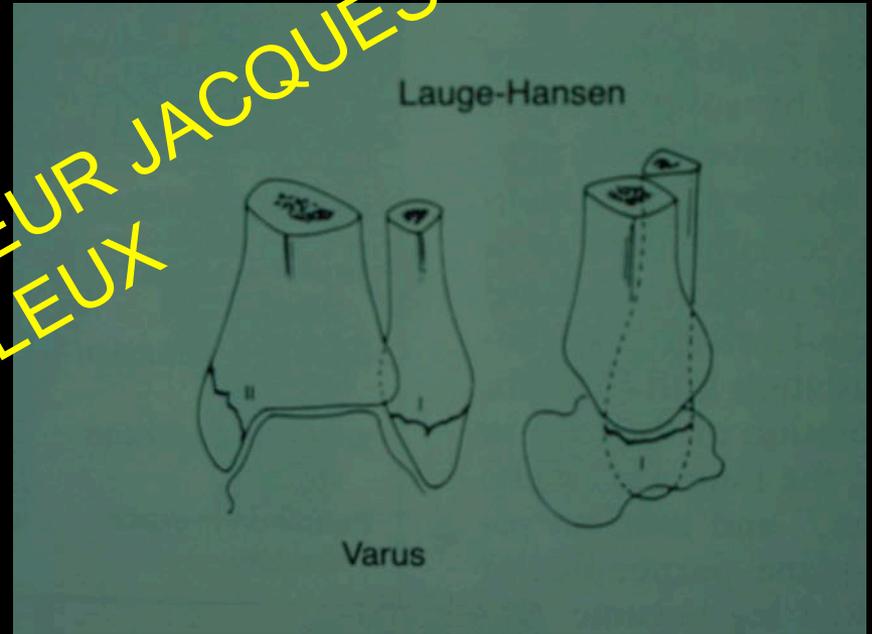
# Classification of ankle fractures : Danis-Weber AO system



# No syndesmotic injuries



Weber A

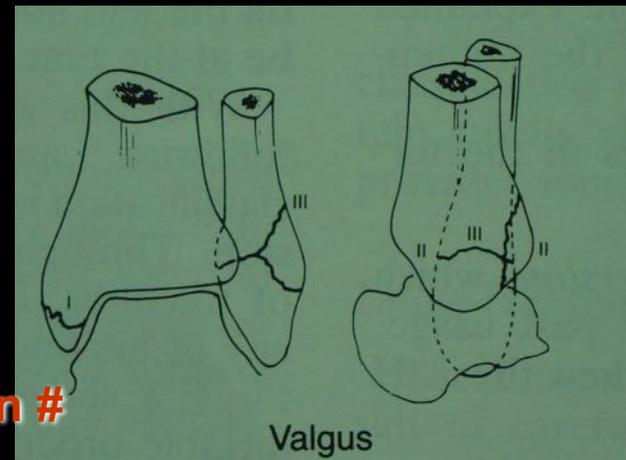
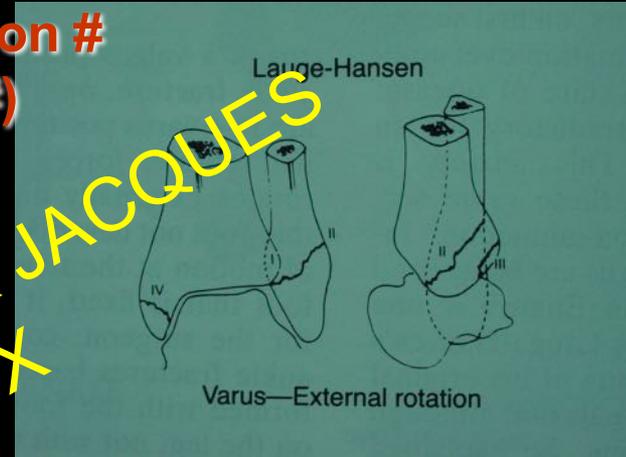
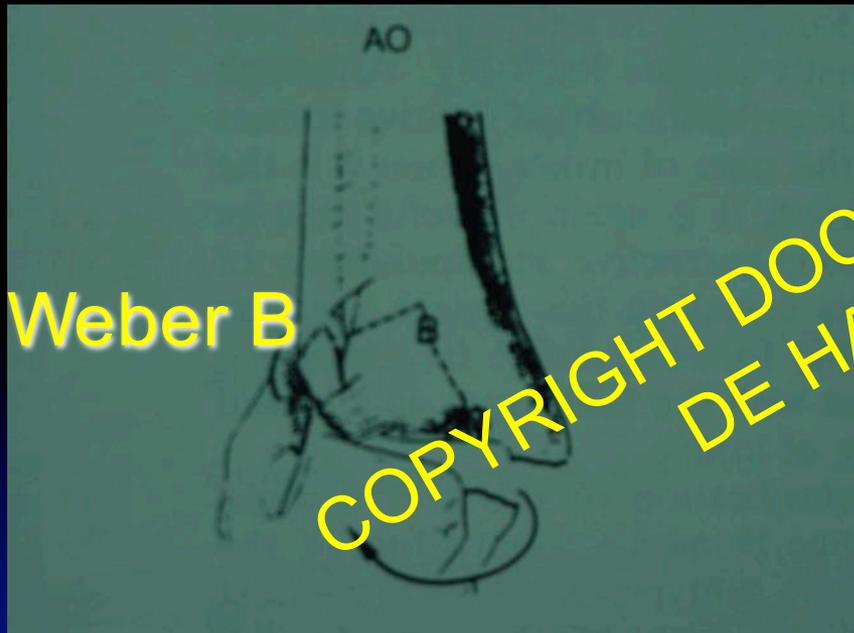


Lauge-Hansen  
Supination adduction#  
(Varus #)

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# possible syndesmotic injuries

Lauge-Hansen  
Supination-eversion #  
(Varus-ext rot #)



Lauge-Hansen  
Pronation-abduction #  
(Valgus #)

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# Weber B



No syndesmotic injurie



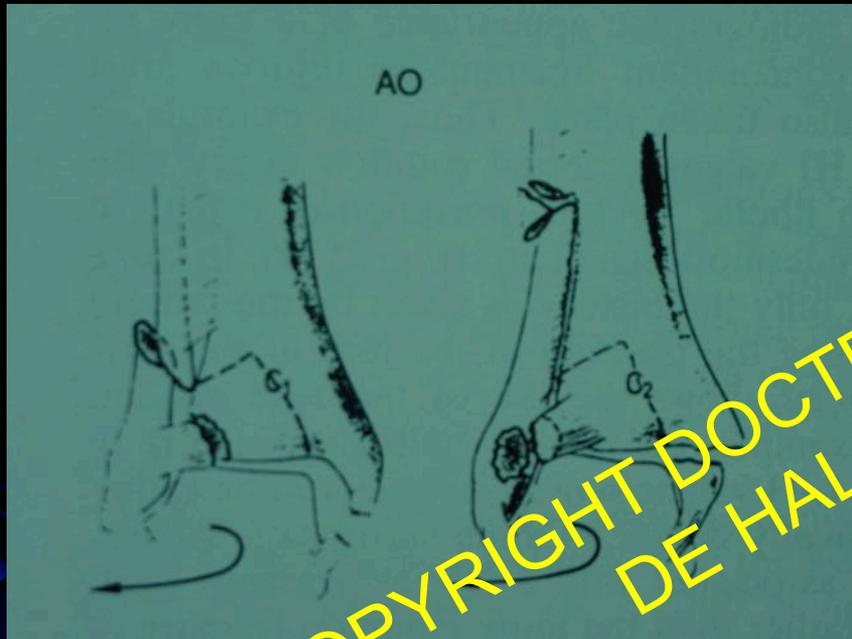
Syndesmotic injurie

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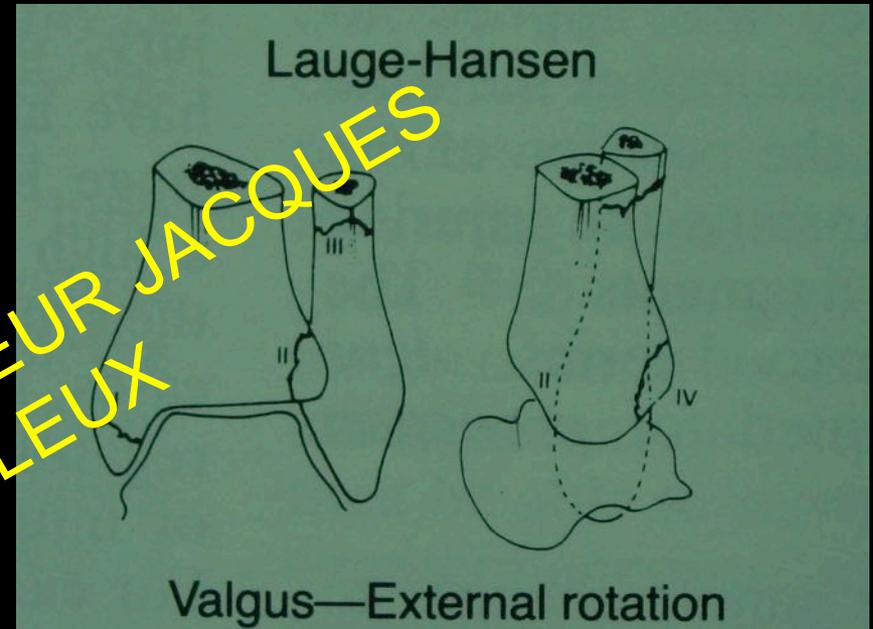
# Treatment



# syndesmotic injuries



Weber C



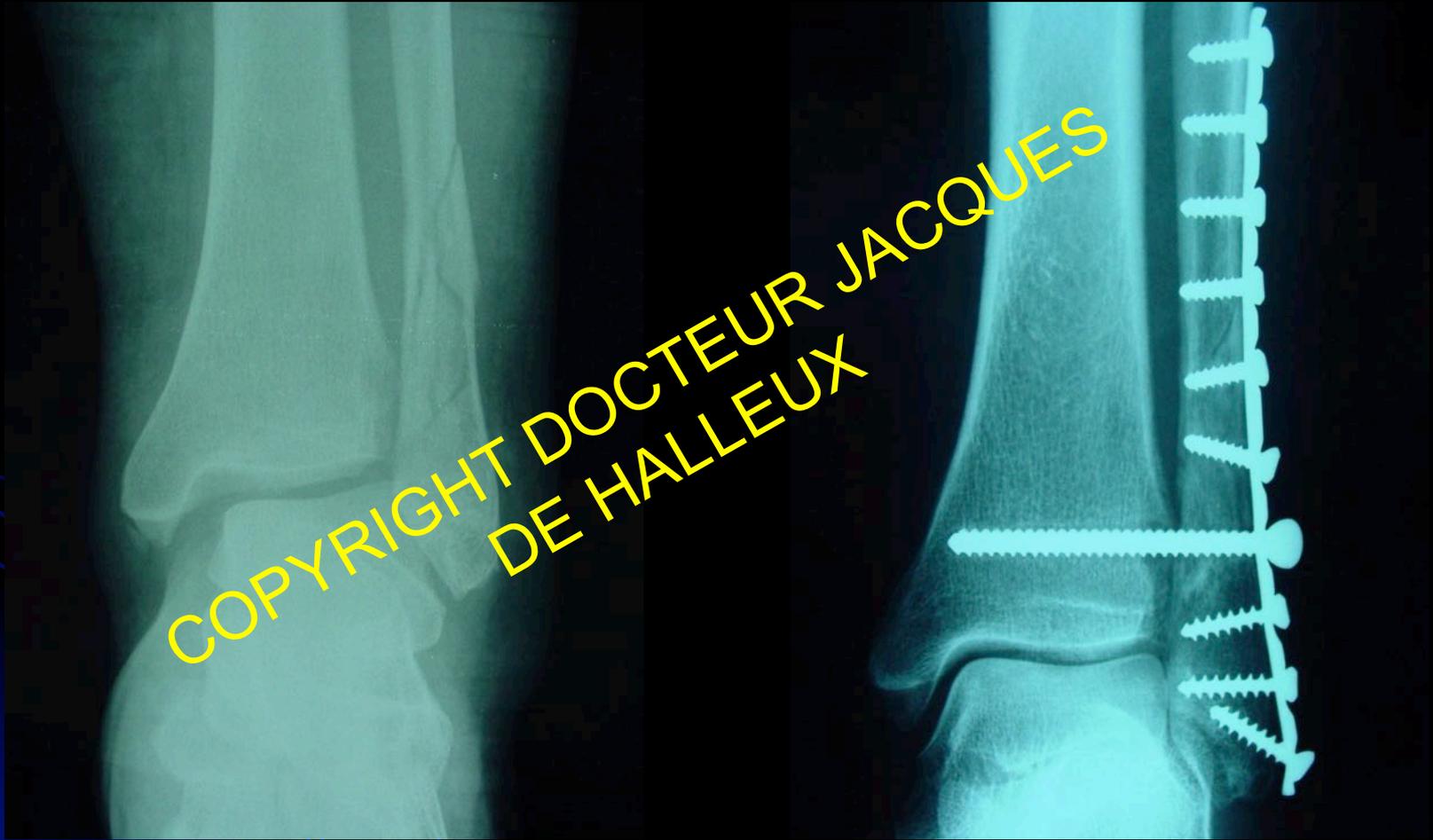
Lauge-Hansen  
Pronation-eversion #  
(Valgus – ext rotation #)

# Weber C

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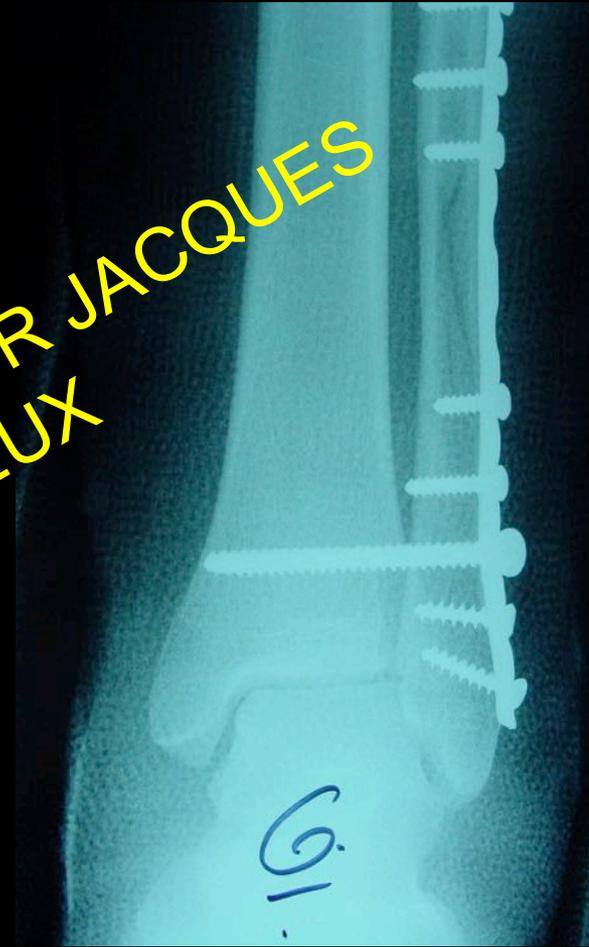
# Weber C



# Weber C



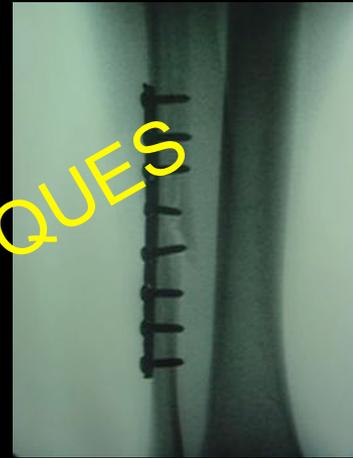
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# Weber C

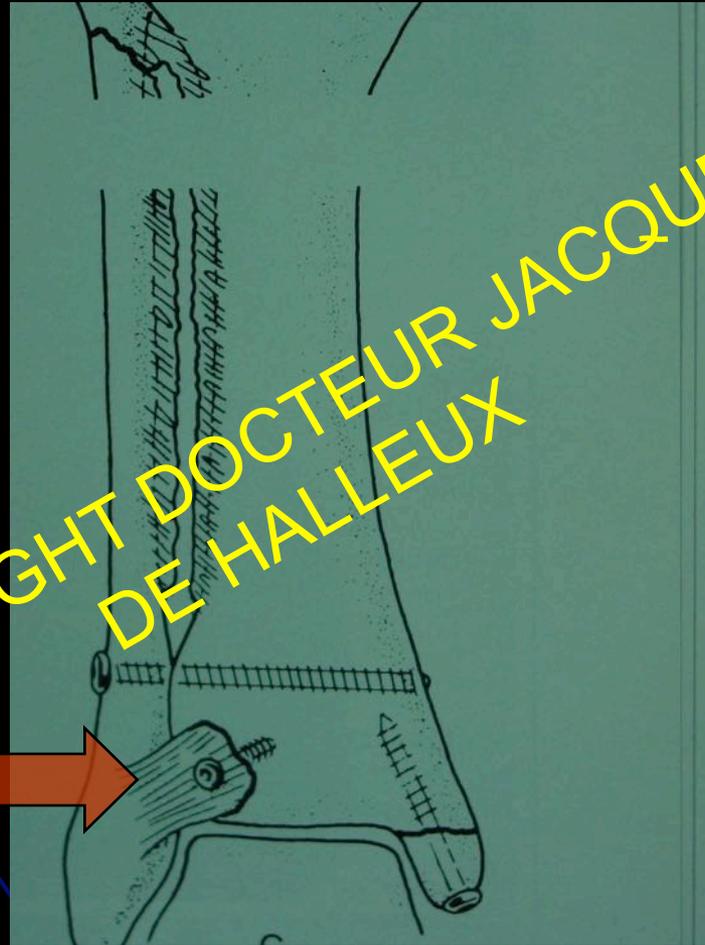


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# Chaput – Tillaux fragment

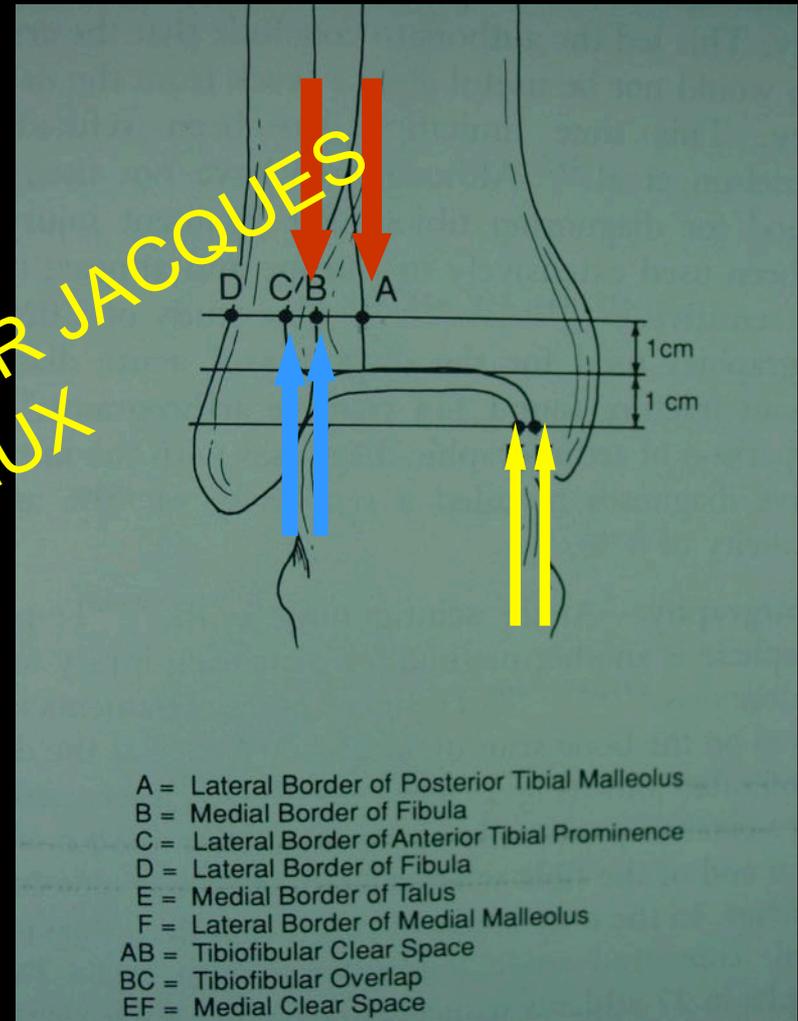
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Syndesmotic tibial bony avulsion

# Conclusions : X-ray

- tibiofibular clear space (A-B) = 3 to 6 mm
- medial clear space (E-F) = 2 to 4 mm
- tibiofibular overlap (B-C) = >6 mm



# Conclusions

## Tibio-fibular syndesmotic injuries :

Without ankle fracture = +

With ankle fracture = +++++

- Weber A : no
- Weber B : some
- Weber C : all

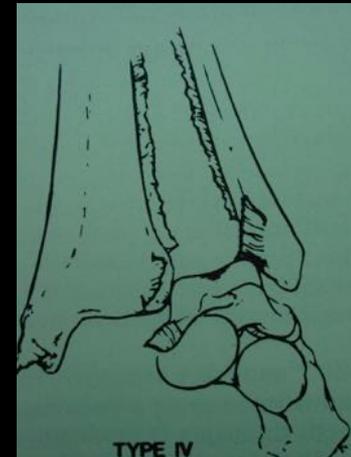
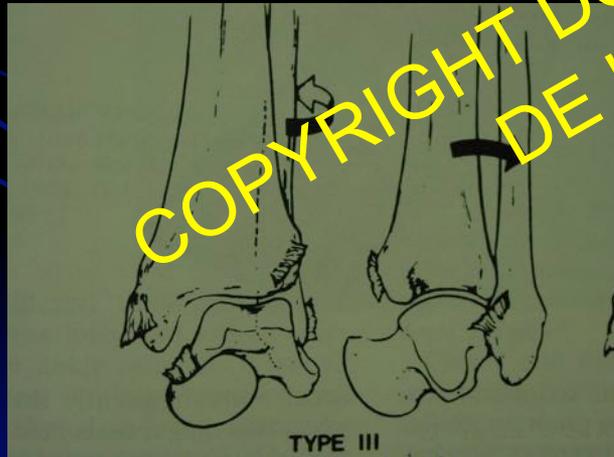
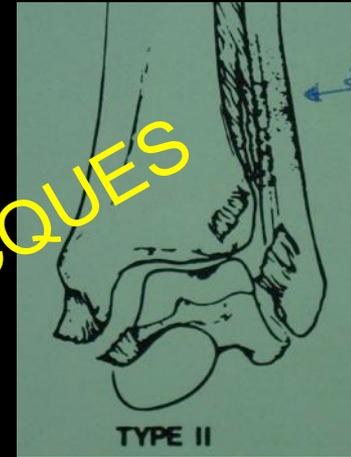
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# Conclusions :

## SPRAINS OF SYNDESMOSIS

Lateral fibular subluxation

idem + plastic deformation fibula



rotatory subluxation fibula

superior dislocation talus

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# Conclusions

## Tibio-fibular syndesmotic injuries :

Without ankle fracture = +

With ankle fracture = +++++

- Weber A : no
- Weber B : some
- Weber C : all

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# Conclusions : Danis-Weber AO

**A:** no syndesmotic injurie



**B:** some syndesmotic injurie

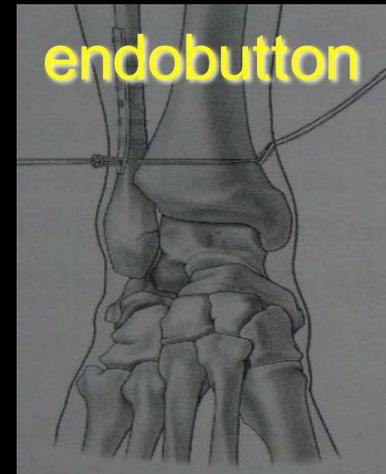


**C:** all syndesmotic injurie



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# Conclusions : Syndesmotic stabilisation



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