

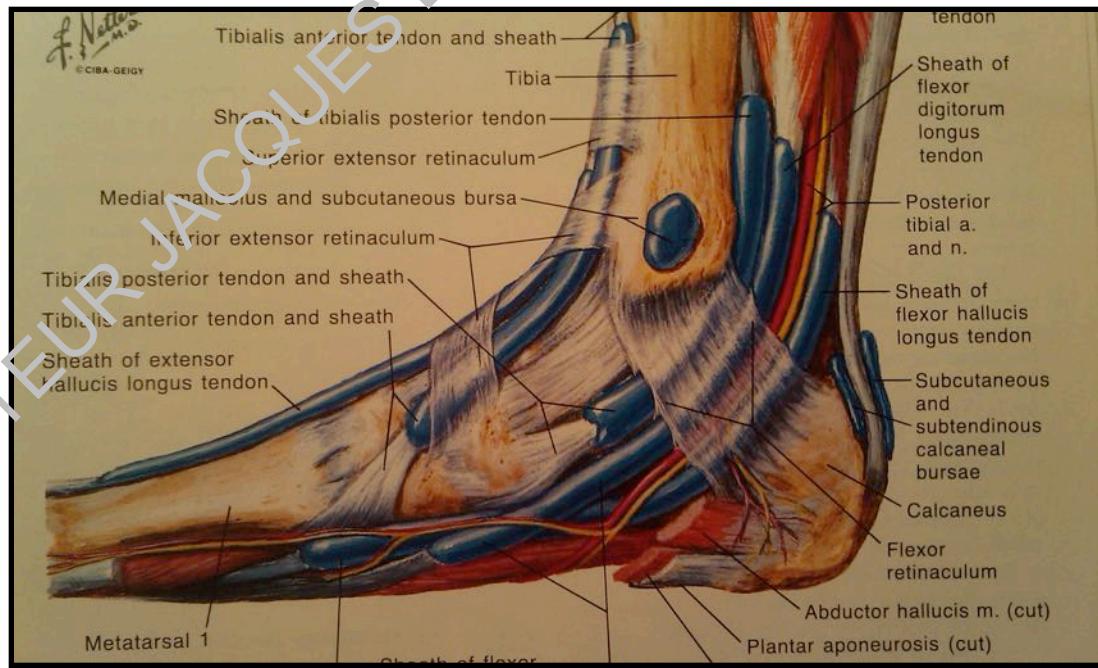
**Pes Planovalgus
and posterior tibial tendinopathy:
*Therapeutic choices in terms of staging the lesions***

Dr de Halleux Jacques

SPA, 2011 september 17

TIBIALIS POSTERIOR TENDON

- Inversion of the heel
- Adduction forefoot
- Plantar flexion of the Ankle





Tibialis posterior tendon



PES PLANO VALGUS

Calcaneum
Subtalar joint
Talus
T-N and N-C
Midtarsal joints

valgus
tilted medially
medialy and down
subluxation
Abduction + suppination

valgus hindfoot

**Achilles tendon =
evertor**



DIAGNOSIS

tibialis posterior dysfunction

- flattening longitudinal arch



DIAGNOSIS

tibialis posterior dysfunction

- valgus of the hindfoot



DIAGNOSIS

tibialis posterior dysfunction

- abduction of the mid and forefoot
- „too-many-toes sign“

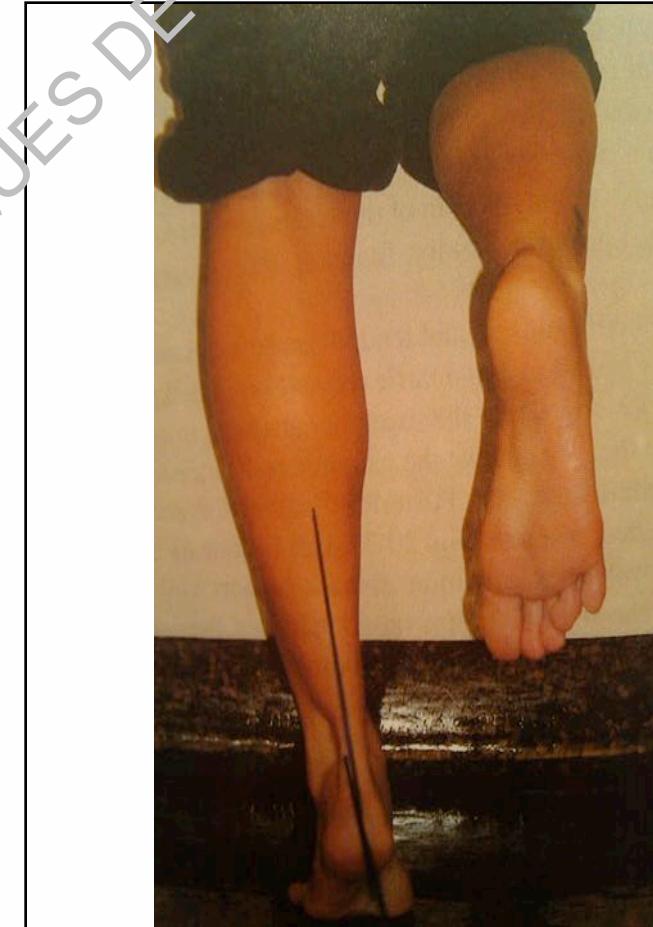
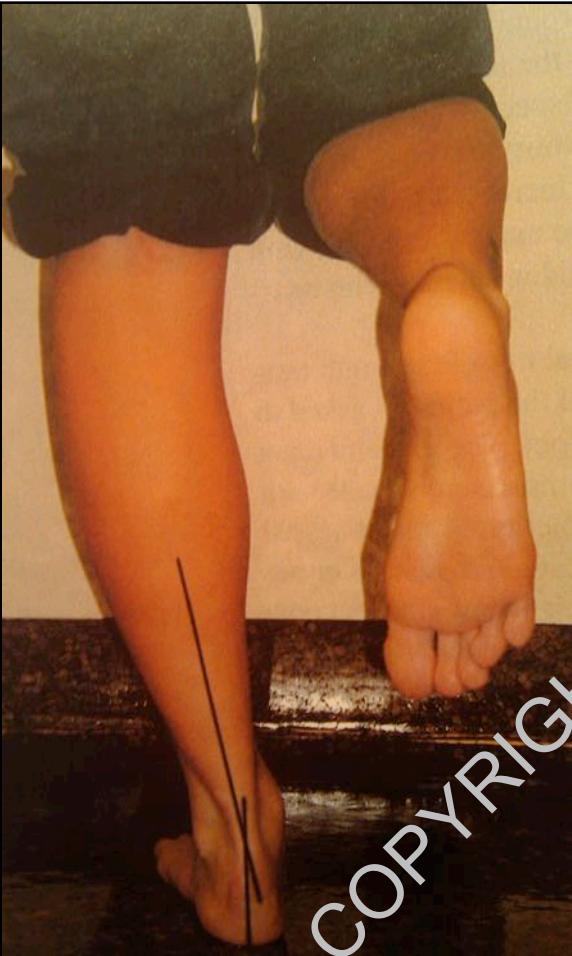


DIAGNOSIS

tibialis posterior dysfunction

„single-heel-rise test“

Normal Tib Post



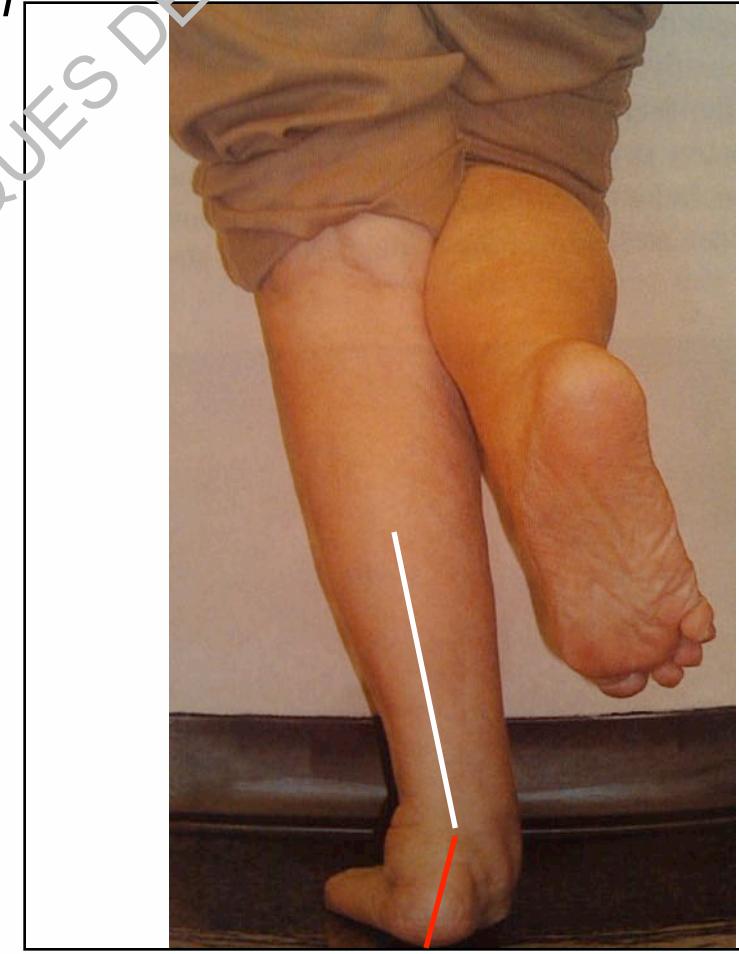
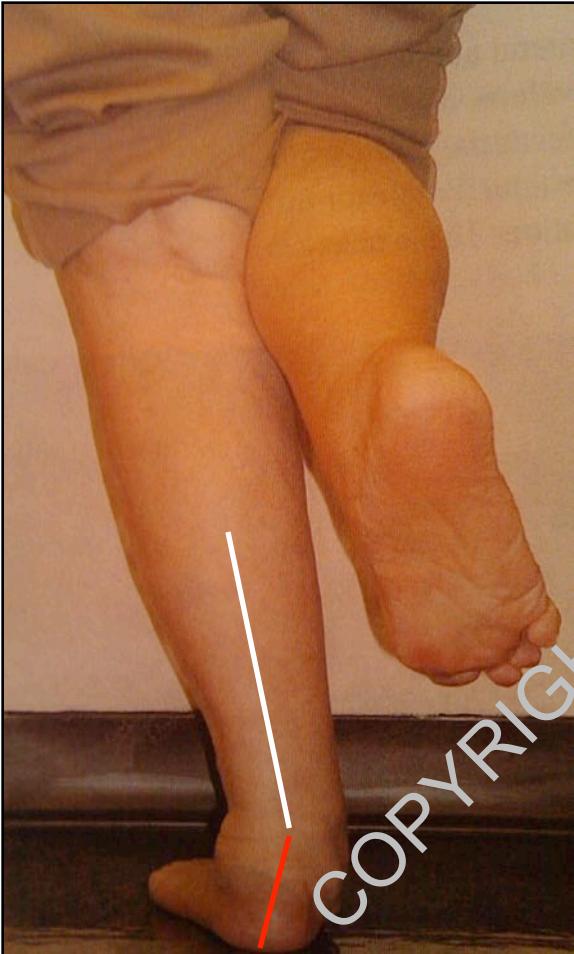
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DIAGNOSIS

tibialis posterior dysfunction

„single-heel-rise test“

Tib Post Dysfunction



STAGES tibialis posterior dysfunction

	stage 1	stage 2	stage 3	stage 4
➤ retromalleolar pain	+	++	++	++
➤ hindfoot valgus	(+/-)	++	++	++
➤ arch flattening	(+/-)	++	++	++
➤ forefoot supination	(+/-)	(+)	++	++
➤ forefoot abduction	(+/-)	++	++	++
➤ deformity		supple	supple	rigid
➤ Ankle pain	-	-	-	++

Stages 1, 2 , 3 = Johnson and Strom, *Clin Orthop*, 1989
Stage 4 = Myerson, *JBJS Am*, 1996

Posterior Tibial Tendon Dysfunction

Stage 1

- retromalleolar pain
- X Ray Normal
- Stages A : inflammation, no deformation
 - B : partial PTT tear, no deformation
 - C : partial PTT tear, little hindfoot valgus

 Tenosynovitis or partial
rupture



Posterior Tibial Tendon Dysfunction

Stage 2

Supple pes plano valgus

- A : *valgus hindfoot ;* ($<50\%$ uncovering TN)
- B : *forefoot supination flexible* ($>50\%$ uncovering TN)
- C : A or B with *forefoot supination fixed*)
- D : *Forefoot abduction*
- E : *medial column (TN, NC, CMT) instability*

→ Elongation, tendinosis
→ (partial) rupture

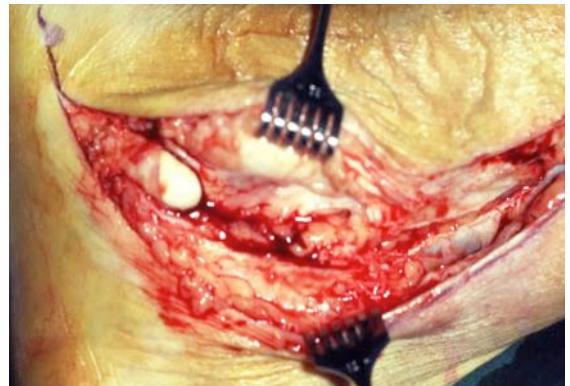


Posterior Tibial Tendon Dysfunction

Stage 3

- Rigid pes plano valgus
- A :*Hindfoot valgus*
- B :*Forefoot abduction*

More advanced course of tendon rupture



Haddad St, Myerson MS and al, Foot and Ankle Int, 2011, jan

Posterior Tibial Tendon Dysfunction

Stage 4

- Rigid pes plano valgus
- Lateral ankle pain
- A : *reducible ankle valgus*
- B : *rigid ankle valgus (more common presentation)*

→ **rupture**

→ **ankle arthrosis**



Posterior Tibial Tendon Dysfunction

TREATMENT

➤ Stage 1



conservative



Surgery?

- physiotherapy
- shoe corrections
- medial support

Ténosynovectomy?

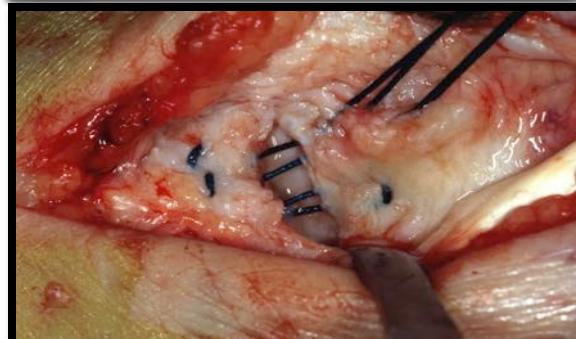
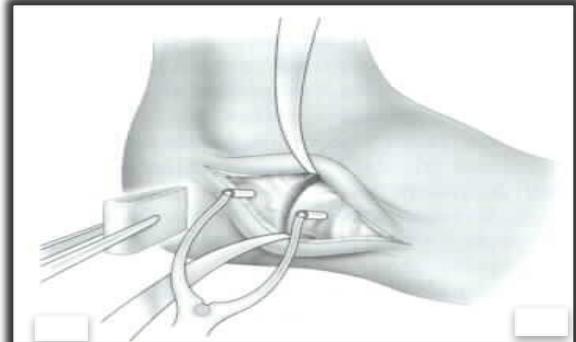
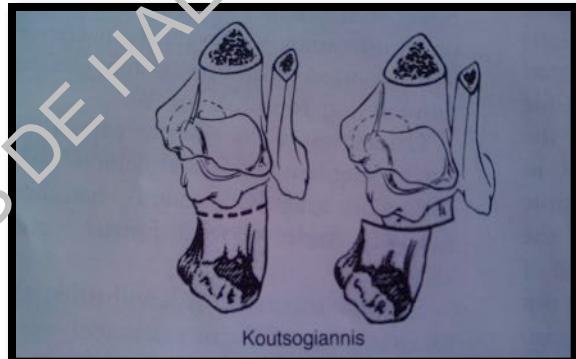
Posterior Tibial Tendon Dysfunction

TREATMENT

➤ Stage 2

What to do?

- Valgus hindfoot?
- Forefoot abduction?
- Forefoot supination?
- Medial column instability?
- Spring ligament?
- Tibialis posterior?
- Achilles tendon ?



PTT dysfunction St K

*complex problem that has
multiple treatment options **

* Hill K, Foot Ankle Clin.8(1):91-104, 2003 Mar

Posterior Tibial Tendon Dysfunction Stage II

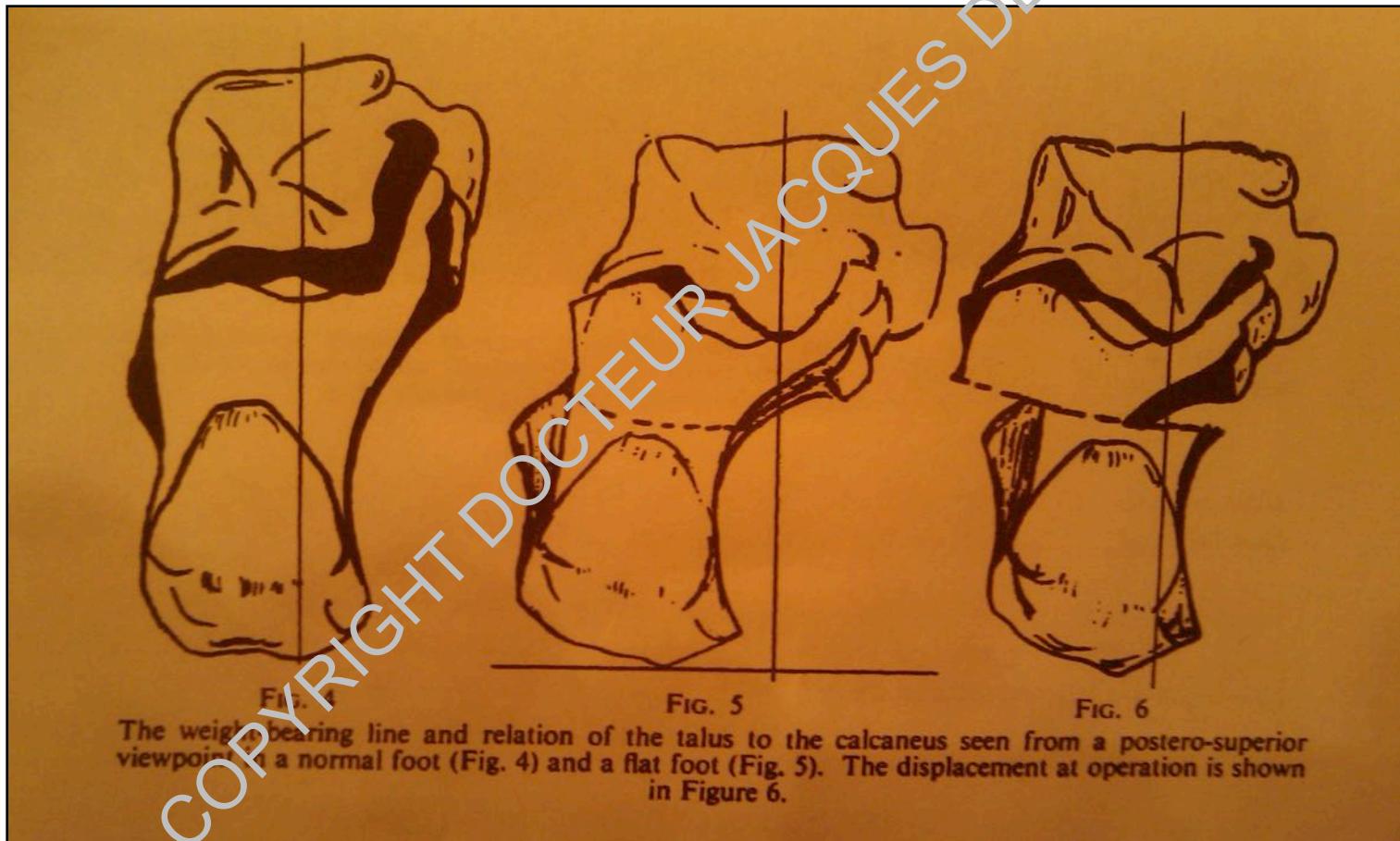
Treatment

SURGICAL

- Calcaneal osteotomy
 - (>< valgus :Koutsogiannis and others)
 - (>< abd forefoot : lateral column lenghtening)
- Arthrodesis
 - (>< abd forefoot : lateral column lenghtening)
 - (>< supp forefoot : medial column)
- Tendon reconstruction
 - (suture plasty, transfert FHL or FDC, Cobb)
- Ligament reconstruction
 - (spring ligament)
- Others
 - (Achilles tendon lenghtening, TN arthrodesis, subtalar arthrodesis, subtalar arthroeresis, medial cuneiform osteotomy, 1st MT osteotomy)

CALCANEAL OSTEOTOMY (valgus correction)

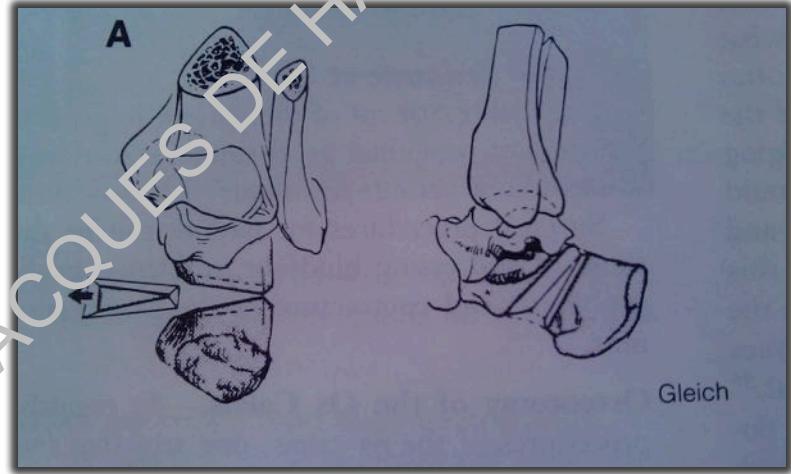
Line of weight-bearing transmitted through the talus
medial to the calcaneus



CALCANEAL OSTEOTOMY

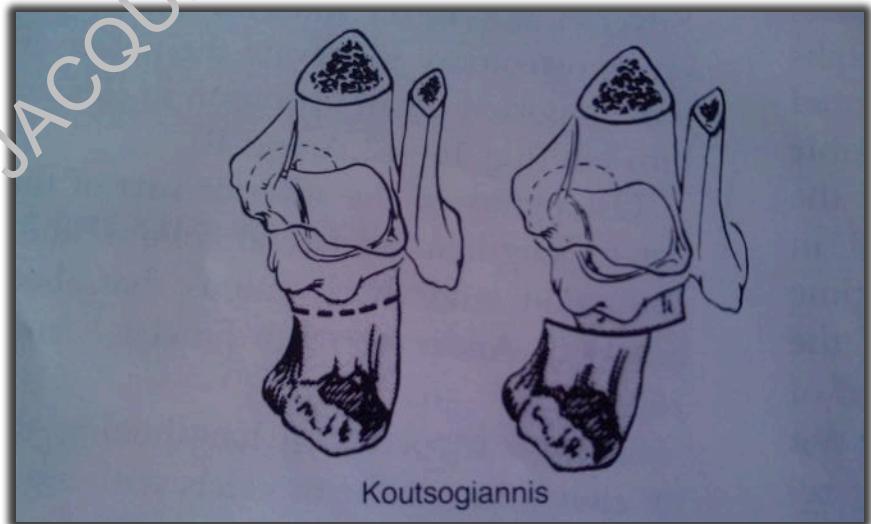
(valgus correction)

- 1893 : posterior fragment forwards, medially and downwards (**Gleich**)
- 1967: lateral opening wedge (**Silver**)



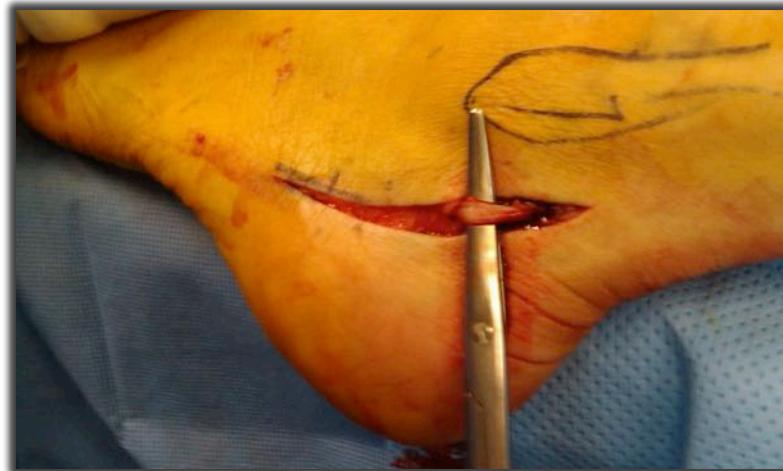
CALCANEAL OSTEOTOMY (*valgus correction*)

- 1971: medial translation of the posterior fragment
(Koutsogiannis) – *JBJS*, febr 1971-



Surgical technique Koutsogiannis osteotomy

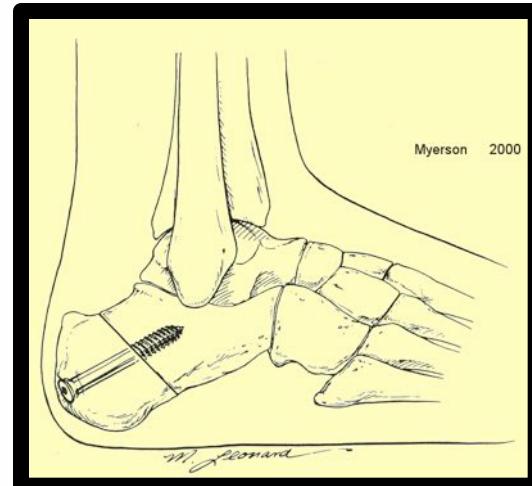
- Lateral incision (parallel and behind peroneal tendon) sural nerve!



Surgical technique Koutsogiannis osteotomy

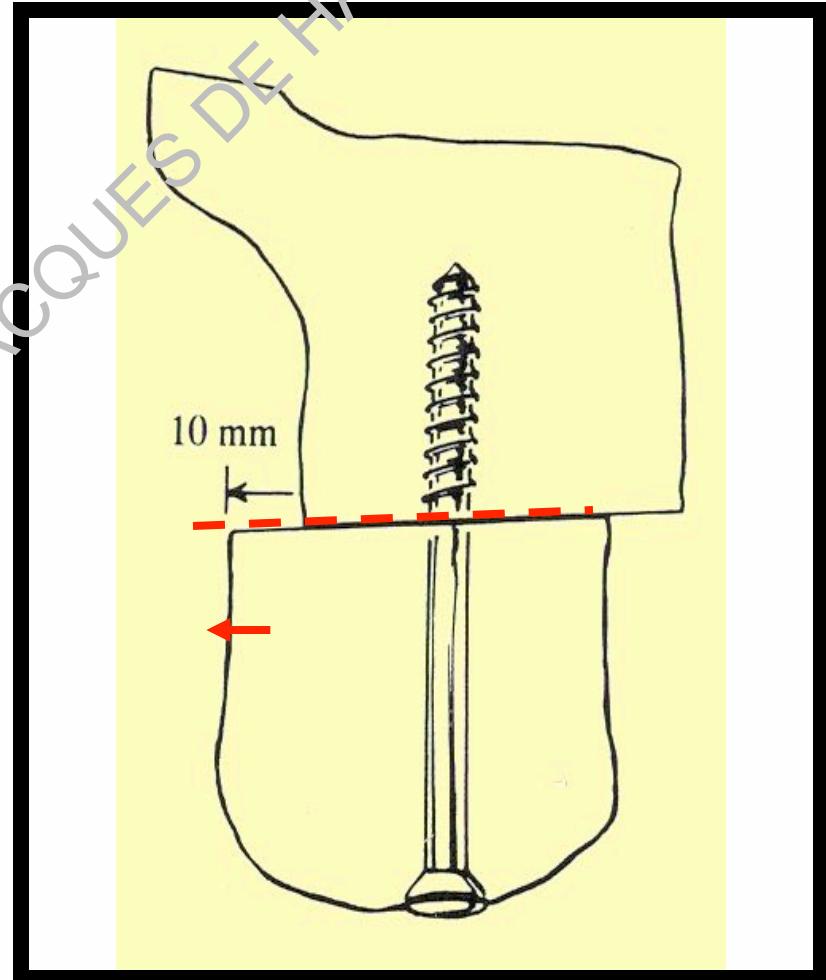


- Incision periostum parallel to the incision

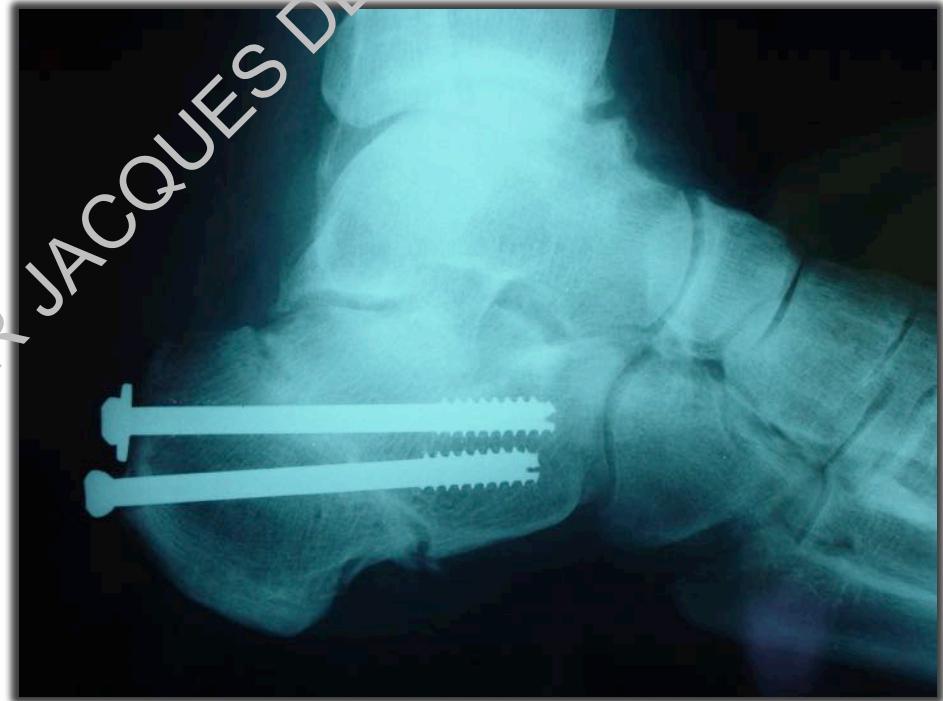
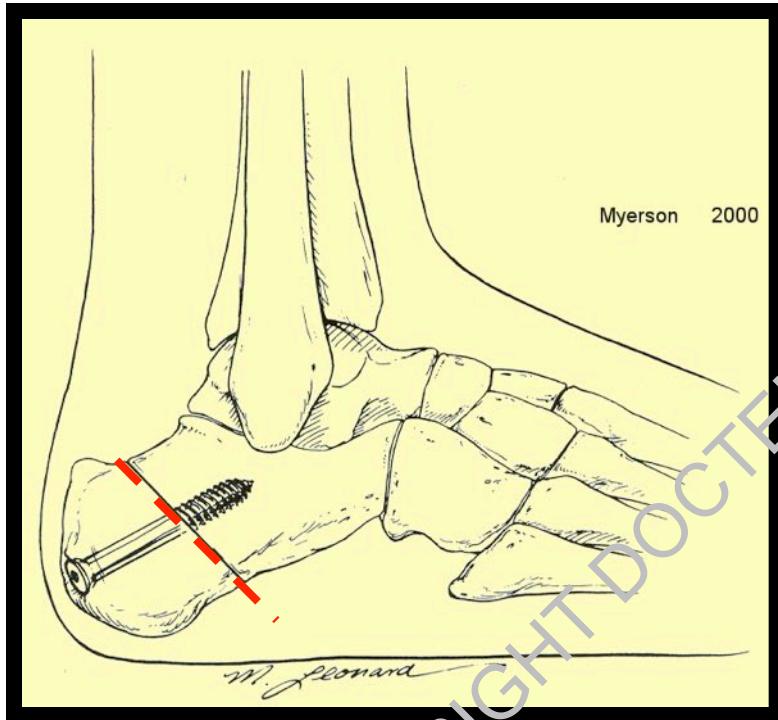


Surgical technique Koutsogiannis osteotomy

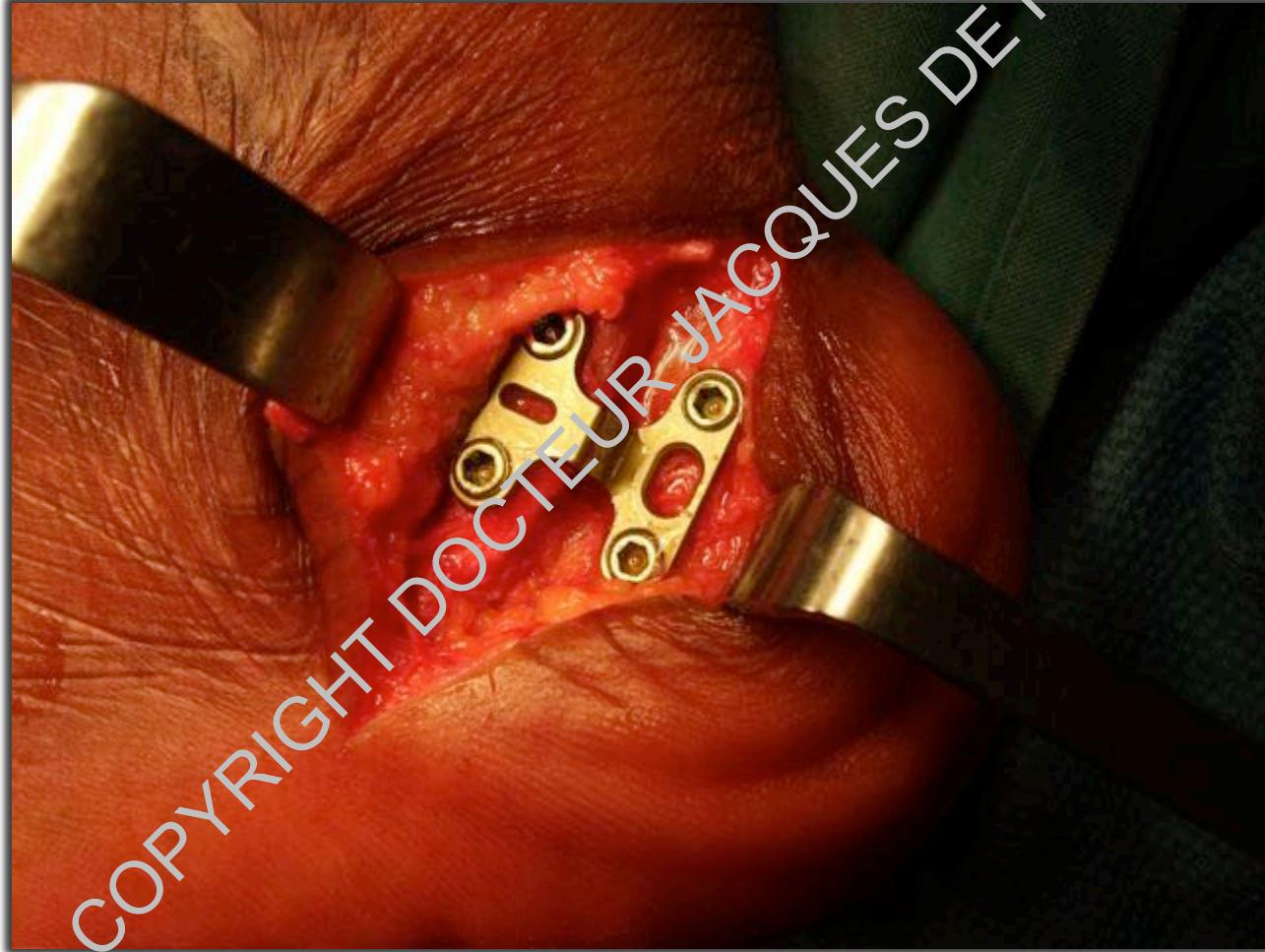
- MEDIAL TRANSLATION
POSTERIOR PART
CALCANEUM ($1/3$ to $\frac{1}{2}$ of the
width of the calcaneus; 1 cm)



Surgical technique Koutsogiannis osteotomy



Surgical technique Koutsogiannis osteotomy

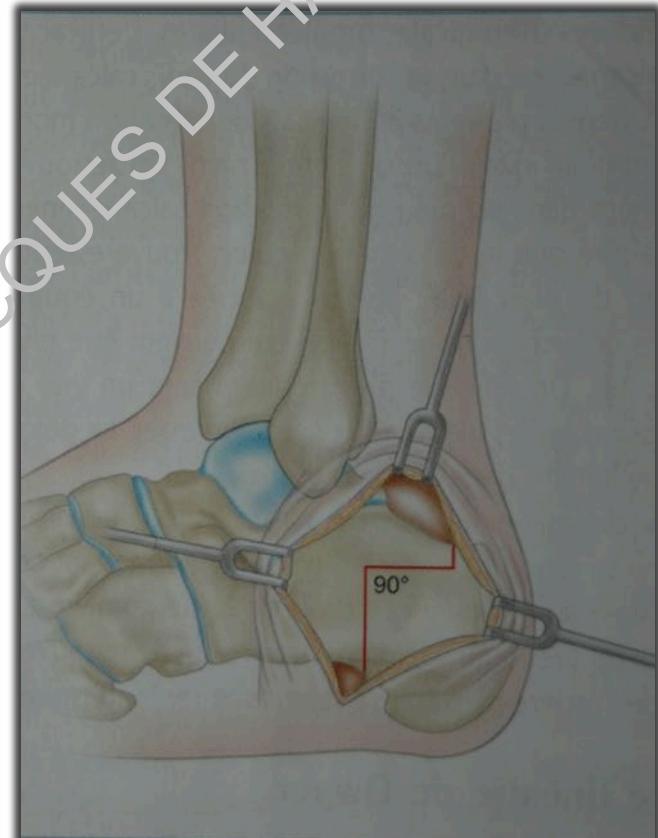


CALCANEAL OSTEOTOMY

(valgus correction)

LATERAL OPENING WEDGE OSTEOTOMY

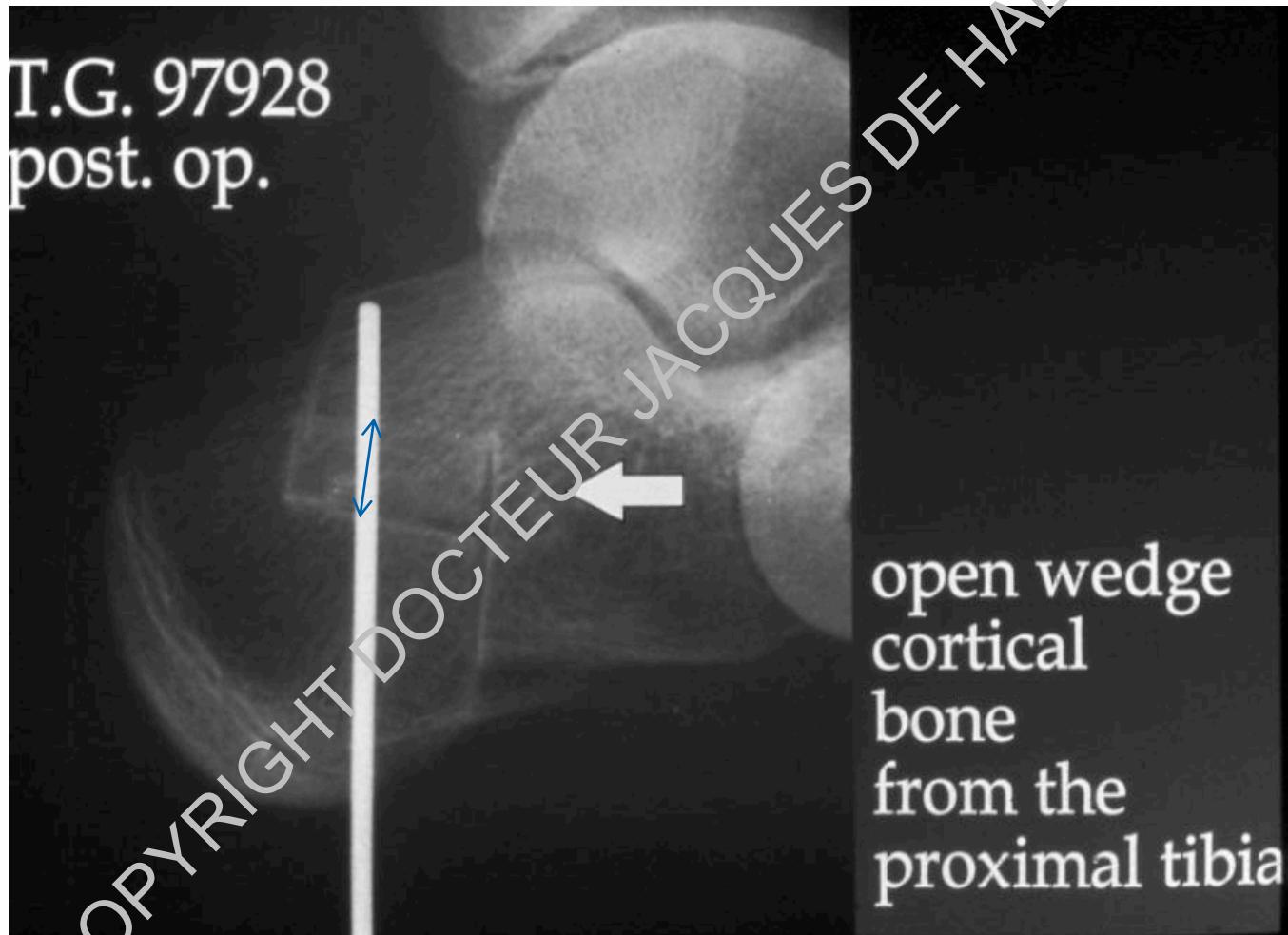
2005 : Z osteotomy
(Malerba)



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MALERBA OSTEOTOMY

Lateral opening wedge osteotomy



picture from: Th Leemrijse, B Valtin, Pathologie du Pied et de la cheville, 2009

RESULTS CALCANEAL OSTEOTOMY (*valgus correction*)

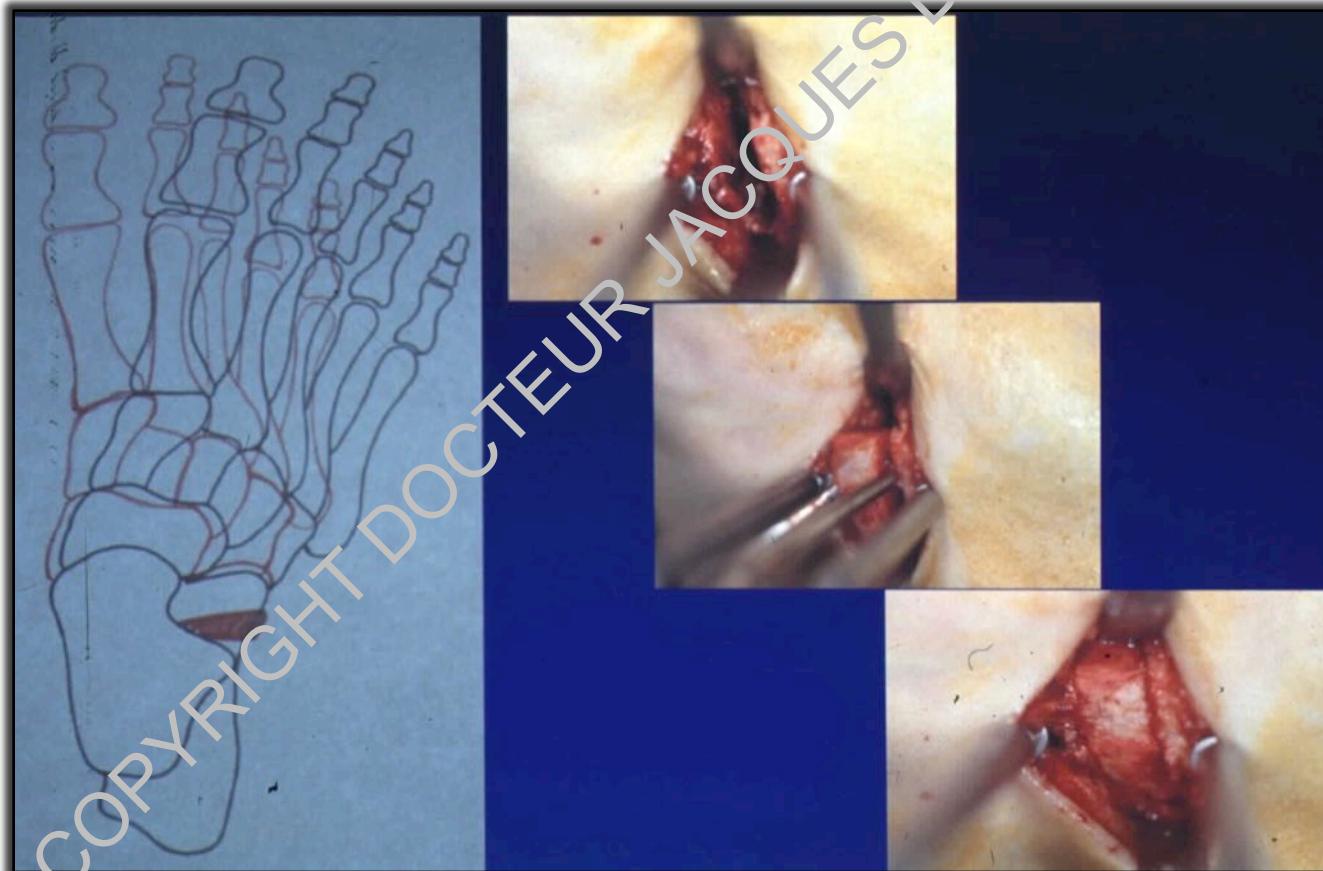
- Correction of the valgus and the eversion force of the Achilles tendon
- Medial arch + forefoot abduction: deformation corrected only if no severe flatfoot

**Calcaneal osteotomy alone
not enough!**

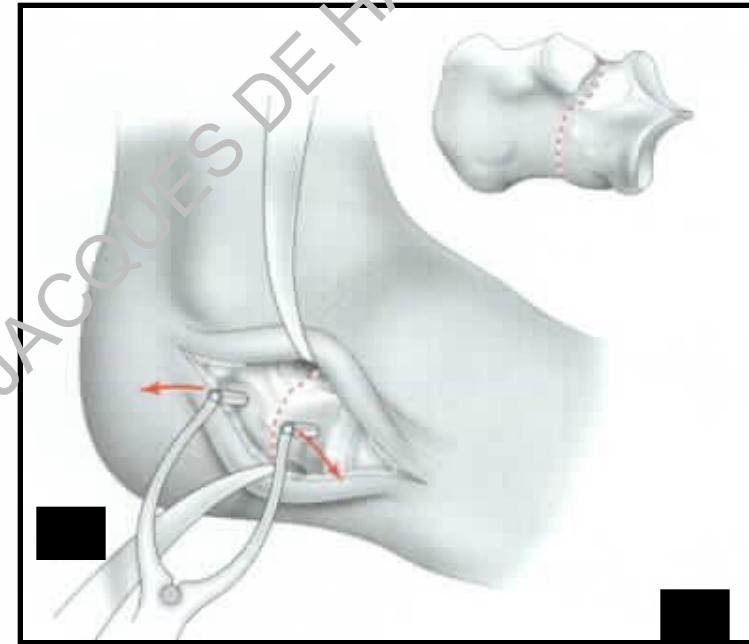
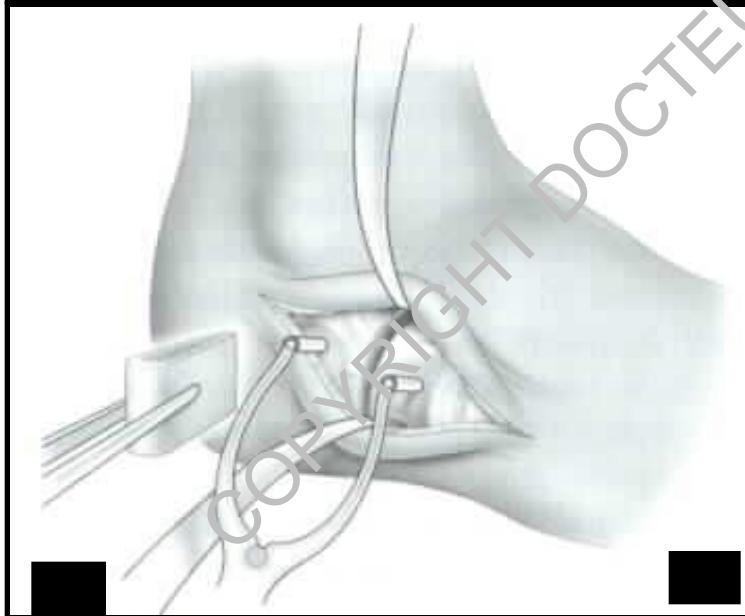
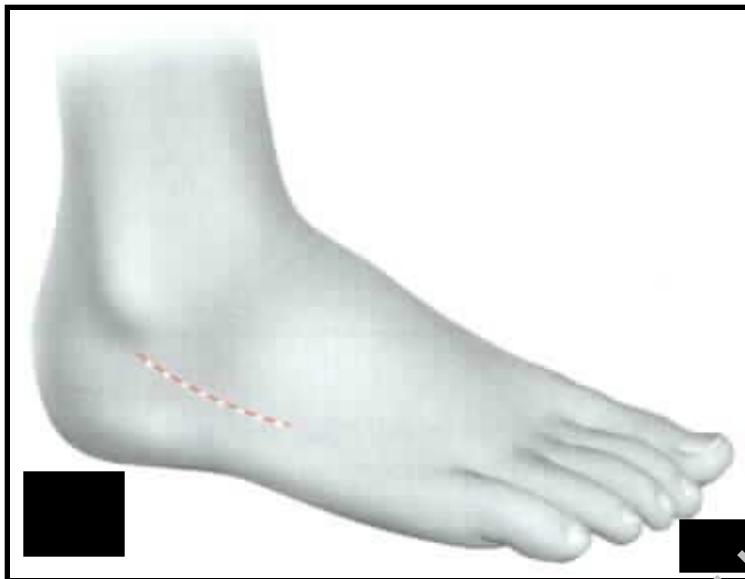
CALCANEAL OSTEOTOMY

(*St IID : forefoot abduction*)

lateral column lenghtening



CALCANEAL OSTEOTOMY: Lateral column lengthening



*Hintermann B:
Techniques in Orthopaedics and
Traumatology 2000*

Lateral column lengthening

Increasing of calcaneo-cuboidal arthrosis

Evans : 65% at 13 years follow-up

Mosier-Laclair : 14% at 5 years follow-up *

Alternative = calcaneocuboid distraction arthrodesis

- less motion hindfoot,
- increasing arthrosis hind and midfoot

(motion subtalar loss of 18 to 30% and TN loss of 40%**)

* Mosier-Laclair, Foot Ankle Clinic (6):95-119, 2001 Mar

** Deland Jet al, Foot Ankle.16(11), 1995

Medial column restauration PTT dysfunction II C (rigid forefoot supination)

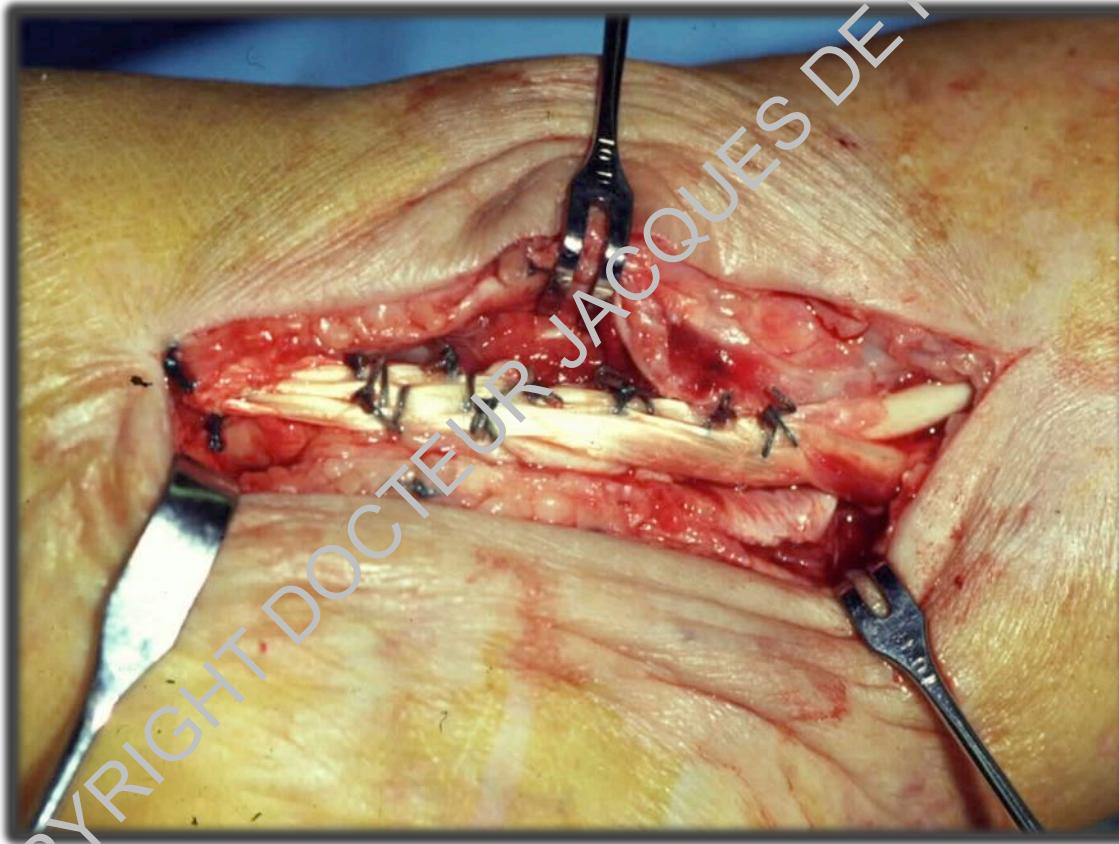
- Arthrodesis naviculo-cuneiform 123 *
- Arthrodesis 1st tarso-metatarsal
- Cotton osteotomy (plantar flexion opening wedge cun 1)**
- Plantar flexion osteotomy MT1

• Alastair Younger, *Foot Ankle Int.* 32 (1) : 101-3, 2011

** Hirose CB, *Foot Ankle Int.* 25 : 568-74, 2004

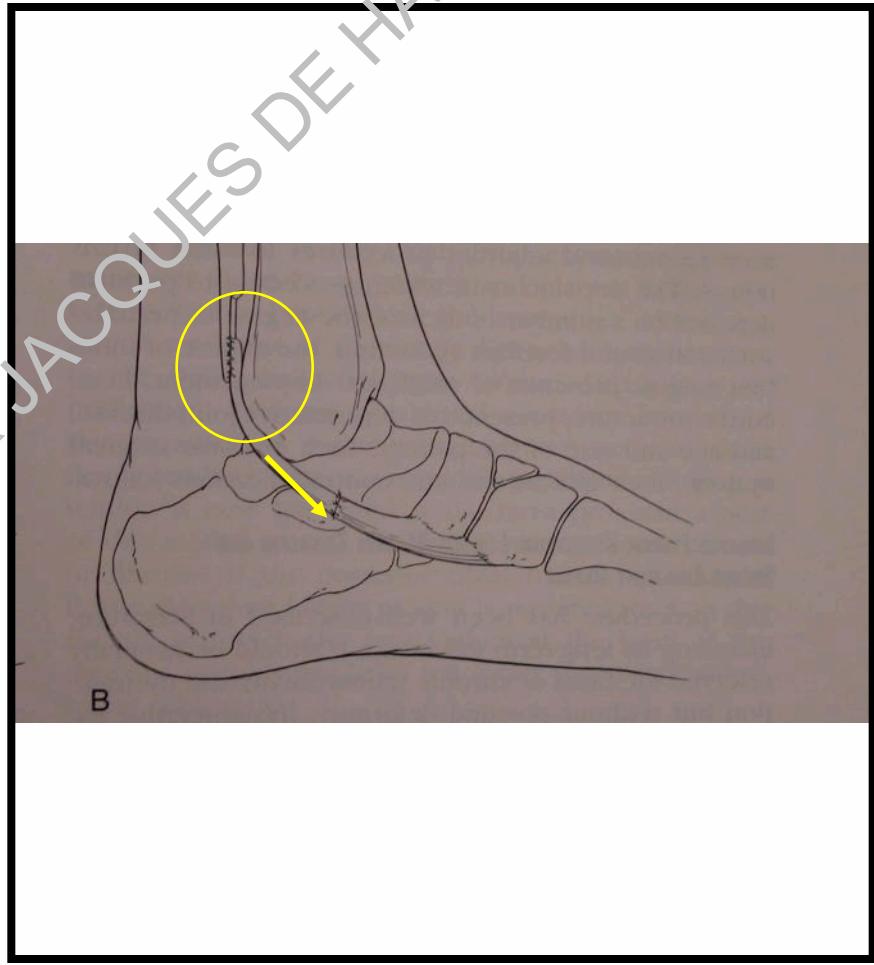
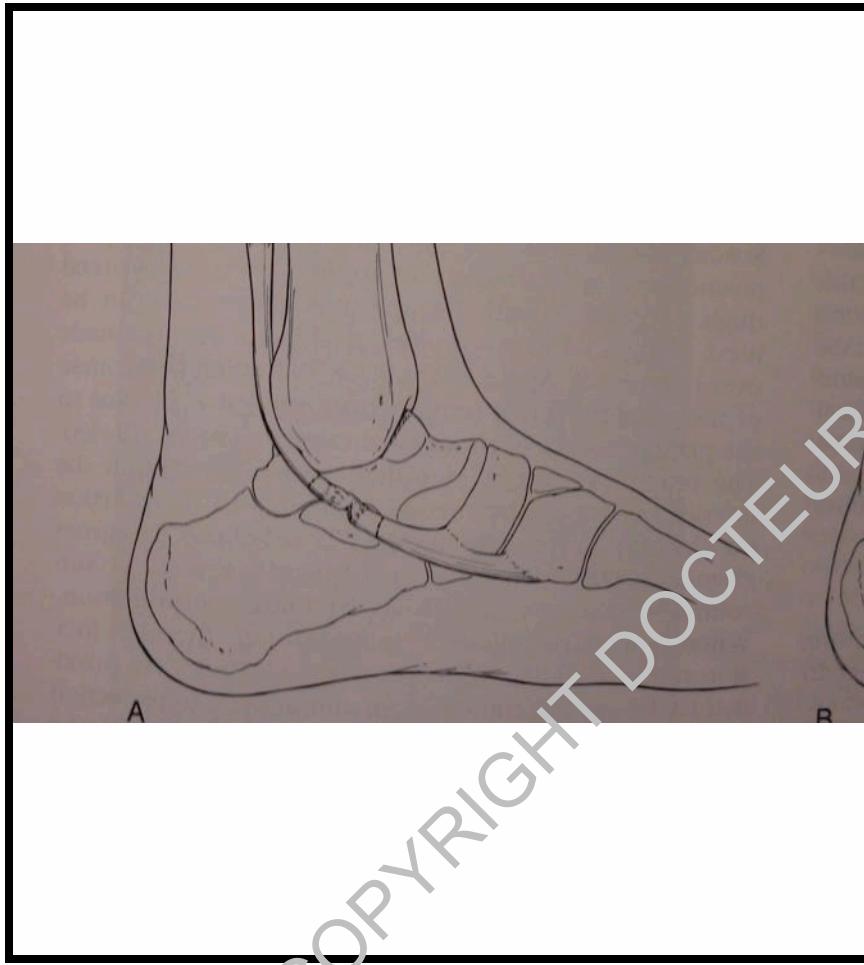
Stephen J Pinney, *Foot Ankle Int.*, 27 (1) : 66-75, 2006 jan

TENDON RECONSTRUCTION: suture

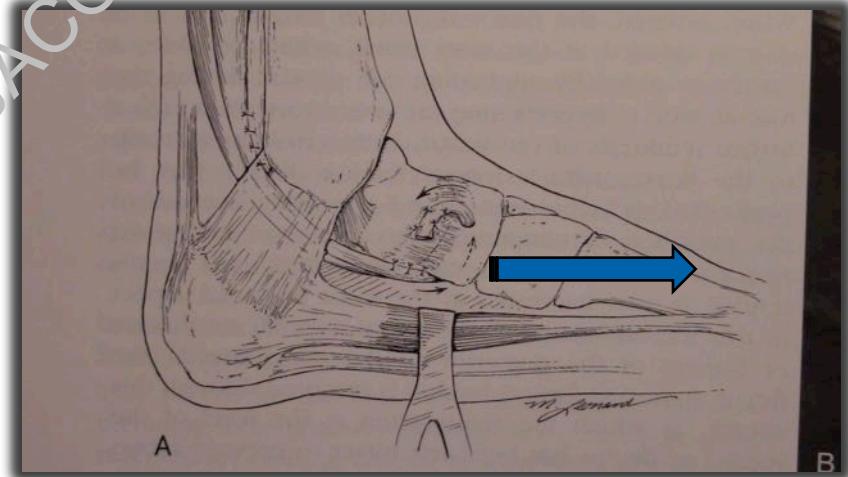
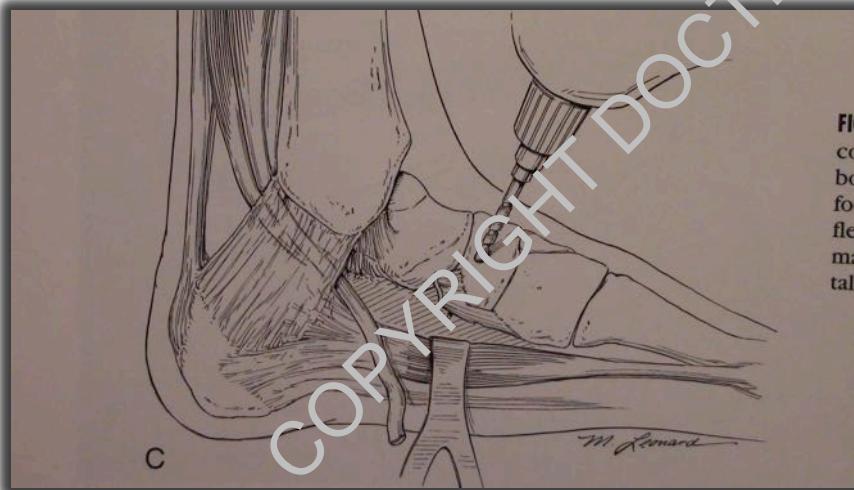
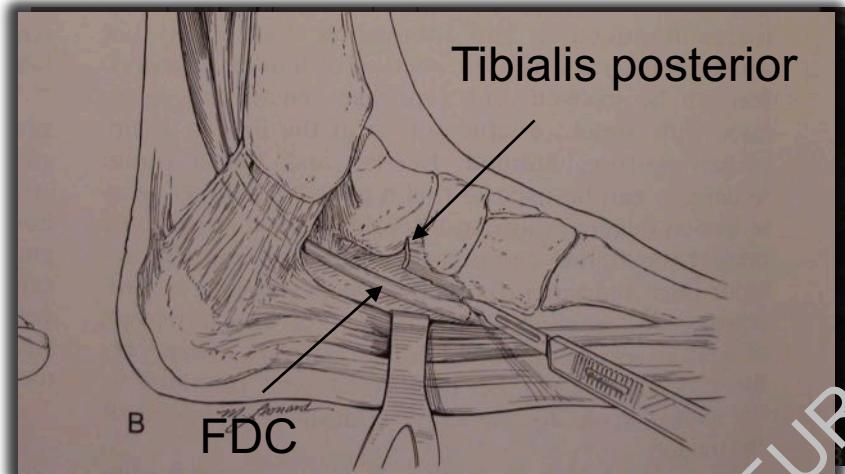


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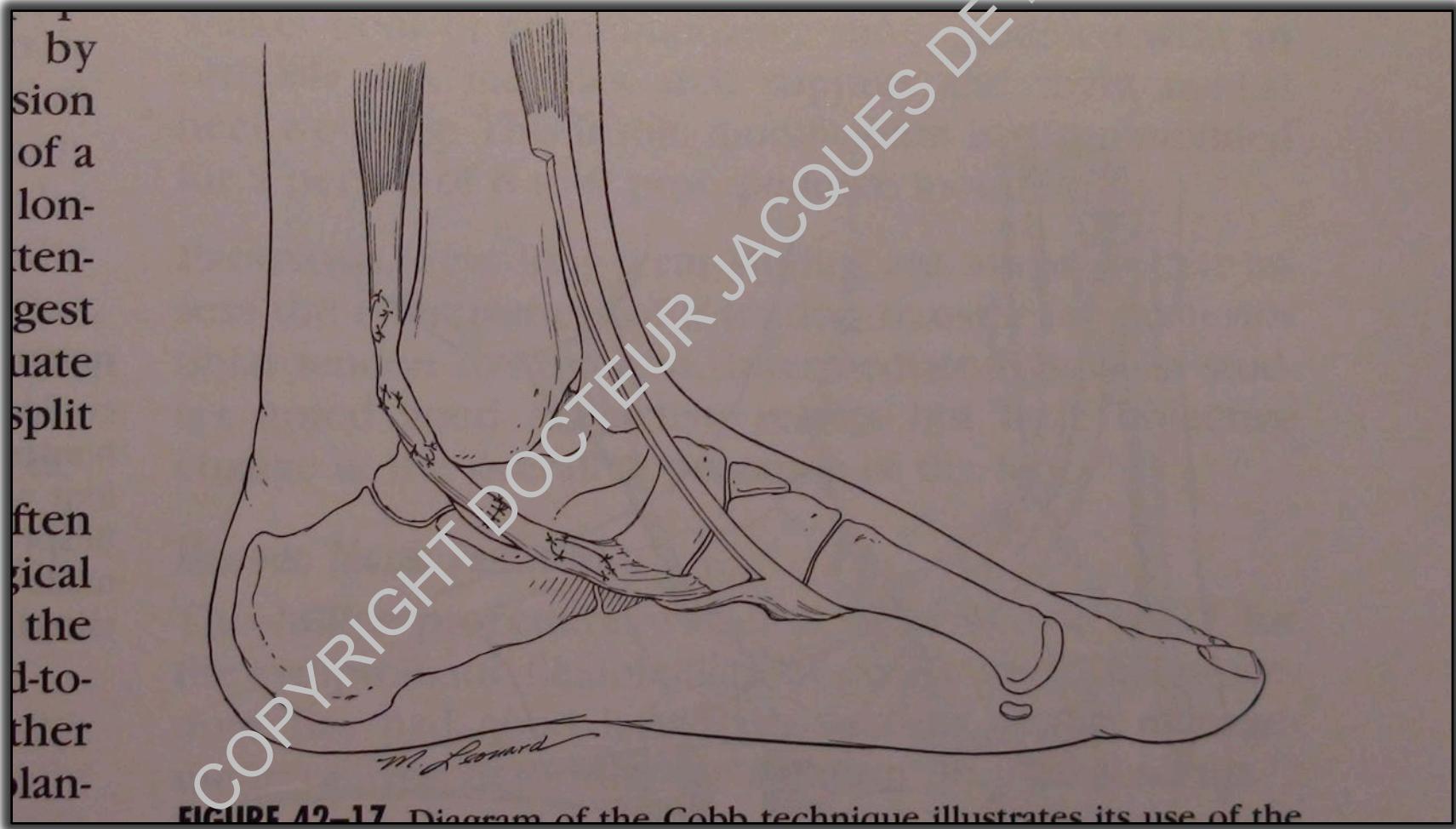
TENDON RECONSTRUCTION: Z-lengthening



TENDON RECONSTRUCTION : FHL or FDC transfert



TENDON RECONSTRUCTION: Transfert Tibialis anterior (Cobb)



Cobb Procedure

restore plantar flexion power of the 1st ray

(more distal insertion of the Tib Ant)

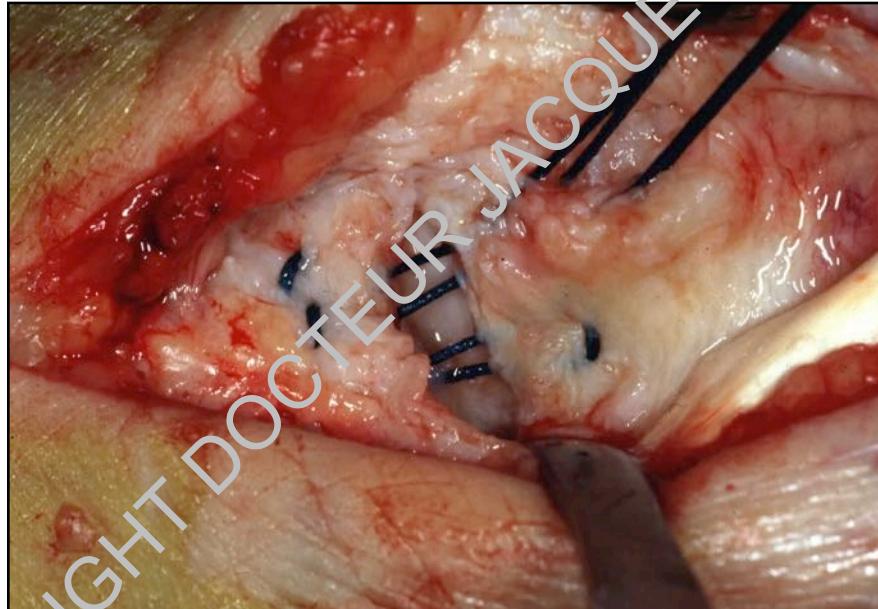
Knupp M, Hintermann B

- n = 22 PTT dysfunction st IIB
- FU : 24 months
- results : AOFAS score 53,2 to 88,5
 - excellent / good results : 95 %
 - no decreasing Force of TA
- Cobb technique = appropriate alternative to arthrodesis in st II B RTT dysfunction (in addition with other technique)

Knupp M, Hintermann B, Foot Ankle Int., vol 28 (4) : 416-21, 2007

LIGAMENT RECONSTRUCTION

spring ligament suture



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RESULTS

FDL transfert + medial translation calcaneal osteotomy

Myerson M S *

n:32 st II PTT dysfunction

mean age : 58 y

FU : 20 months (14 to 48)

results : **AOFAS score 48 to 84**

94% pain relief, improvement arch of the foot

Wacker J T **

n : 44 st II PTT dysfunction

mean age 61 y

FU : 51 months (38 to 62)

results : **AOFAS score 48 to 88,5**

95% pain relief

80% improvement arch of the foot

* Myerson MS, Orthopedics. 19:383-8, 1996

** Wacker JT, JBJS. 84-B : 54-8, 2002

RESULTS

**FDL transfert + medial translation calcaneal osteotomy
+ lateral column lenghtening (Mosier-Laclair**)**

Satisfaction rate high

No medial arch restauration in all patients

Cc arthrosis 14%

RESULTS

CC arthrodesis + PTT repair + Achilles tendon lengthening (Lauwerens, 2006)

N = 20; FU = 24 months

85% complete relief of pain

10% nonunion

15% sural nerve damage

Posterior Tibial Tendon Dysfunction

Treatment



➤ Stage 3

- A : + Medial transl calc ost
- B : + lenght lat column



surgical

- triple arthrodeses

Posterior Tibial Tendon Dysfunction Treatment

- Stage 4



Surgical

- A : ankle soft tissue repair + Triple Arthrodesis
- B : Panarthrodesis / TTC arthrodesis

*Bluman EM, Myerson MS, Foot Ankle Clinic, 12(2): 341-62, 2007

Posterior Tibial Tendon Dysfunction TREATMENT

CONCLUSION

		I	II	III / III	III / IV	IV				
		conservative	MTCO	PTT repair	spring	Medial	Lateral	Triple	Soft tissue	Pantalar
		synovectomy		ligament	column	column	column	arthrodesis	ankle	TTC desis
I	pain	A PTT inflam; no deform								
		B parti PTT tear; no deform								
		C parti PTT tear; little valgus								
II	supple PPV	A calc valgus								
		B supple forefoot supp								
		C rigid forefoot supp								
		D forefoot abd								
		E mdL column instabilty								
III	rigid PPV	A calc valgus								
		B forefoot abd								
IV	ankle valgus	A supple								
		B rigid								

Posterior Tibial Tendon Dysfunction

CONCLUSION

- Good physical examination
- Good treatment indication
- Good results



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