

CONGRESSO NAZIONALE SOCIETÀ ITALIANA FISSAZIONE ESTERNA

Fissazione esterna nel trattamento
delle emergenze e traumi militari,
tecniche di ricostruzione degli arti e
trattamento degli esiti postraumatici

**Le fratture del pilone tibiale e
fissatore esterno in acuto**

Dott. G. Martino

ROMA

2025



16-17 MAGGIO 2025

What is a PILON TIBIAL FRACTURE?



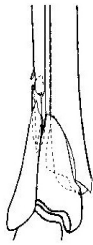
<<“TIBIAL PILON” IS THE DISTAL TIBIAL
METAPHYSIS WICH IS SHAPED LIKE A
PHARMACIST’S PESTLE (PILON).
FRACTURES OF THE “TIBIAL PILON”
INVOLVE THE ARTICULAR SURFACE>>

*Destot E (1911) Traumatisme du pied et
rayons X. Masson, Paris*



43 distal

43-A1



43-A extra-articular fracture

43-A2

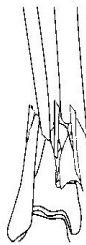


43-A1 simple

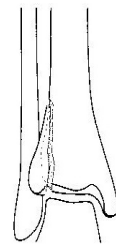
43-A2 wedge

43-A3 complex

43-A3



43-B1



43-B partial articular fracture

43-B2



43-B1 pure split

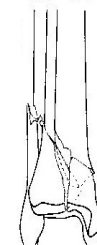
43-B2 split-depression

43-B3 multifragmentary depression

43-B3



43-C1



43-C complete articular fracture

43-C2

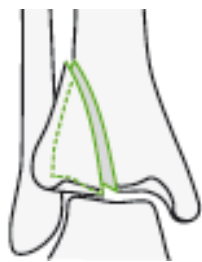


43-C1 articular simple,

43-C2 art. simple, metaphyseal

43-C3 articular multifragmentary

43.B Partial Articular Fracture



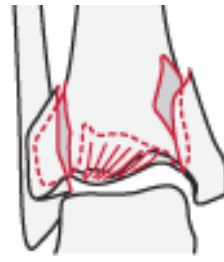
43.B1

pure split



43.B2

split-depression



43.B3

multifragmentary depression

43.C Complete Articular Fracture



43.C1

articular simple, metaphyseal simple



43.C2

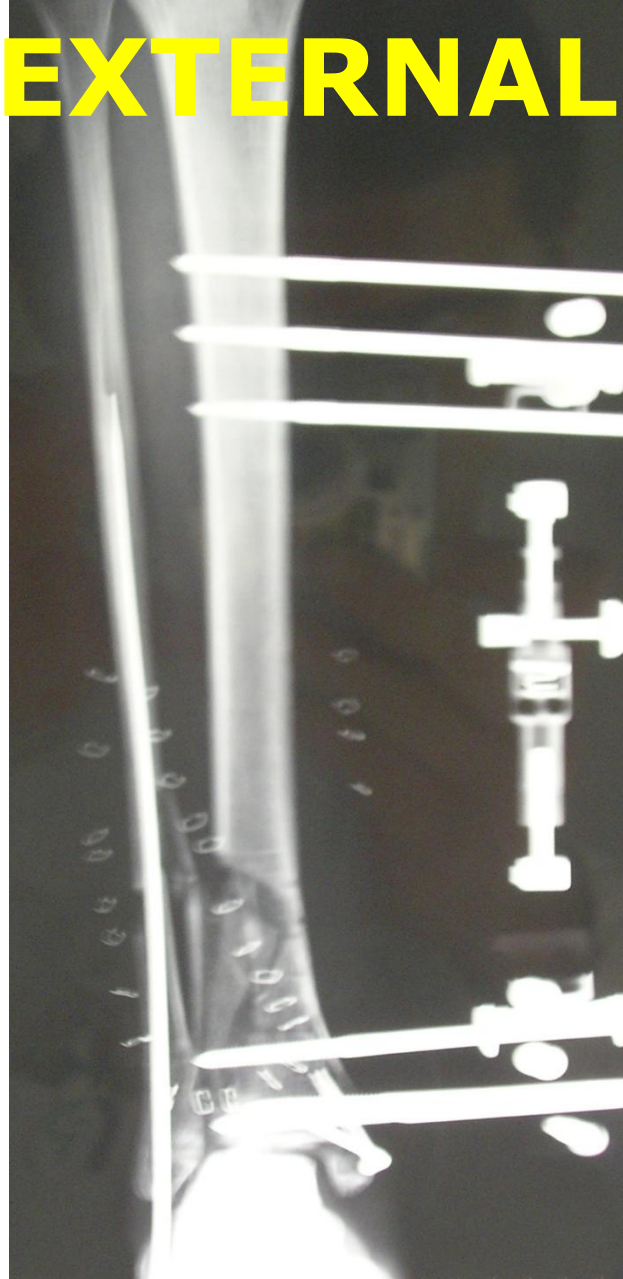
articular simple, metaphyseal multifragmentary



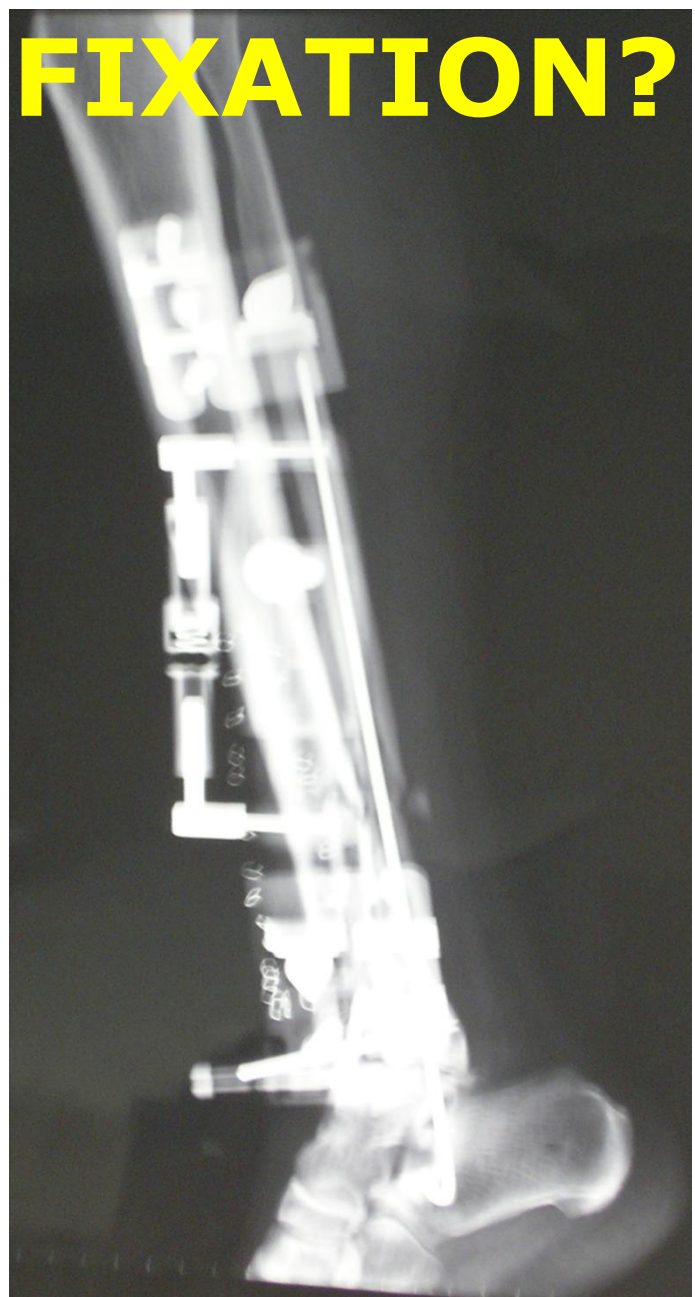
43.C3

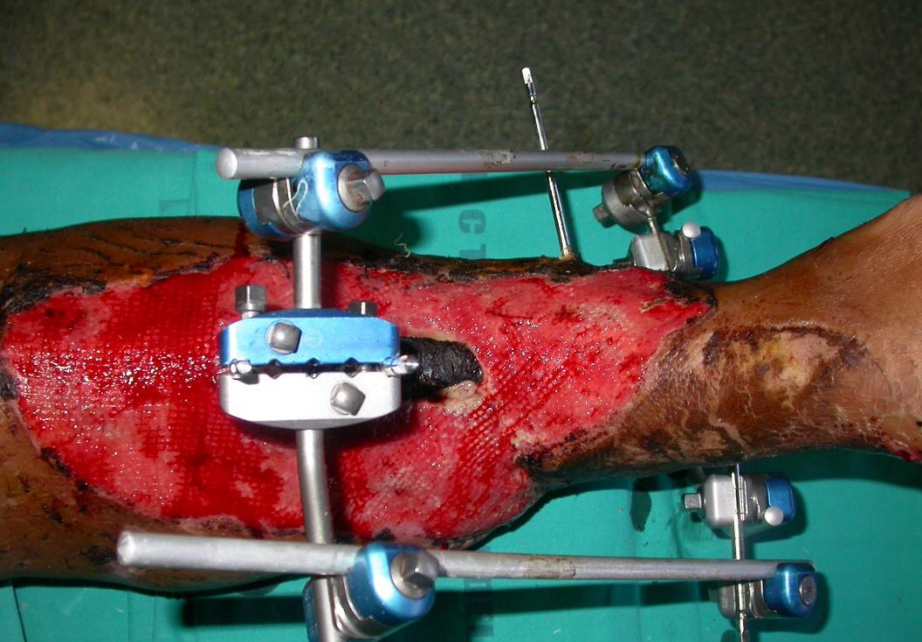
articular multifragmentary

EXTERNAL



FIXATION?







1st STABILIZATION

2nd DEFINITIVE TREATMENT

<<...NONE OF THE PATIENTS WHO REQUIRED

SECONDARY ARTHRODESIS (23% OF ALL CASES)

WERE IN THE GROUP WHO HAD UNDERGONE

TWO-STEP SURGERY ($P < 0.05$).

The range of ankle movement was much greater in the two-step group than in the others; these patients also had less pain, more frequently continued working in their previous profession, and had fewer limitations in their leisure activities. These differences did not reach statistical significance.>>

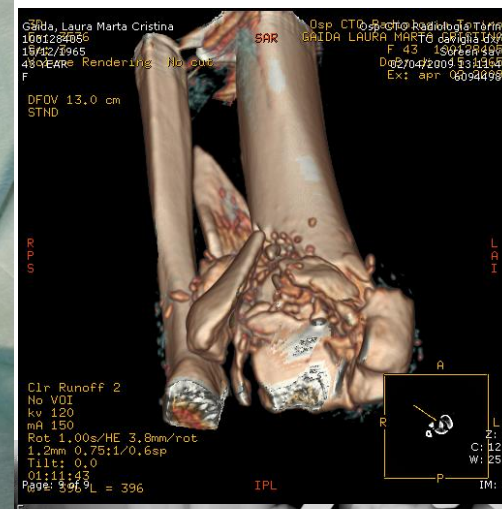
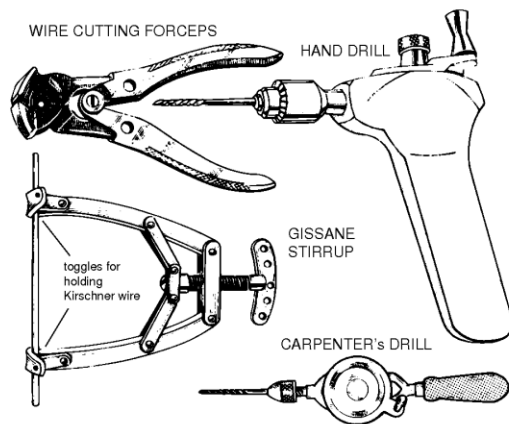
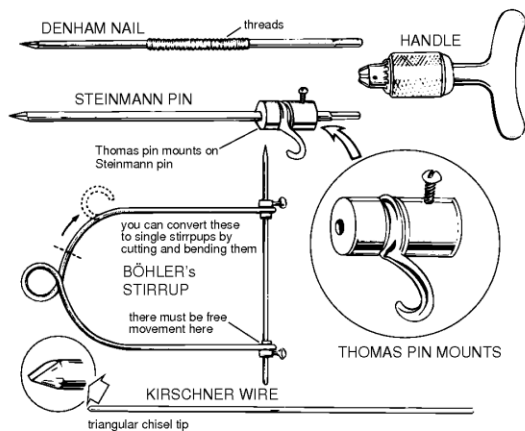
TRATTAMENTO D' ATTESA

~~-DOCCIA GESSATA~~

~~- GESSO CHIUSO~~



EQUIPMENT FOR BONE TRACTION



Quanto tempo aspettare per il trattamento definitivo?

- Sirkin et al., JOT, 1999

I) closed fracture: 12,7 days

II) open fractures: 14 days

- Dickson KF et al., Injury, 2001

10 to 21 days

- Harris AM et al., Foot Ankle Int., 2006

7,6 days

**NON
AVERE
FRETTA!**

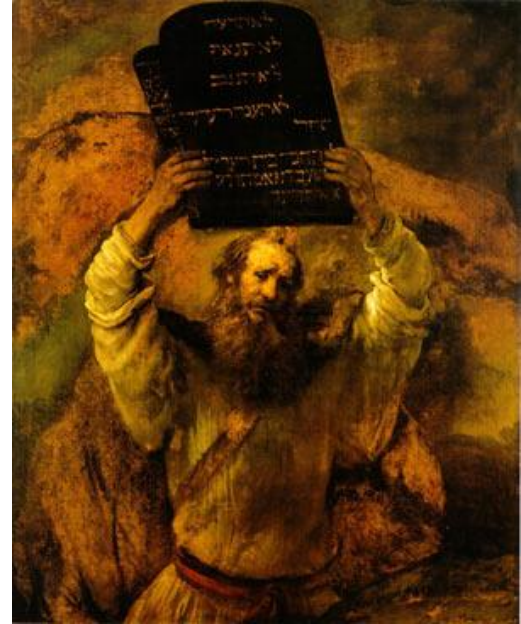
T.P. RÜEDI, M. ALLGÖWER

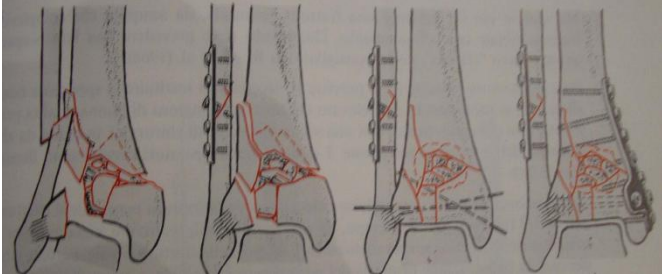
INJURY 1969

1 – Ricostruzione del
perone se fratturato

2 – Ricostruzione della
superficie articolare tibiale

3 – Supporto con placca





OPEN REDUCTION AND PLATE OSTHEOSYNTHESIS Complications (1)

- 52 tibial pilon fractures, 79% closed fractures, 89% ORIF.

Overall local complication rate: 54%.

Major local complicating events: 21 (40%)



77 additional operations

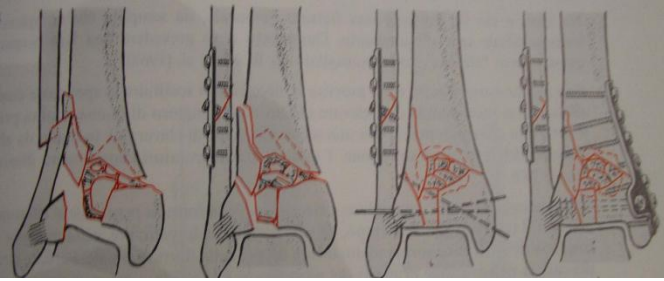
Mc Farran et al., J. Orthop. Trauma, 1992

- 60 tibial pilon fractures treated by ORIF



37% of deep infection in Reudi type III fractures

Teeny SM, Wiss DA, Clin Orthop Relat Res., 1993



OPEN REDUCTION AND PLATE OSTHEOSYNTHESIS

Complications (2)

- ORIF vs. EX.FIX.:

**3 AMPUTATIONS IN 18 CLOSED
FRACTURES!**

BUT SURGERY 3-5 DAYS AFTER TRAUMA

Wyrsch et al., JBJS-Am, 1996 e 1997

37 AO 43-B3 and -C3

**12/37 patients (35%): post-operative complications, with
3/37 (8%) joint infection**



OPEN REDUCTION AND PLATE OSTHEOSYNTHESIS Complications (3)

- Percutaneous , minimally invasive osteosynthesis
submuscular and subcutaneous plating



LOW RATE OF SOFT-TISSUE COMPLICATIONS

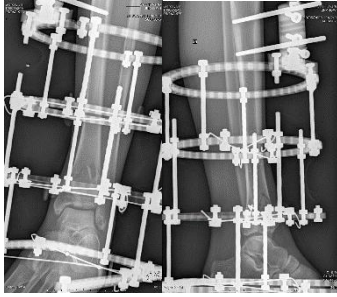
BUT MAINLY LOW-ENERGY FRACTURES

12 A-type, 1 B-type and 7 C-type

Helfet et al., Injury, 1997

17/21 A-type

Oh et al., Clinical orthopaedics, 2003



CLOSED/MINIMAL REDUCTION AND EXTERNAL FIXATION

Complications (1)

28 ORIFs, 14 Ilizarov ring fixators

FIXATORS gr.:

- SHORTER time to HEAL
 - HIGHER rates of NONUNION
 - HIGHER rates of MALUNION
 - HIGHER rates of INFECTION
- (not statistically significant)

Bacon S et al., Injury, 2008

Meta-Analysis > Injury. 2020 Jul;51(7):1448-1456. doi: 10.1016/j.injury.2020.04.056.

Epub 2020 May 12.

Review > Strategies Trauma Limb Reconstr. 2022 May-Aug;17(2):105-116.

doi: 10.5005/jp-journals-10080-1557.

Review > Cureus. 2022 Apr 17;14(4):e24204. doi: 10.7759/cureus.24204. eCollection 2022 Apr.

Post-Operative Outcomes of Circular External

Contents lists available at ScienceDirect

> Foot Ankle Int. 2021 Jun;42(6):723-733. doi: 10.1177/1071100720979976. Epub 2021 Feb 9.

Outcomes and Complications With Treatment of Open Tibial Plafond Fractures With Circular External Fixator

Ahmed M Thabet¹, Christopher Gerzina², Francesco Sala³, Soyoung Jeon⁴, Giovanni Lovisetti⁵,
Amr Abdelgawad⁶, Thomas A DeCoster⁷, Wael Azzam⁸

Affiliations + expand

PMID: 33559484 DOI: 10.1177/1071100720979976

CRITERI DI SCELTA

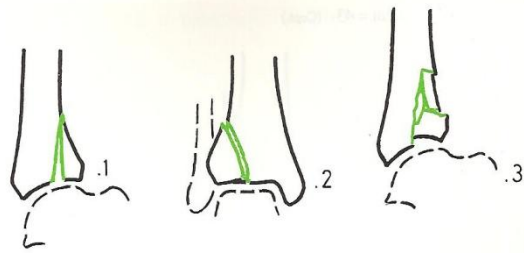
- Numero e dimensione dei frammenti
- Depressione centrale
- Pluriframmentazione

Bourne et al., The Journal of Trauma, 1983, Vol 23, 592-593

Tecniche meno aggressive

- Fissazione esterna
- Fissazione esterna + sintesi a minima
- ORIF tecnica MIPO (AO)

B1

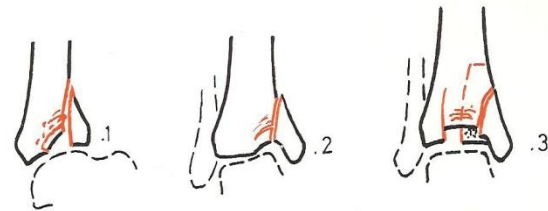


1. ORIF: viti

2. ORIF: viti

3. ORIF: viti + trapianto (se necessario)

B2

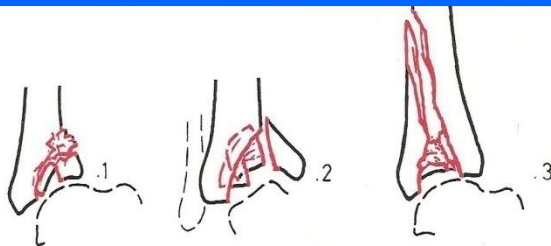


1. ORIF: viti + trapianto (se necessario)

2. ORIF: : viti + trapianto (se necessario)

3. FE a ponte – LCP (MIPO) + trapianto (se necessario)

B3

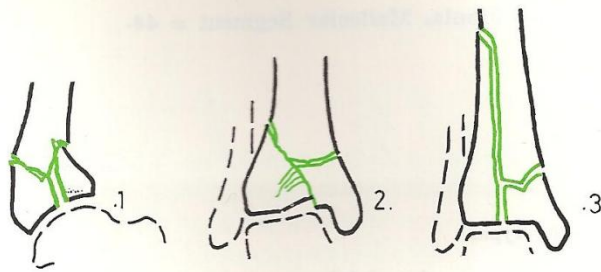


1. ORIF: viti + trapianto

2. ORIF: viti + LCP (MIPO)

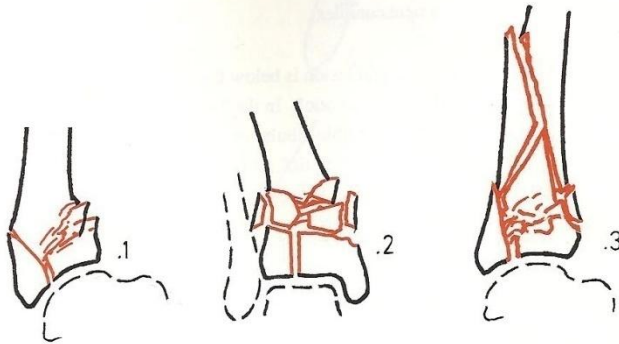
3. FE a ponte + trapianto

C1



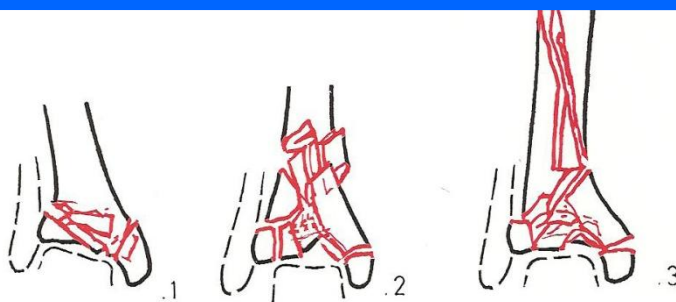
1. FE a ponte + ev. sintesi a minima o LCP (MIPO)
2. FE a ponte + ev. sintesi a minima LCP (MIPO)
3. FE a ponte + ev. sintesi a minima

C2



1. FE a ponte + ev. trapianto (se necessario)
2. FE a ponte
3. FE a ponte

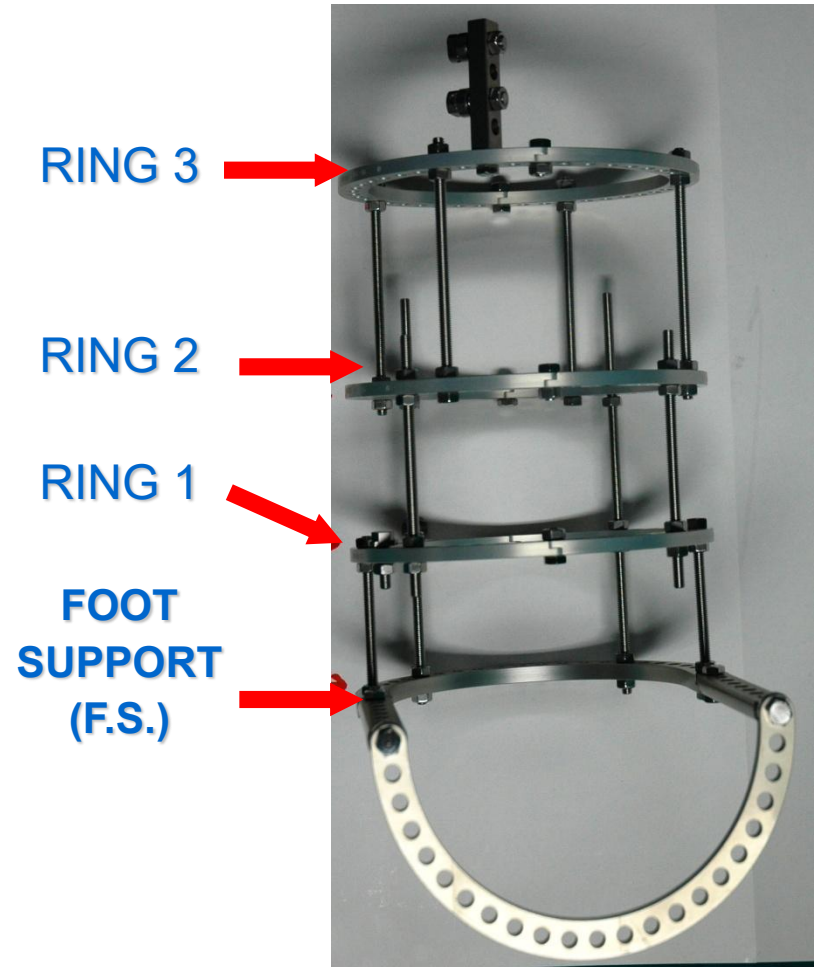
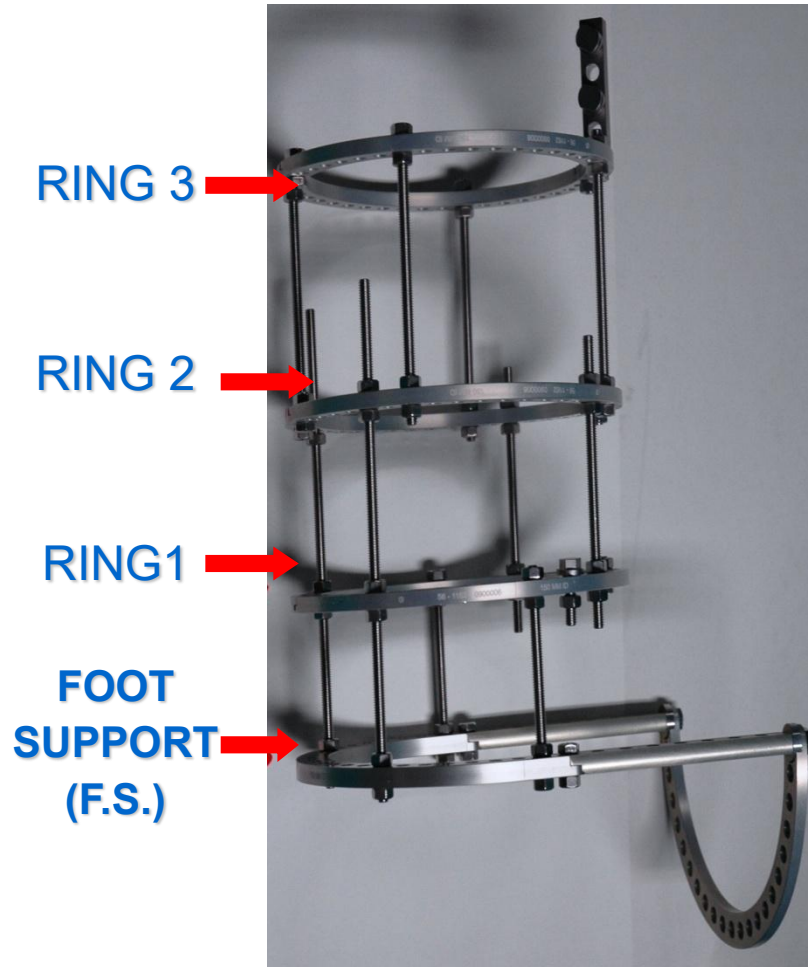
C3



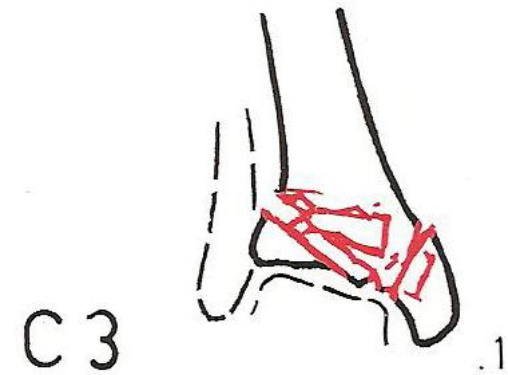
1.
2.
3.

FE a ponte

F.S. → solid distal end for ligamentotaxis, useful in spanning the ankle joint
RING 1 → metaphyseal ring, reduction and fixation of the articular fragments
RING 2 → diaphyseal ring, reduction and fixation of diaphyseal extension
RING 3 → proximal end for ligamentotaxis and fixation

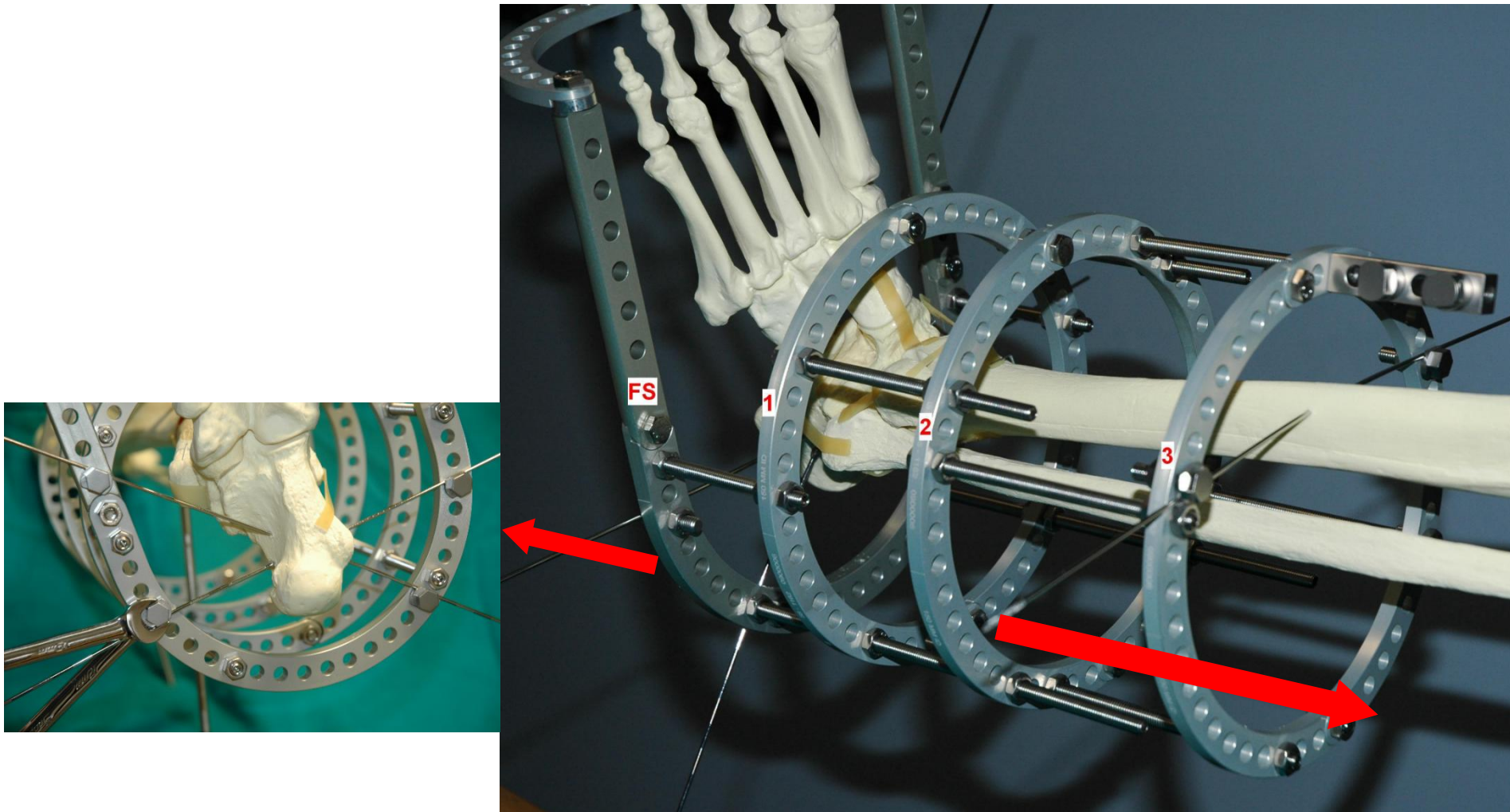


G.L., f, 35 anni



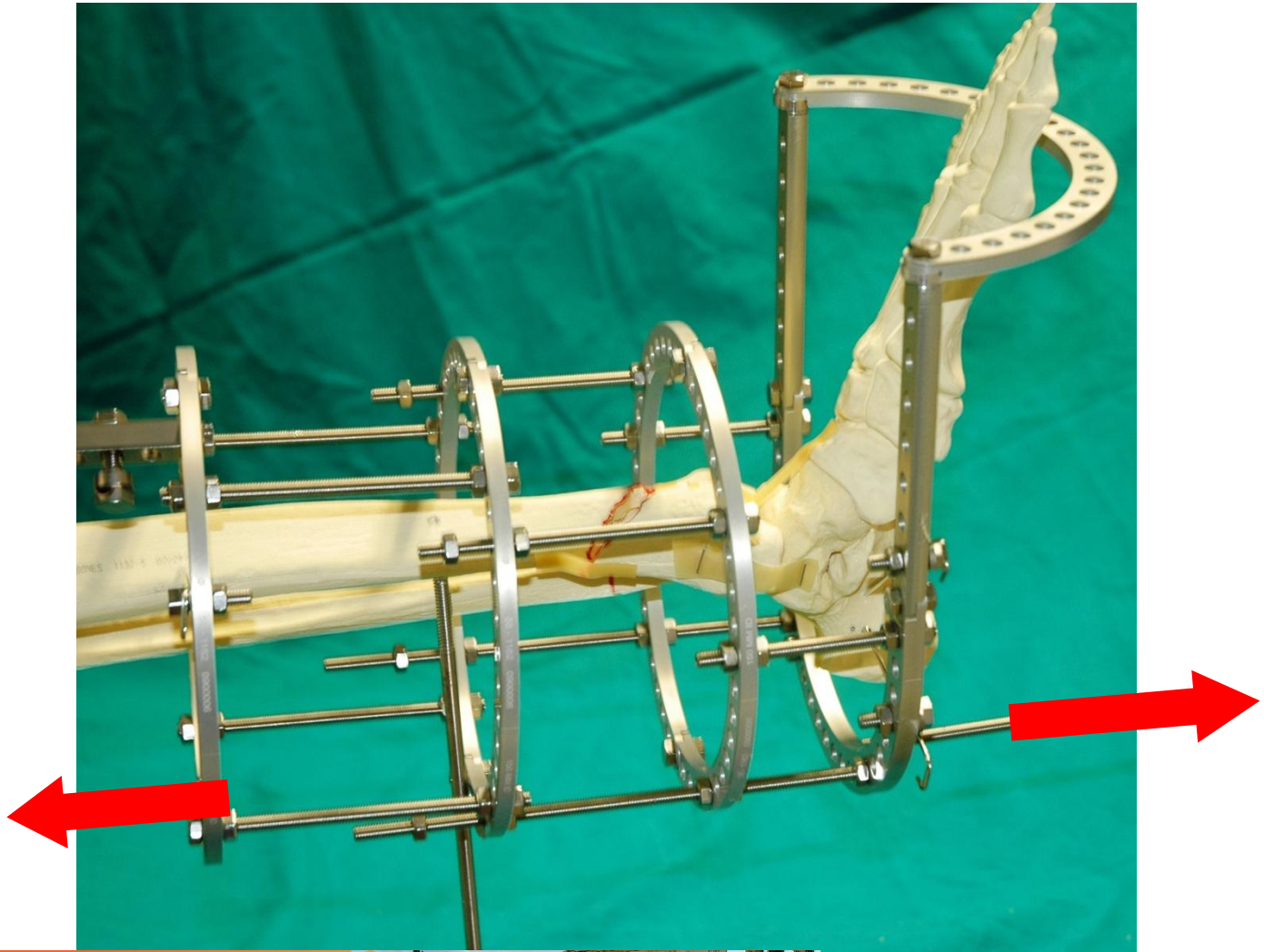


Il calcagno viene solidarizzato al diapason di supporto del piede attraverso 2 fili incrociati a olive contrapposte. Controllo delle torsioni e blocco della tibia attraverso un filo di lavoro solidale all'anello 3

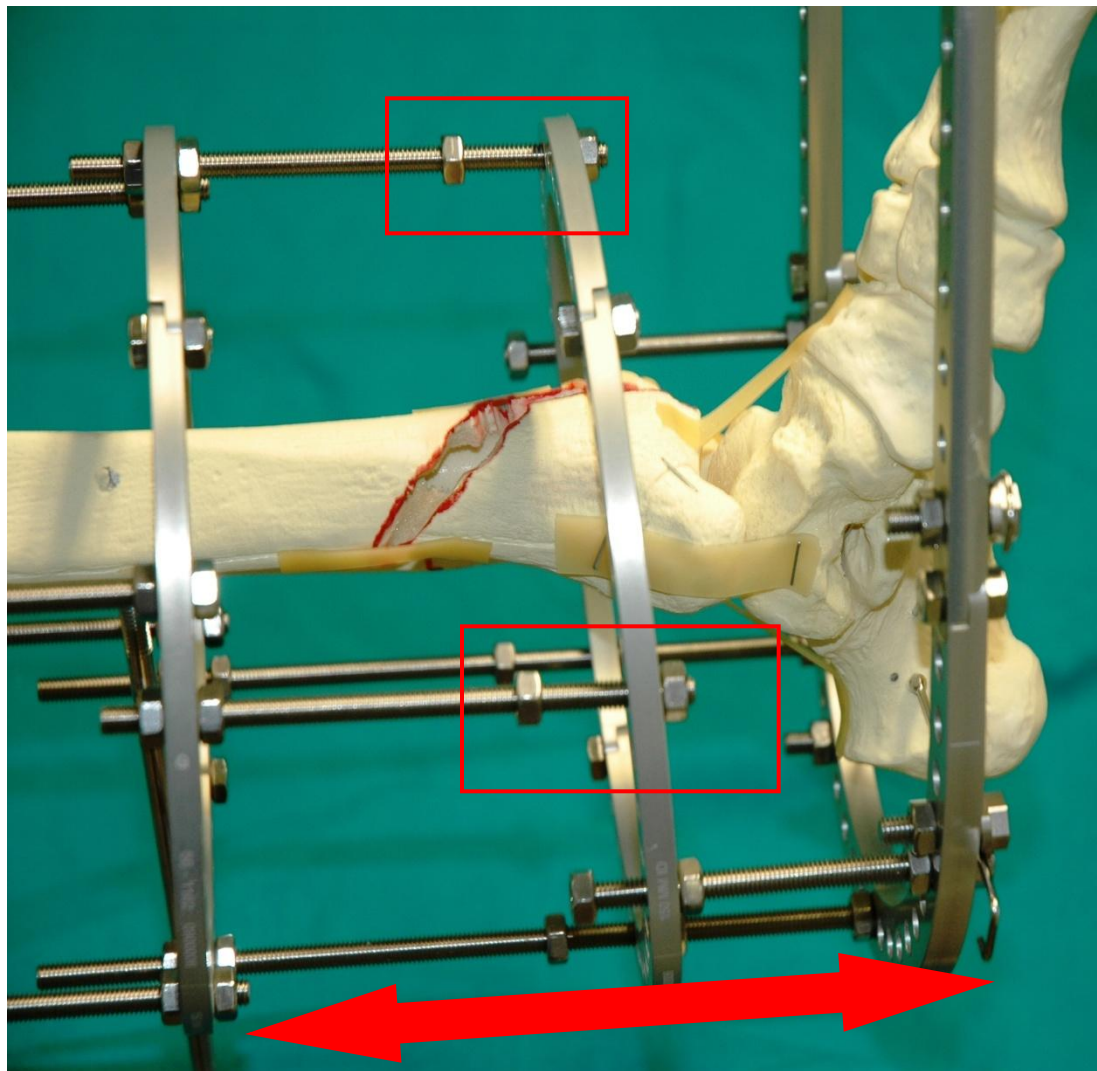


Ligamentotassi per distrazione tra FS e anello 3

Riduzione articolare per ligamentotassi

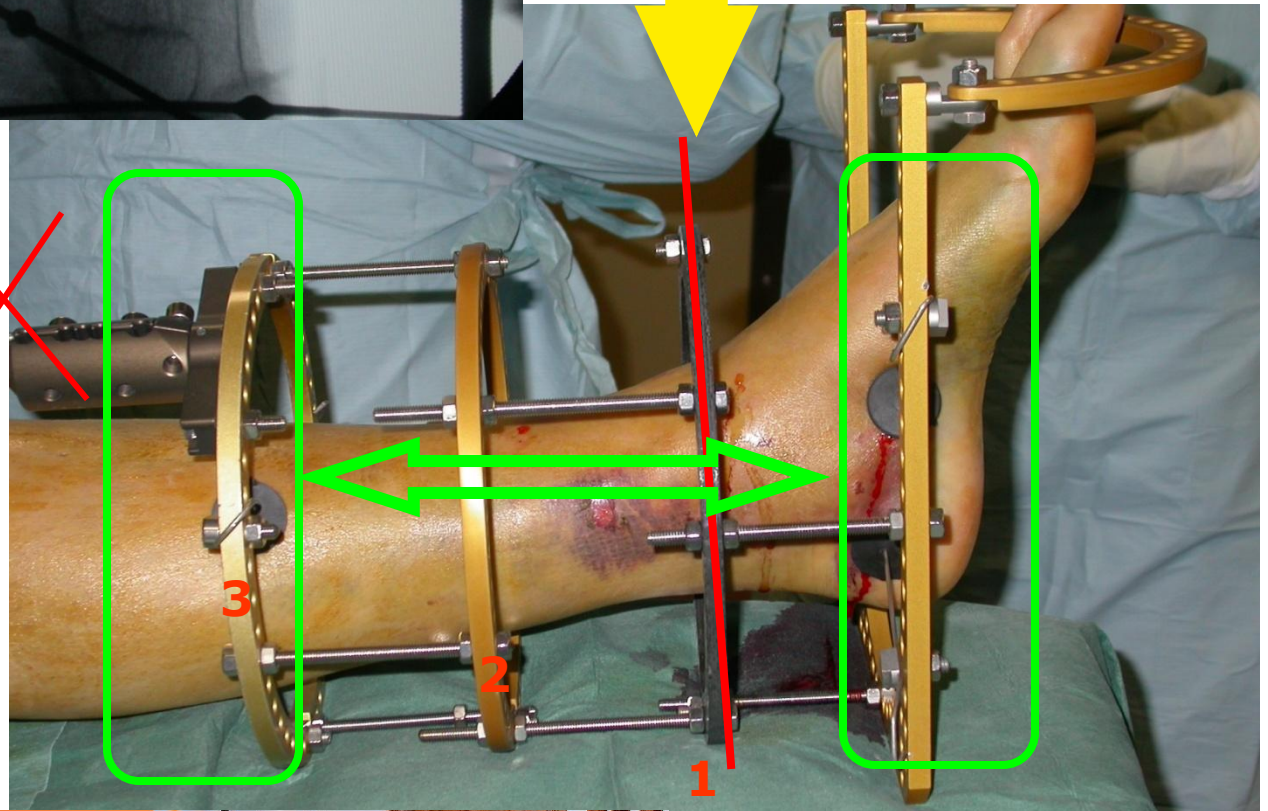


**La ligamentotassi e' mantenuta bloccando l'anello 2 sulle barre posteriori
L'anello 1 viene svincolato e centrato sull'epifisi**



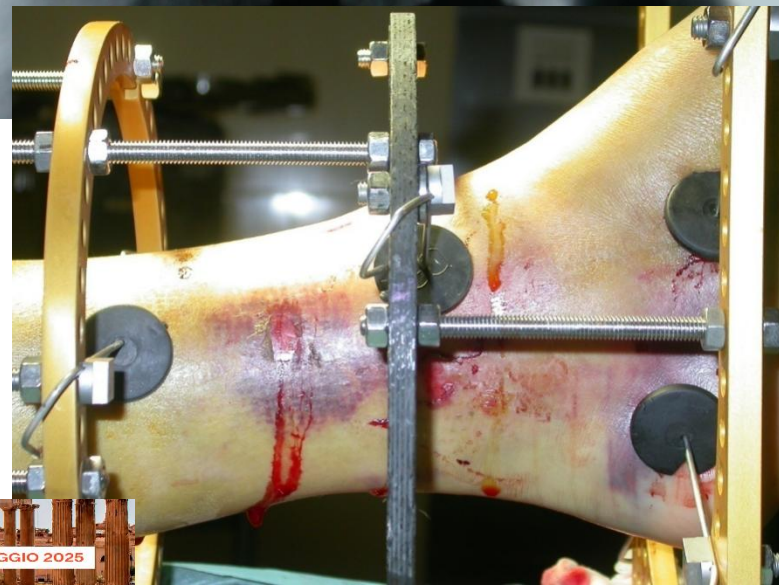
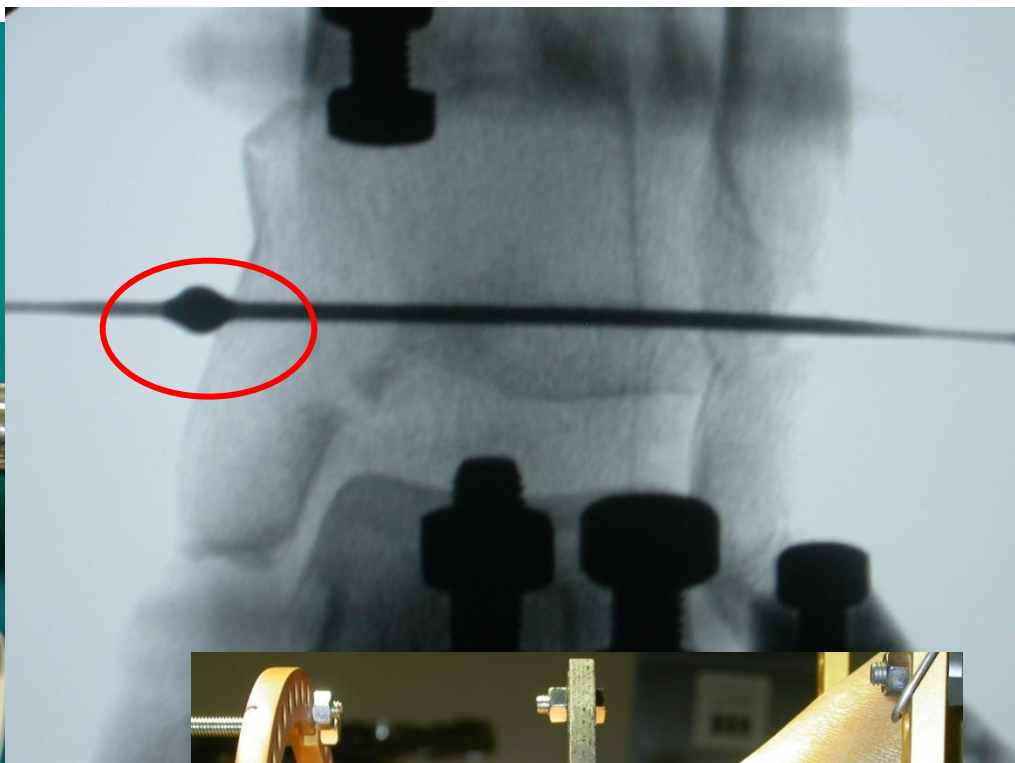
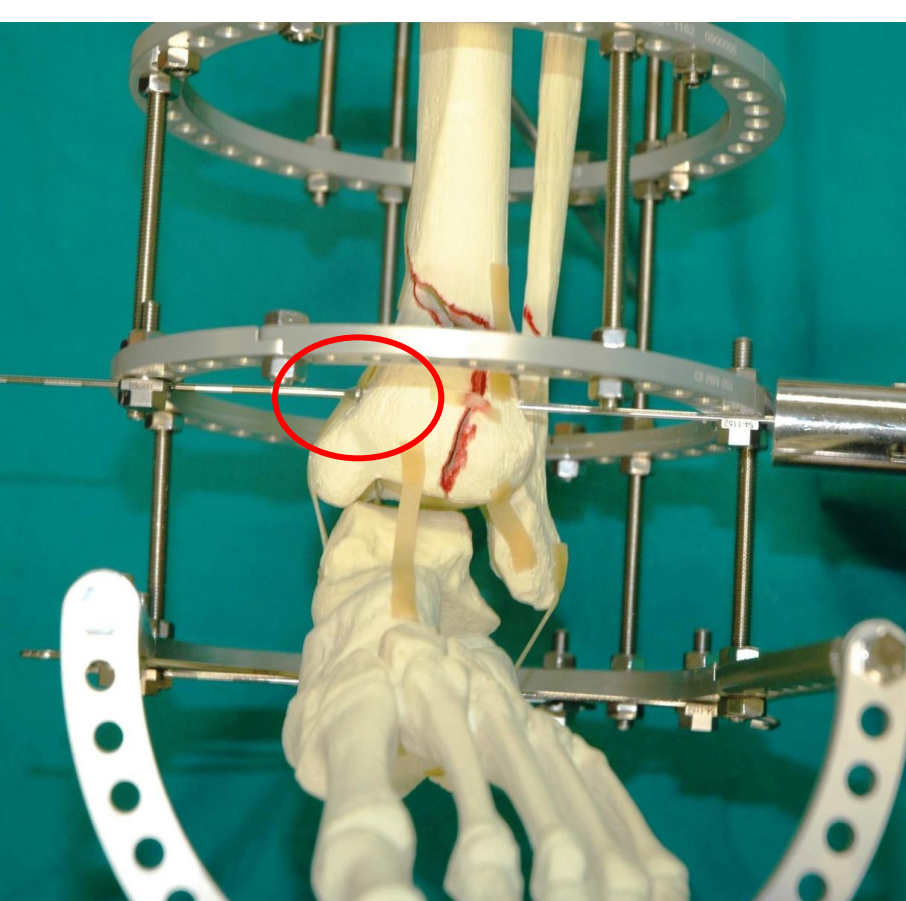


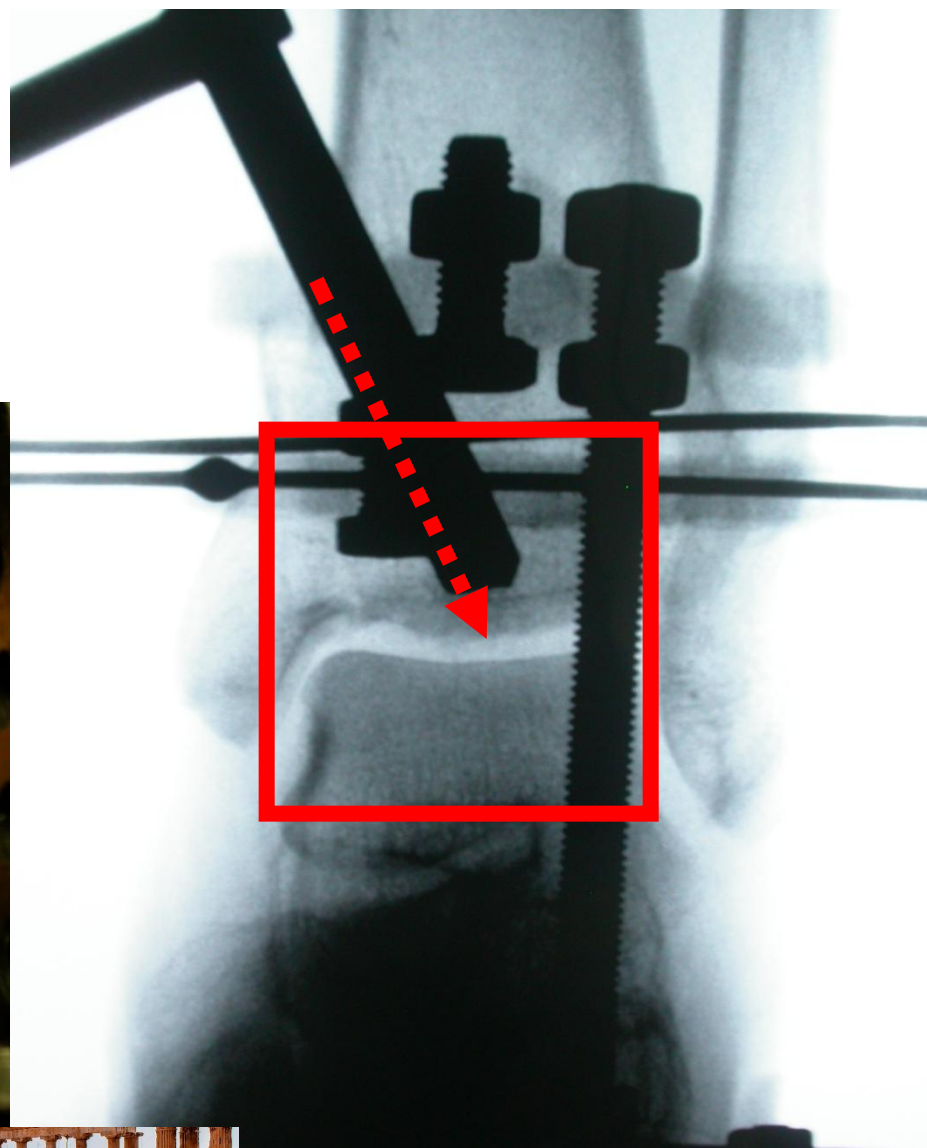
X-ray



Procedure miniinvasive

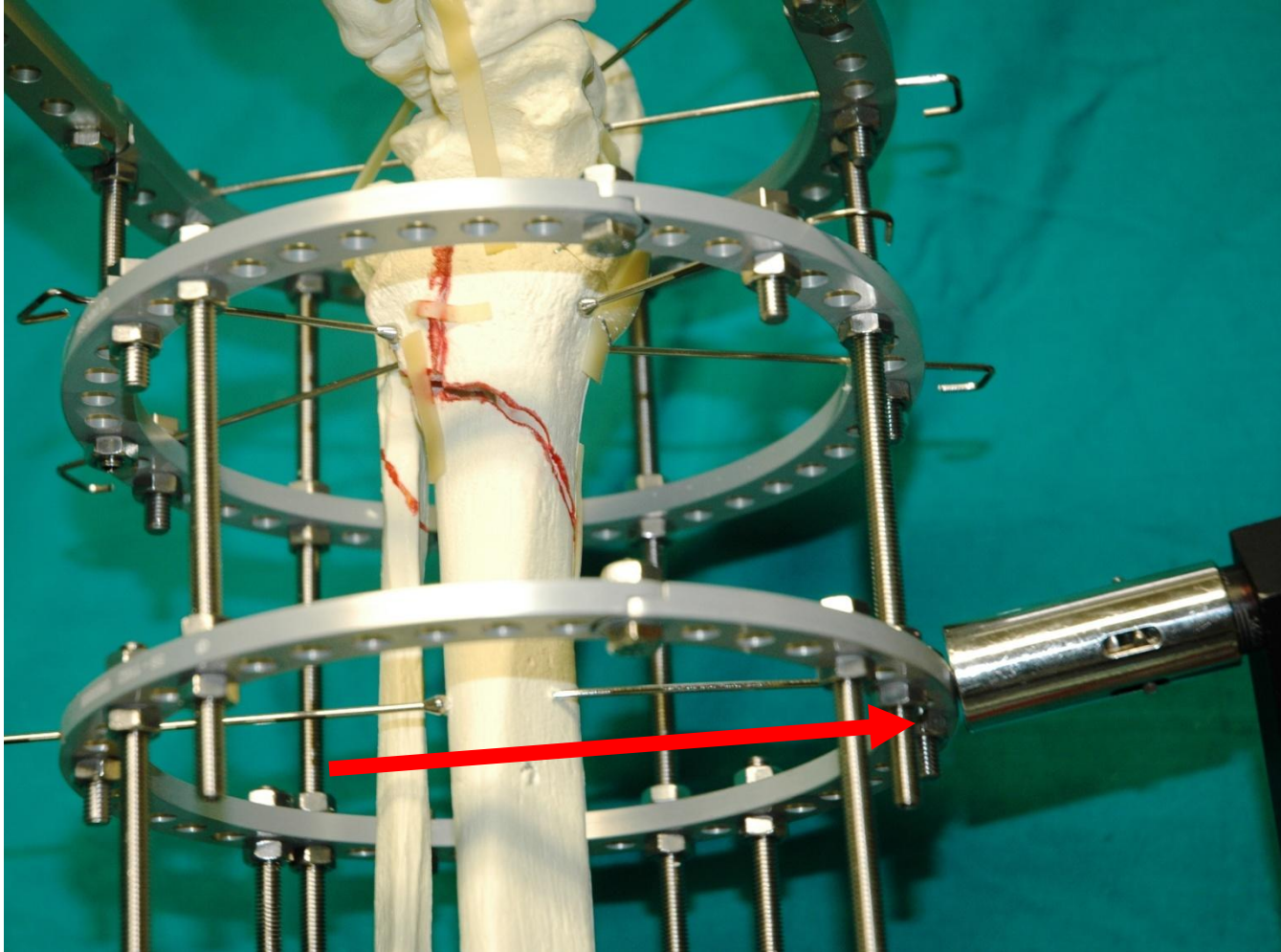
Riduzione percutanea con filo ad oliva sull'anello 1





Riduzione di irradiazione diafisaria

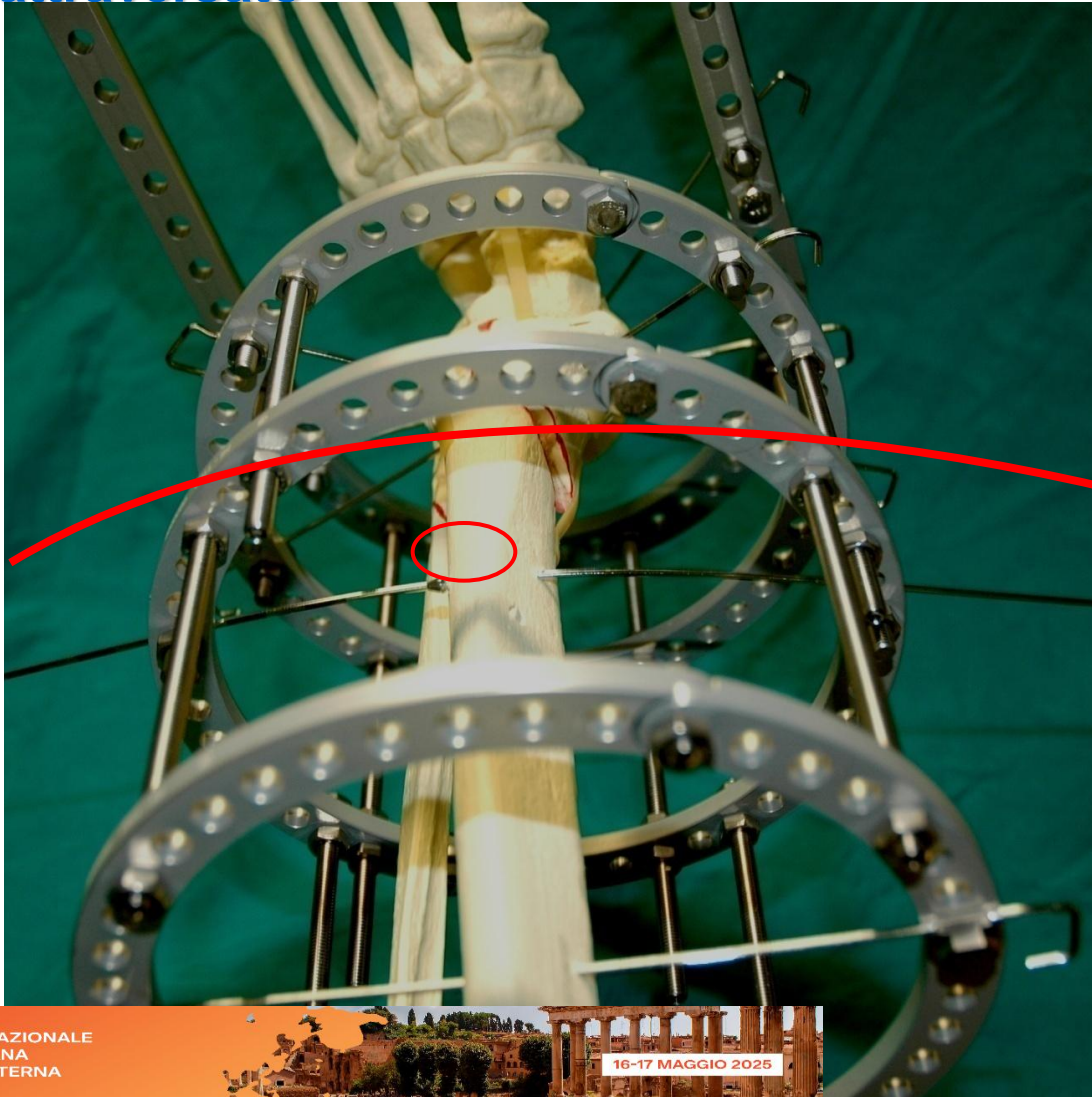
Correzione sul piano frontale (varo-valgo) si ottiene con la trazione esercitata da un filo con oliva

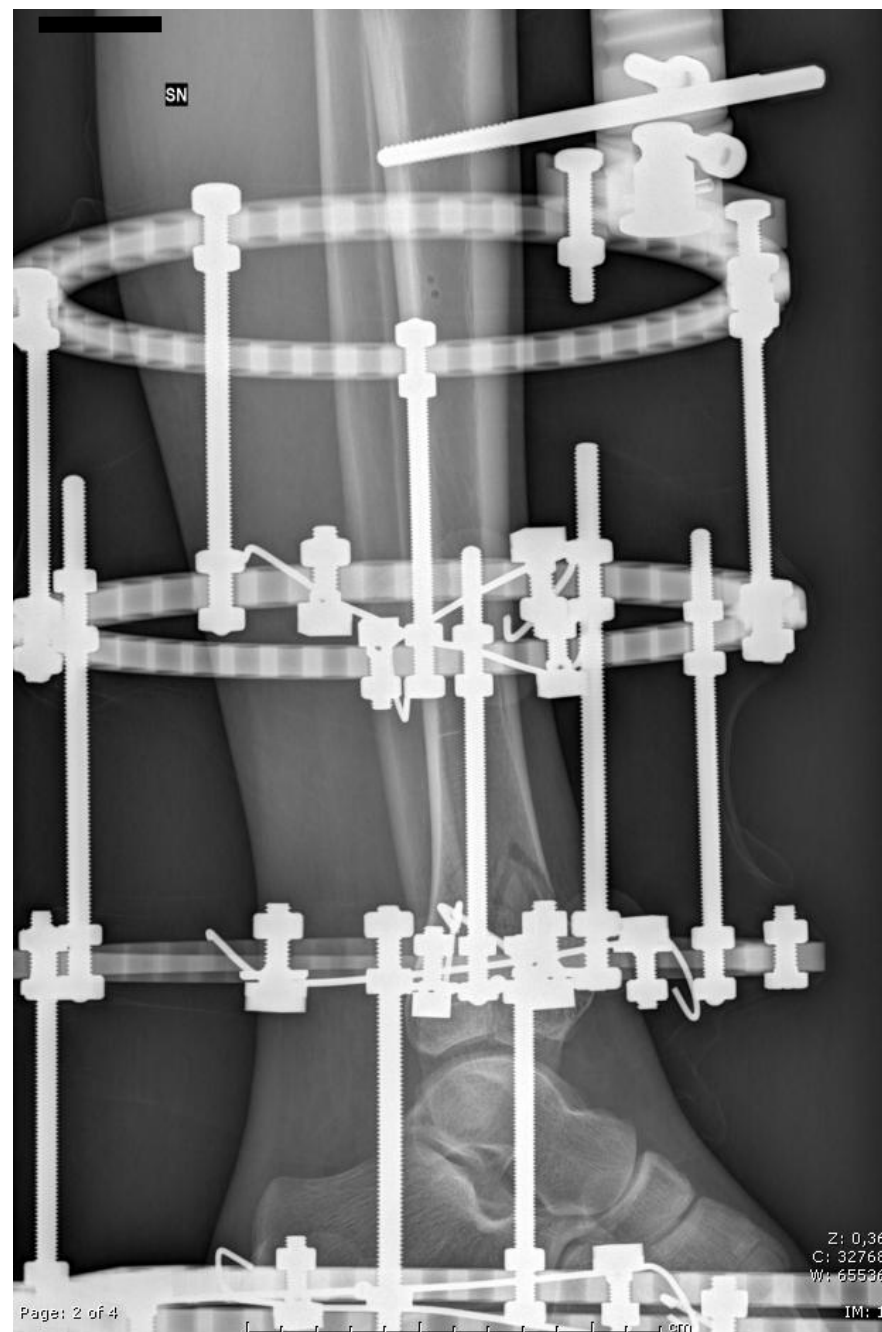


Riduzione di irradiazione diafisaria

Correzione sul piano sagittale (procurvato-recurvato)

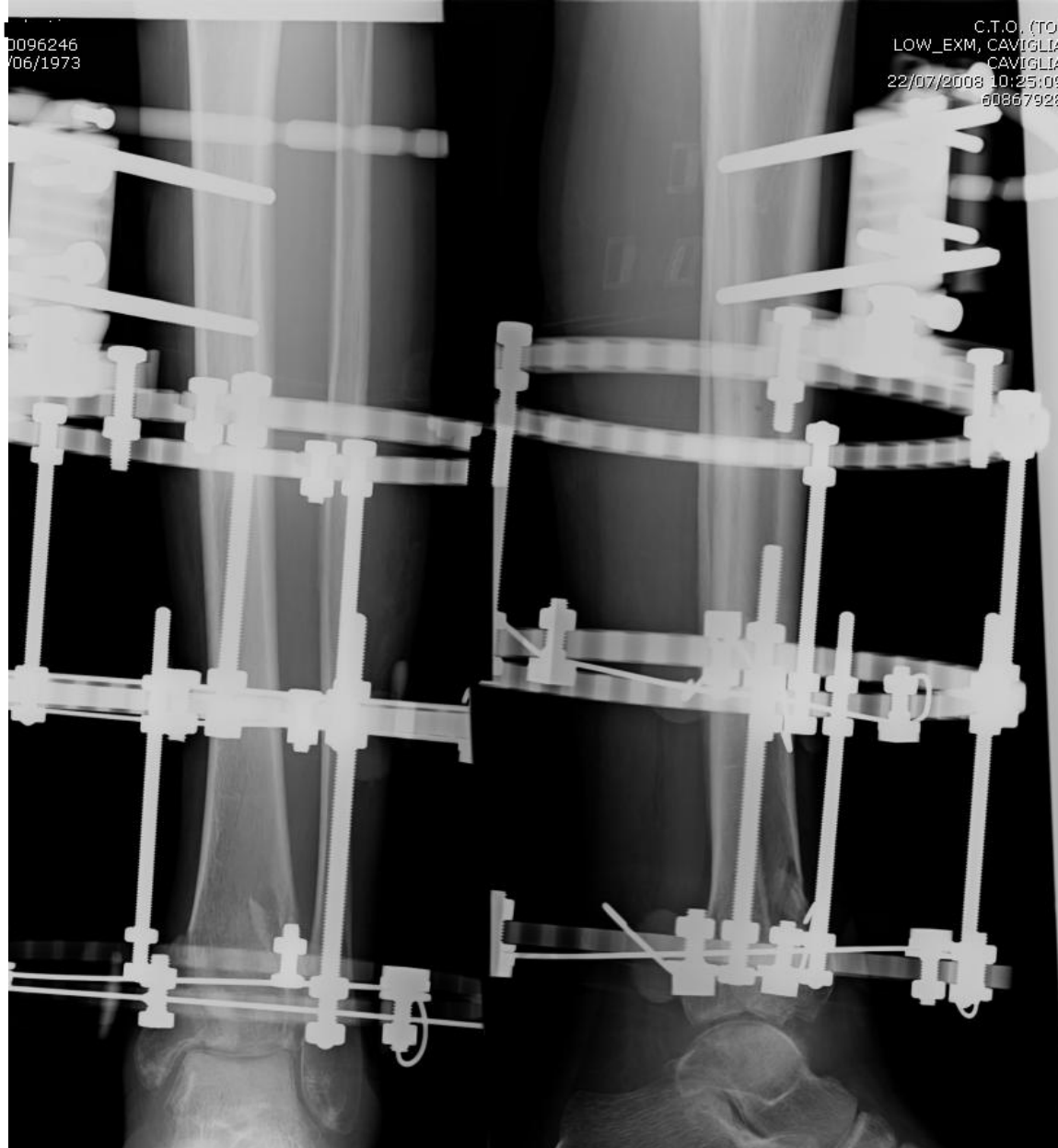
Tecnica del filo arcuato: la tensione di un filo arcuato provoca la rettilineizzazione dello stesso e il movimento consensuale dell'osso attraversato





0096246
06/1973

C.T.O. (TO)
LOW_EXM, CAVIGLIA
CAVIGLIA
22/07/2008 10:25:09
00867928



05/06/1973

F

C.T.O. (TO)
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CAVIGLIA
28/10/2008 08:39:34
60896787

Sx

Sx

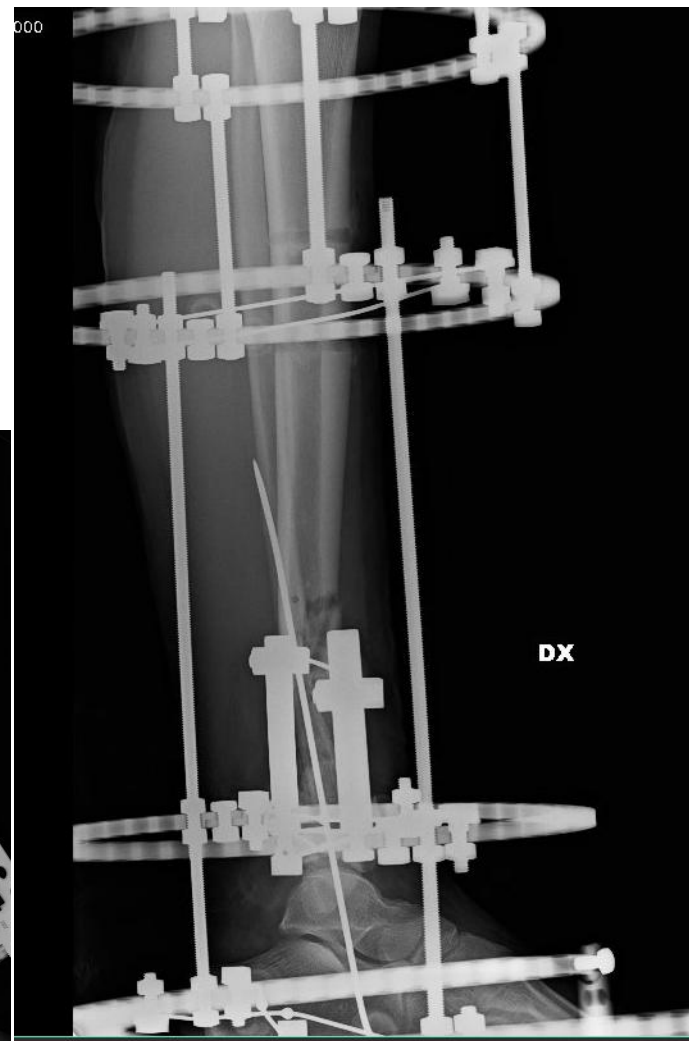
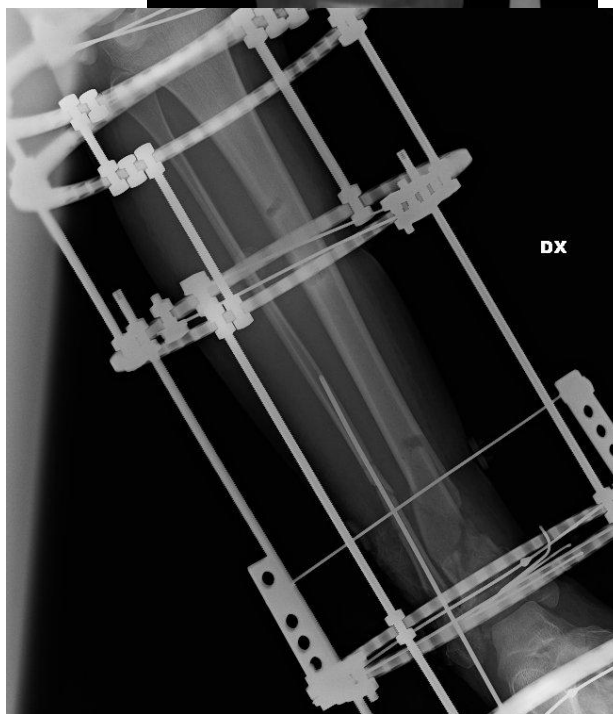
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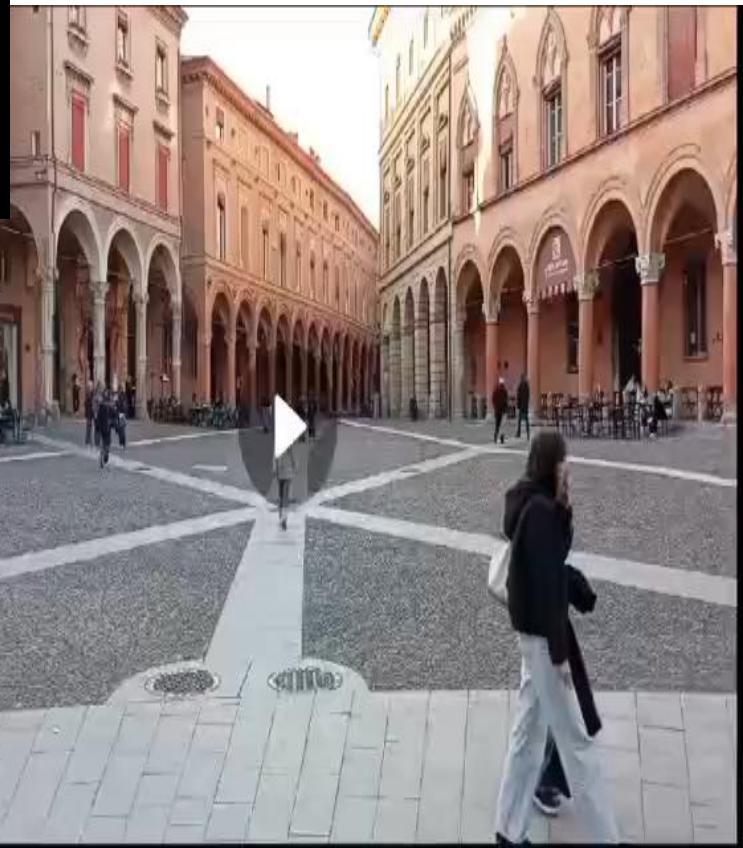
S: 149
Z: 0,52
C: 512
W: 1024
IM: 1001

cm



C.3

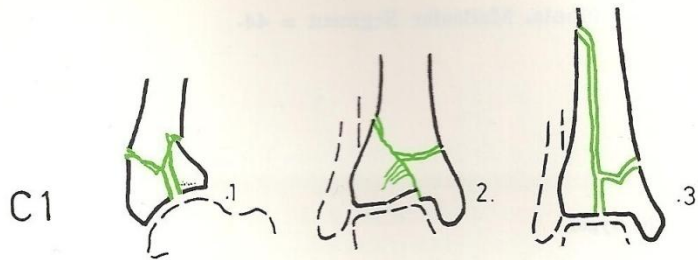


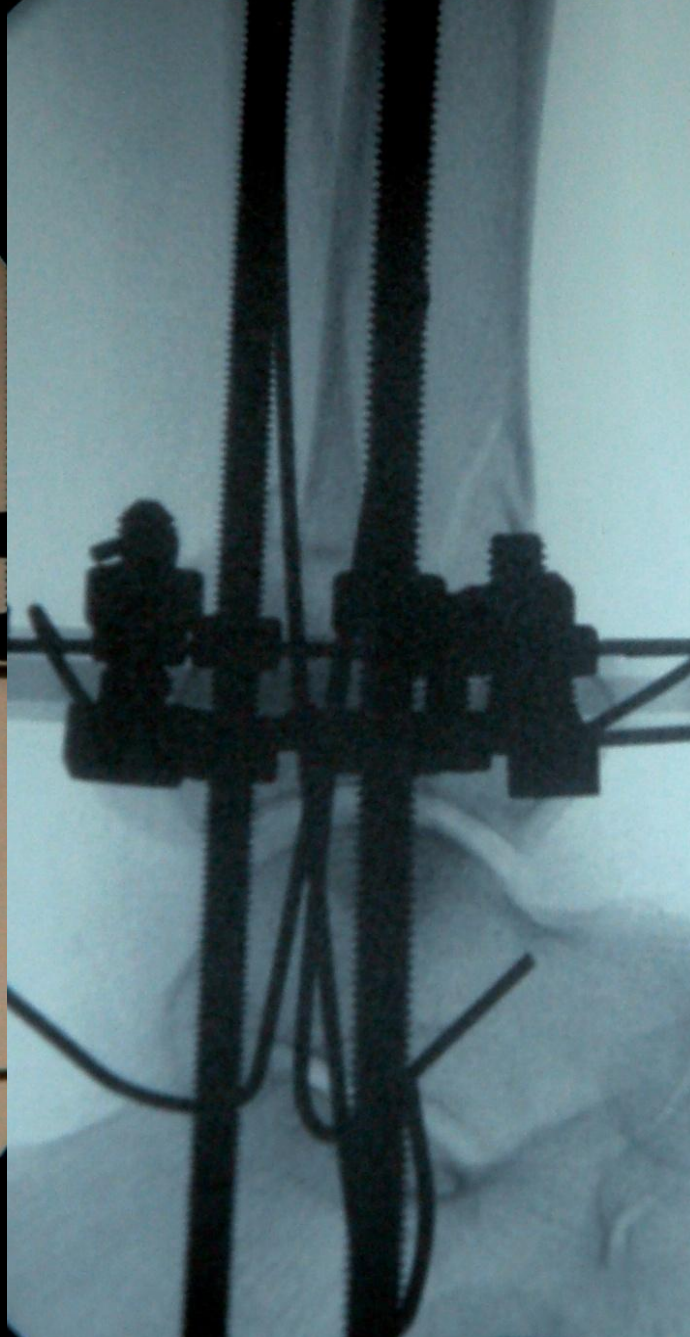
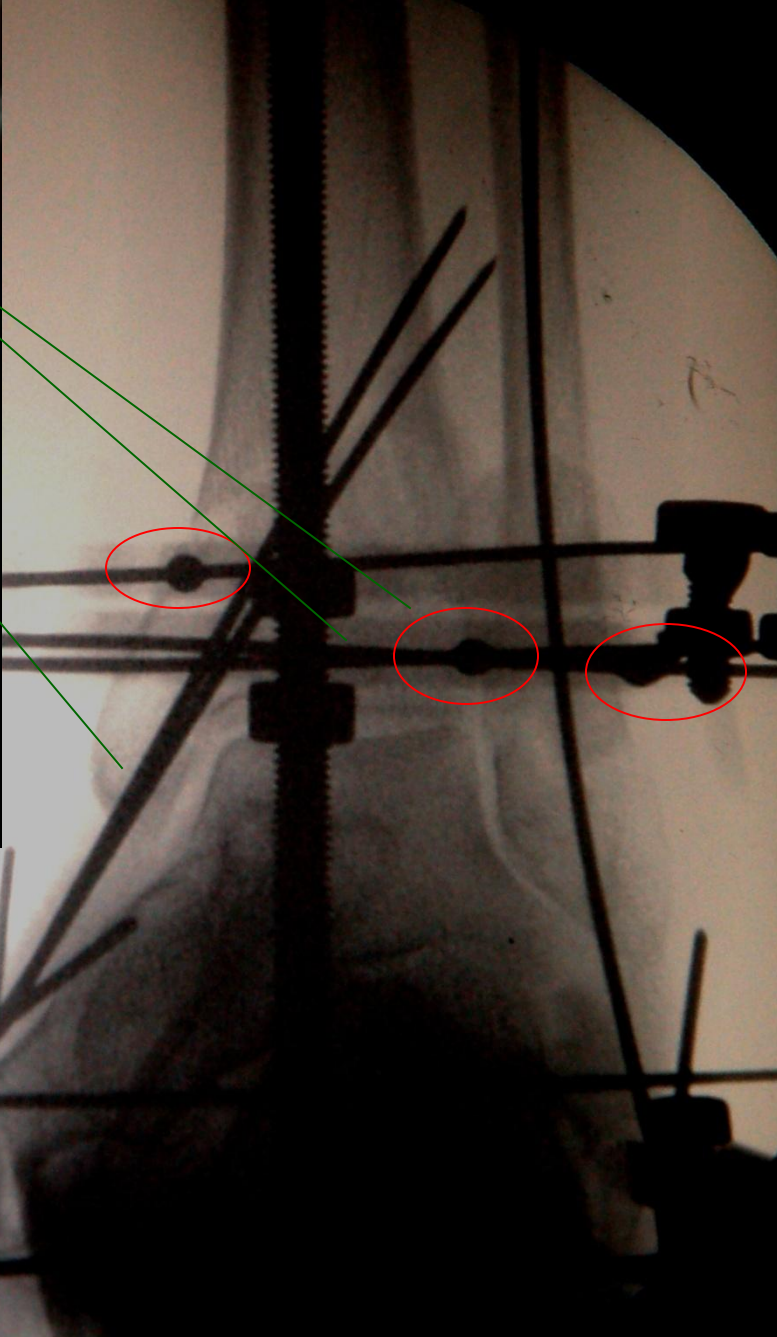


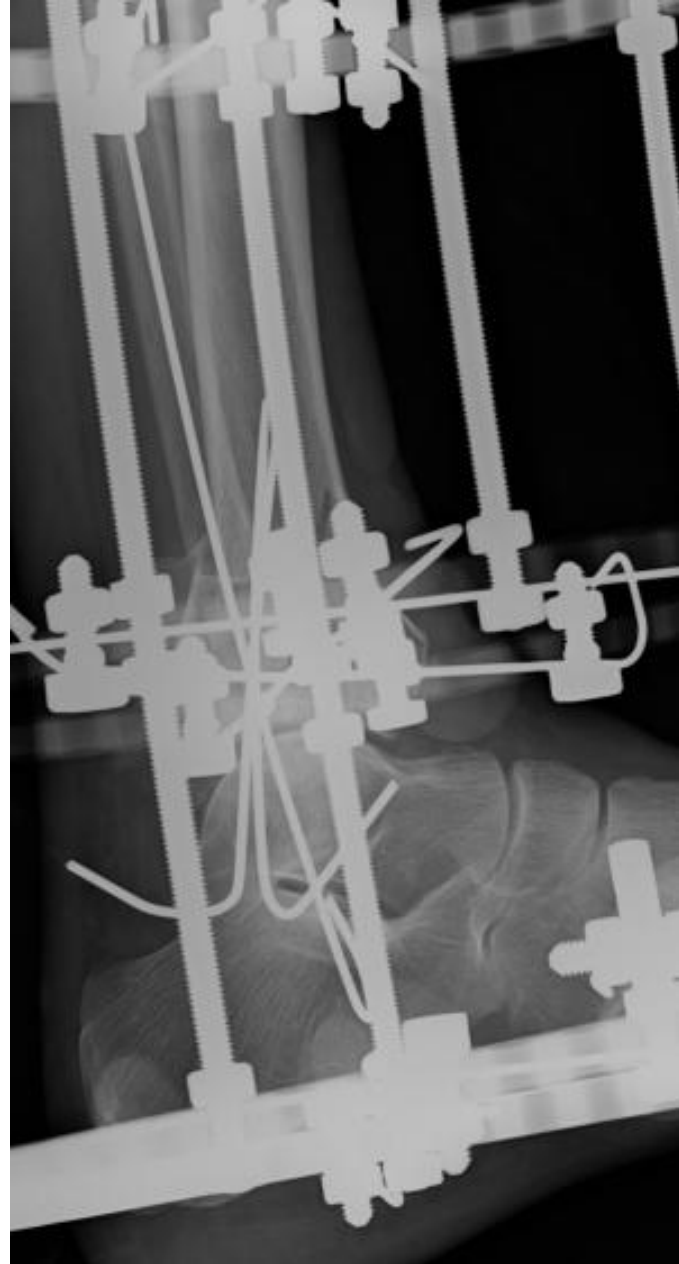
02/04/25

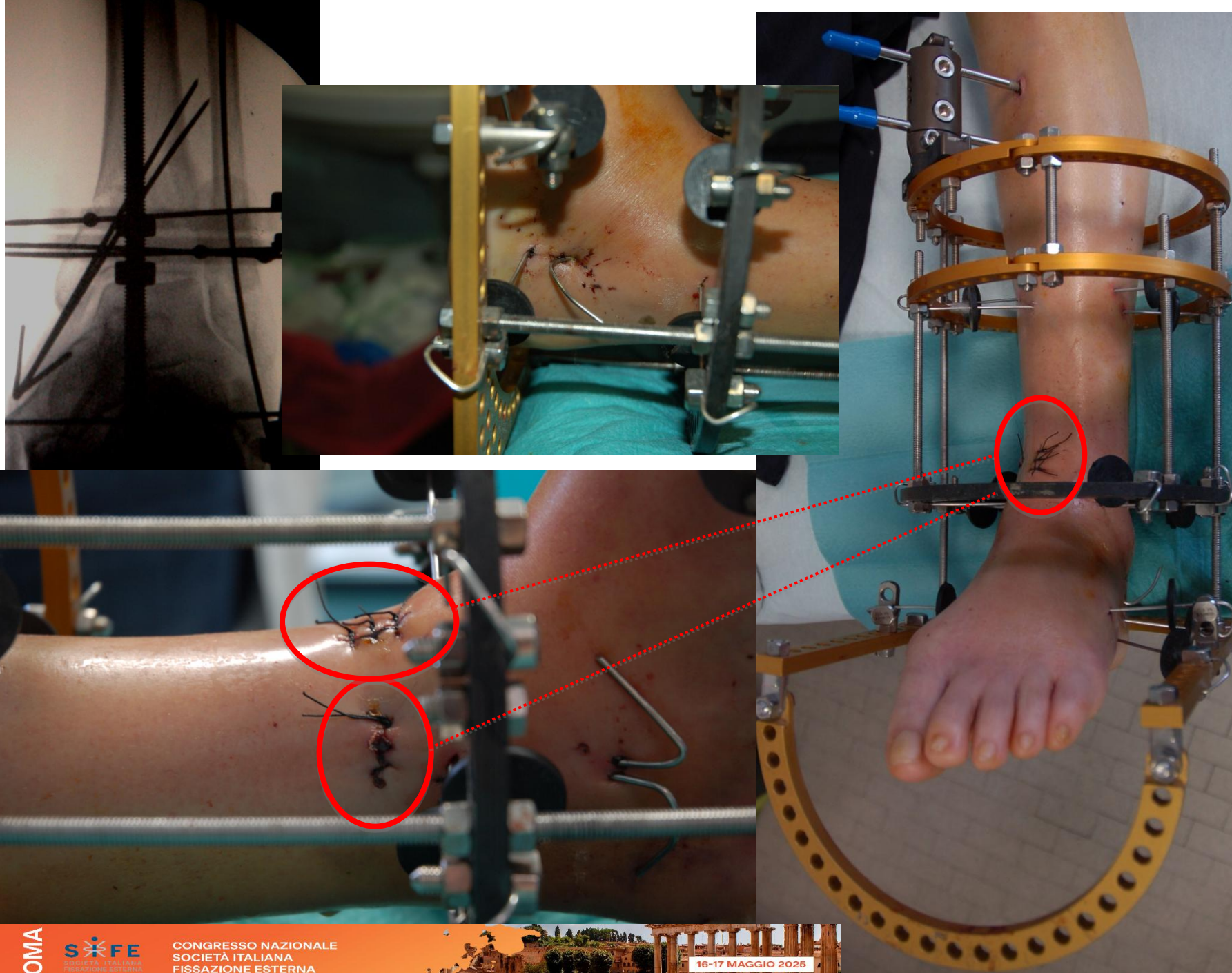


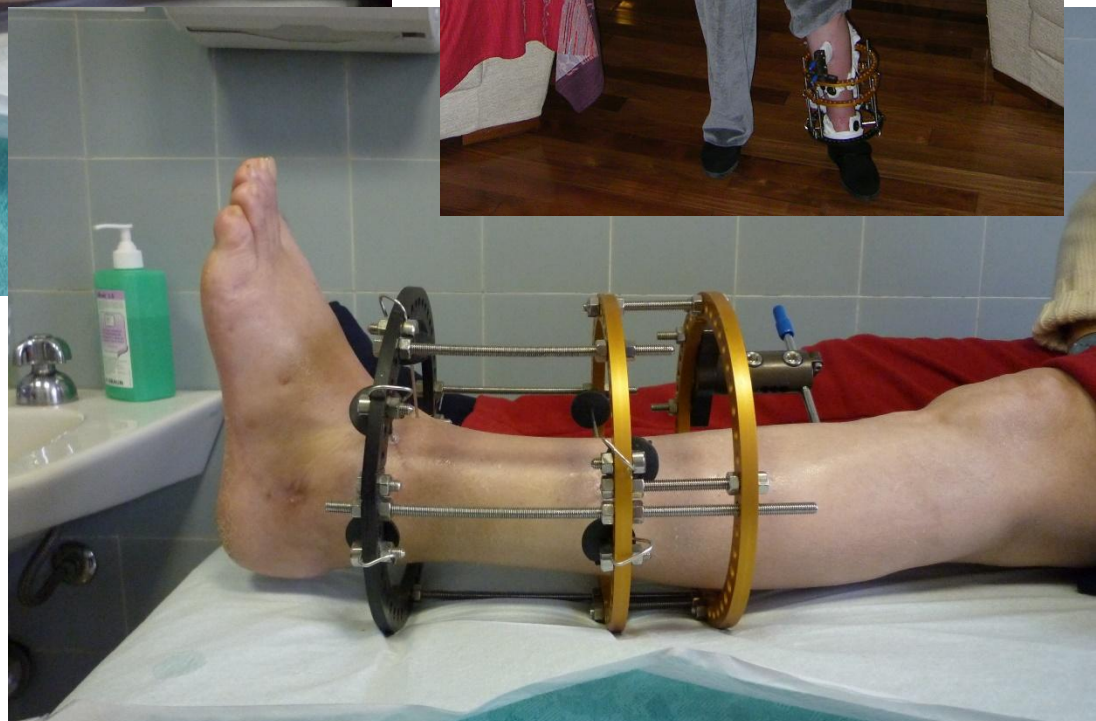
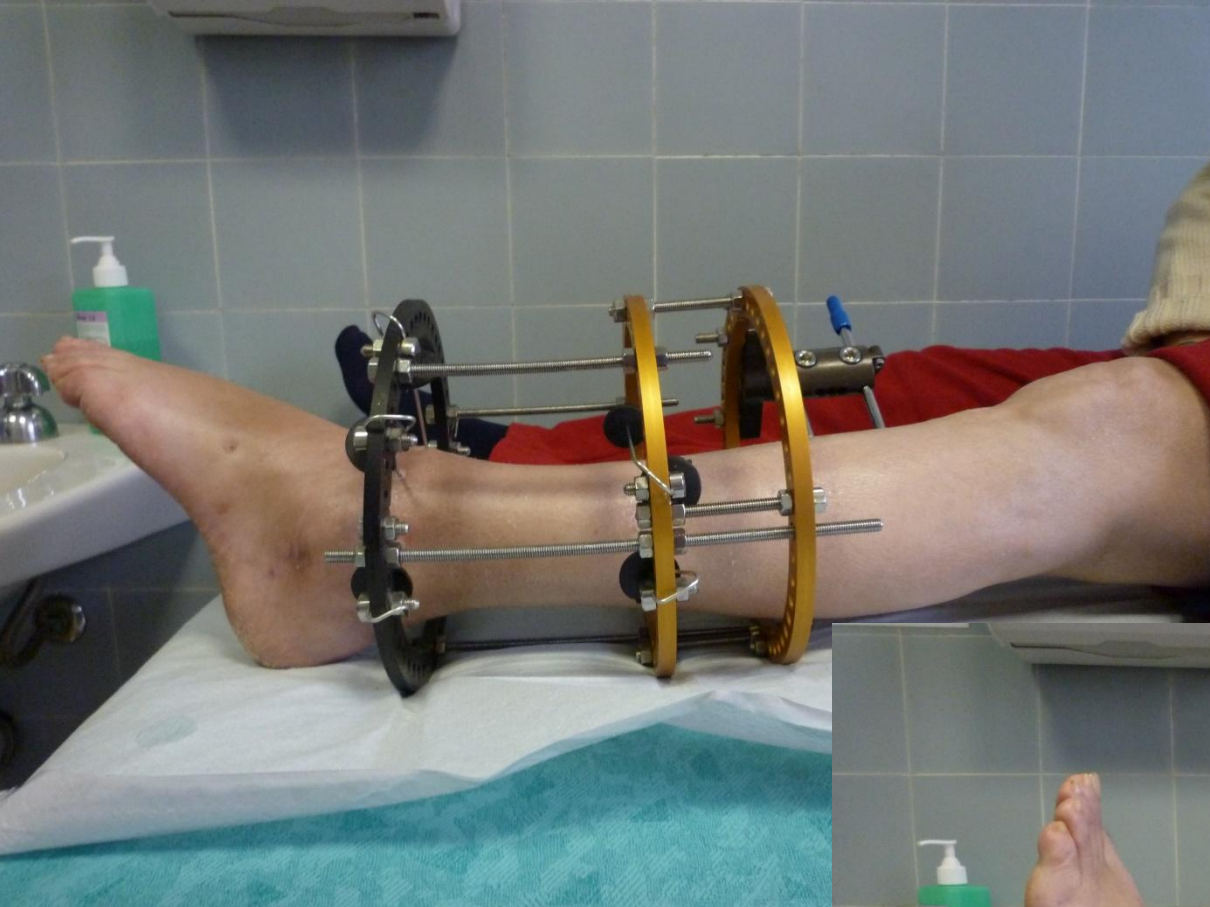
F.C., f, 60 anni, trauma ad alta energia

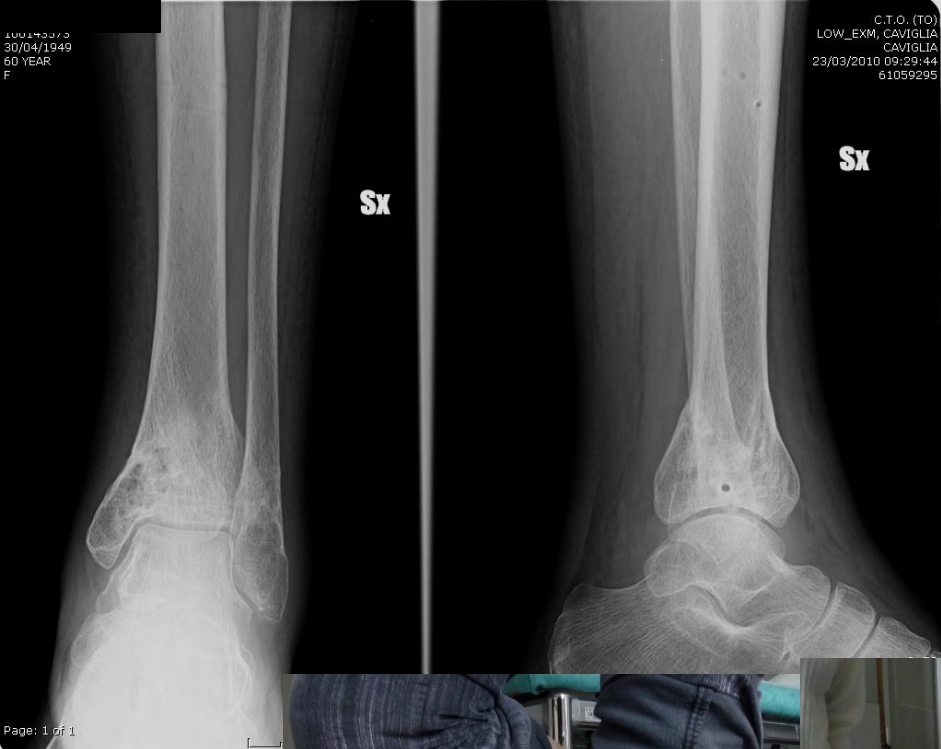








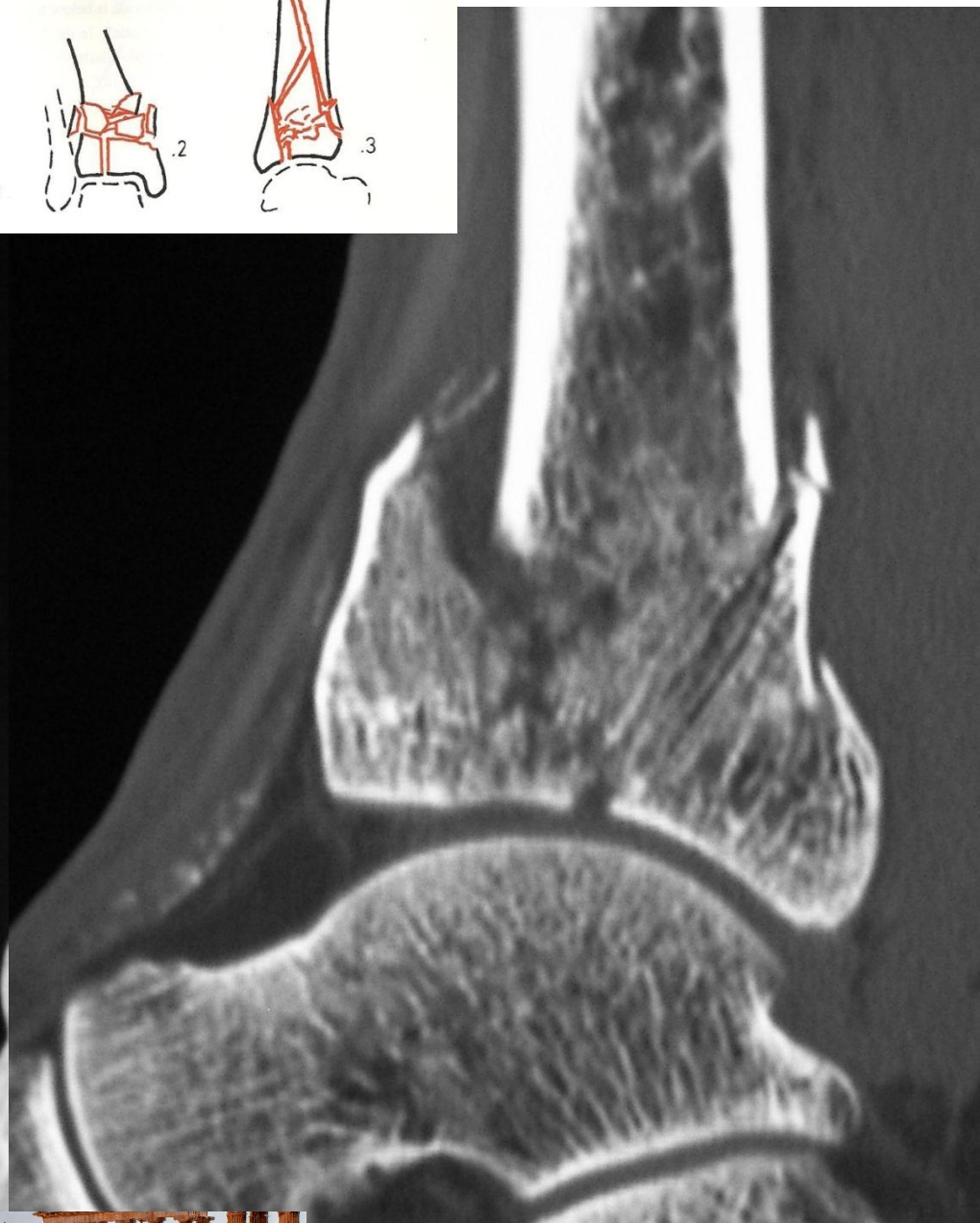
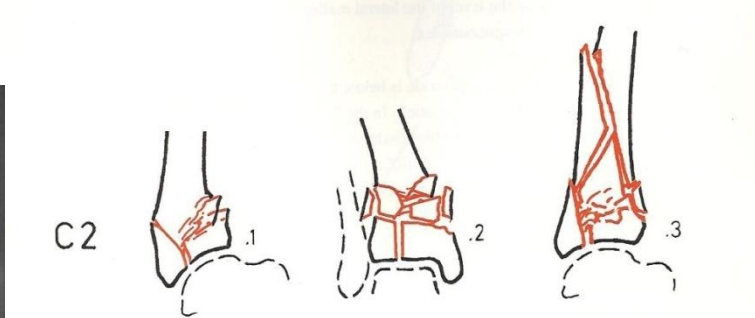
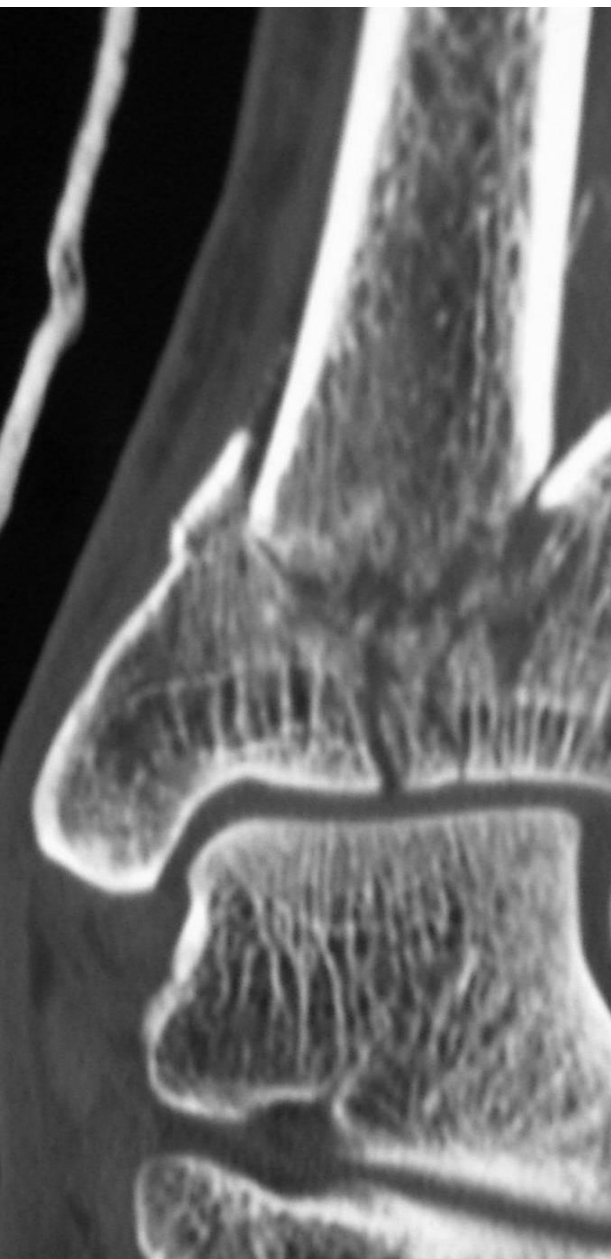


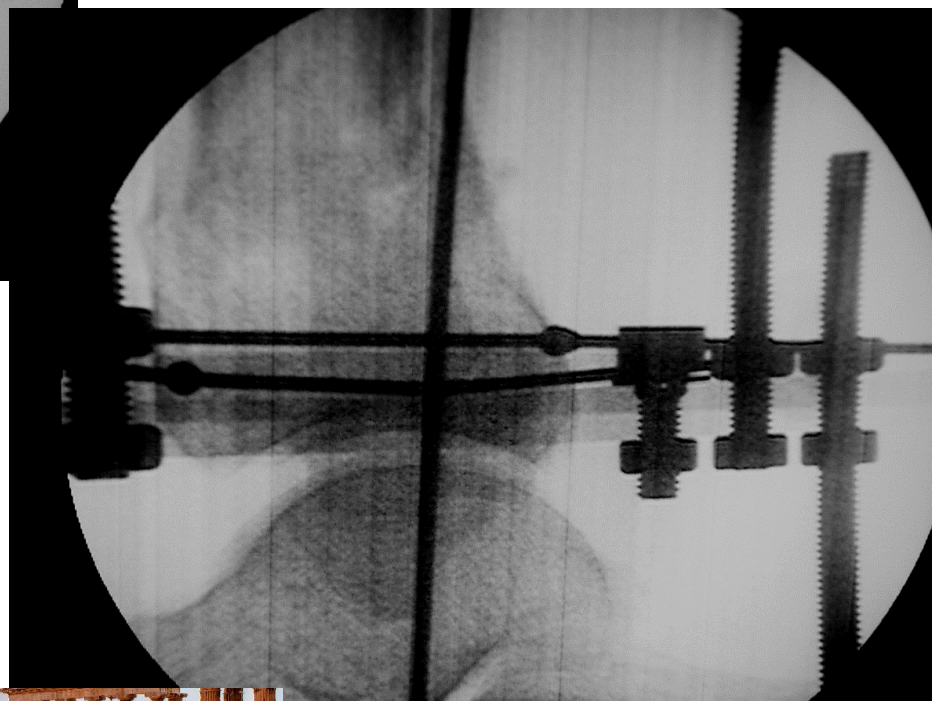
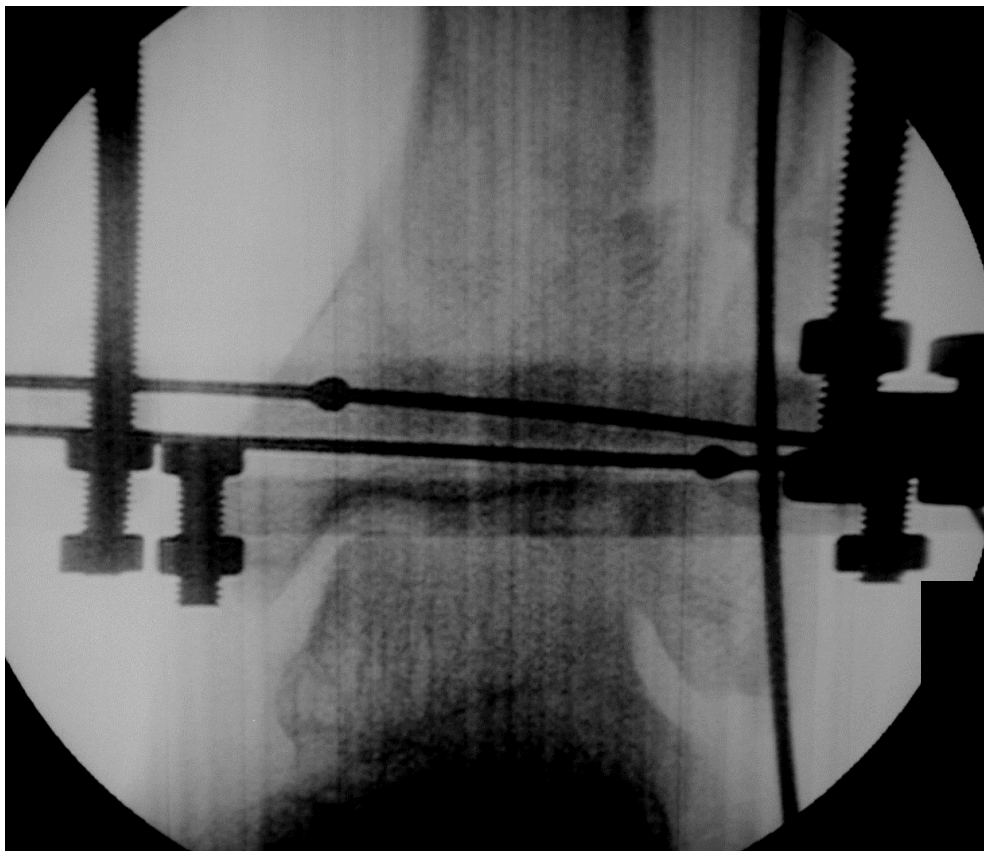


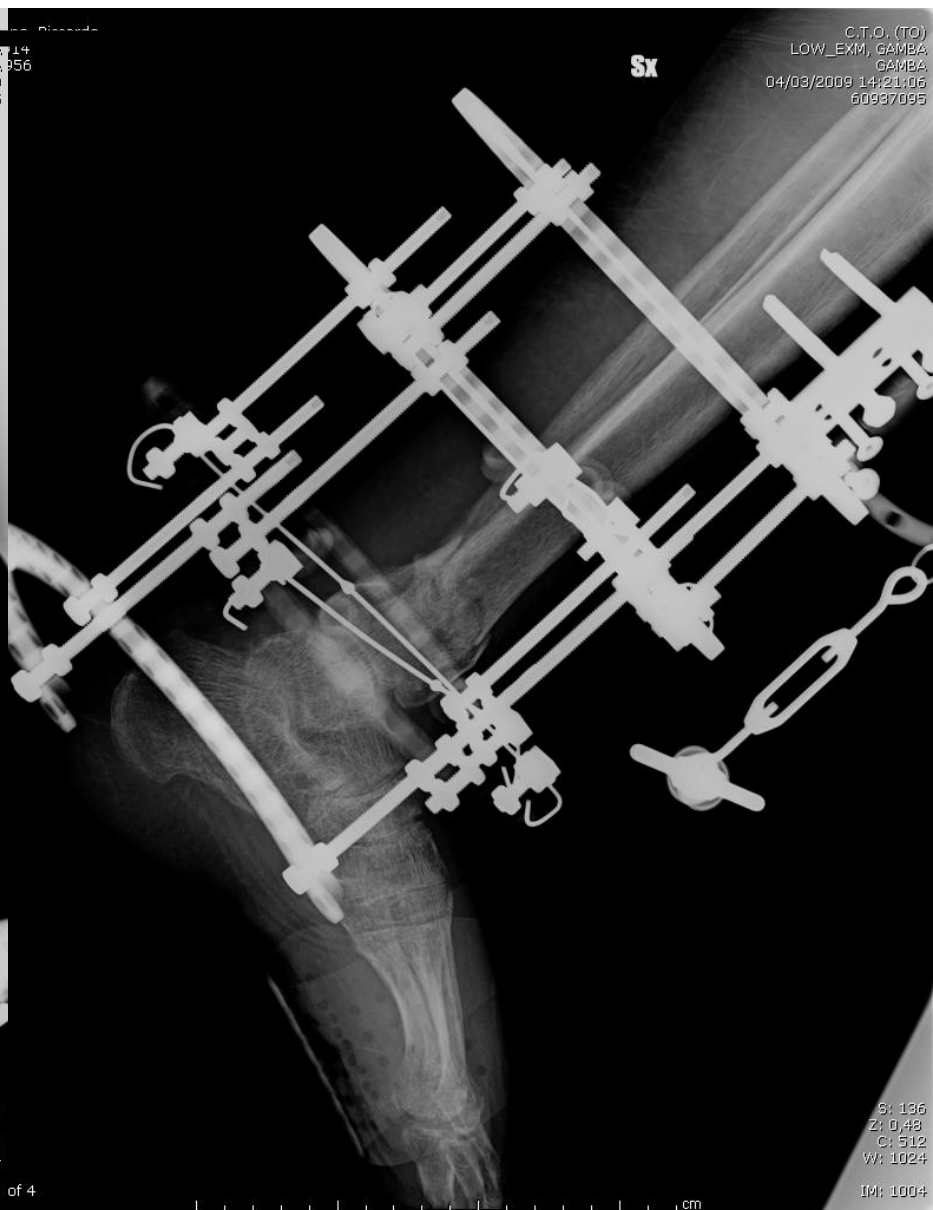
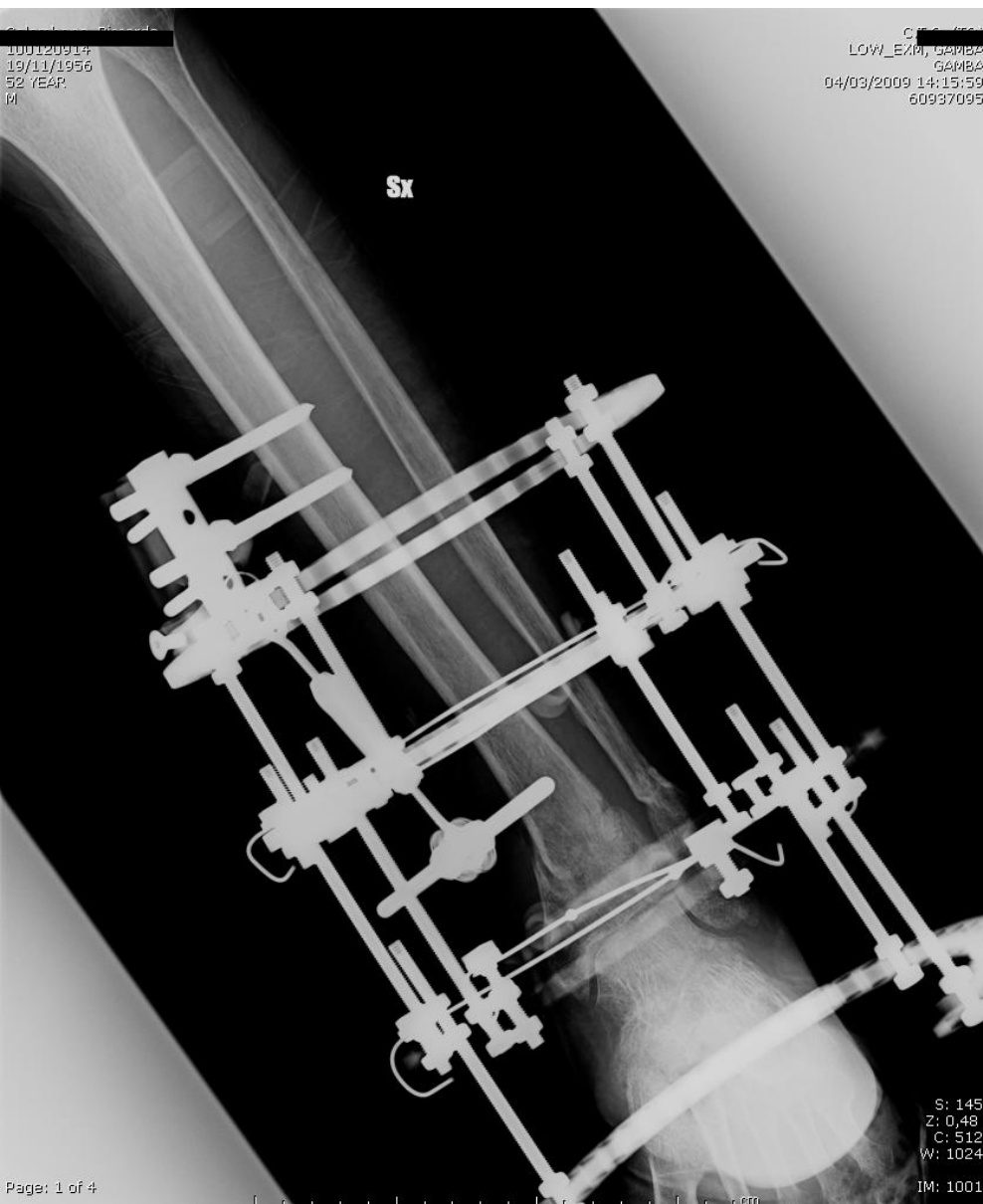
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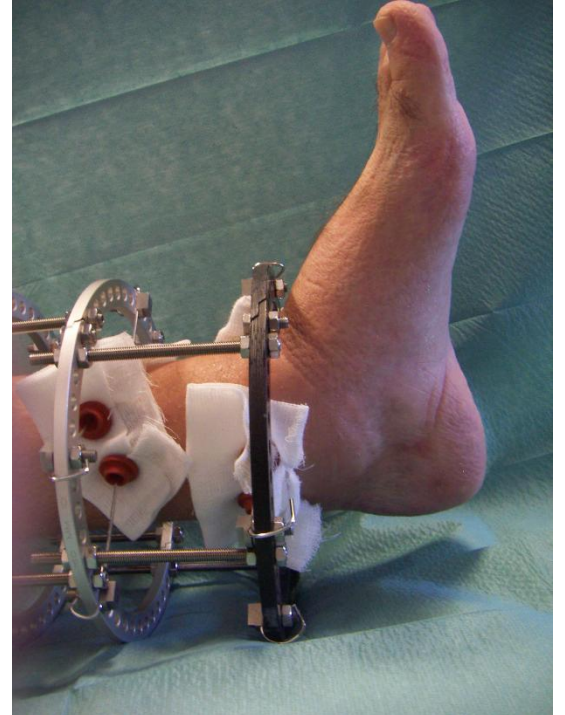
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CAVIGLIA
23/03/2010 09:29:44
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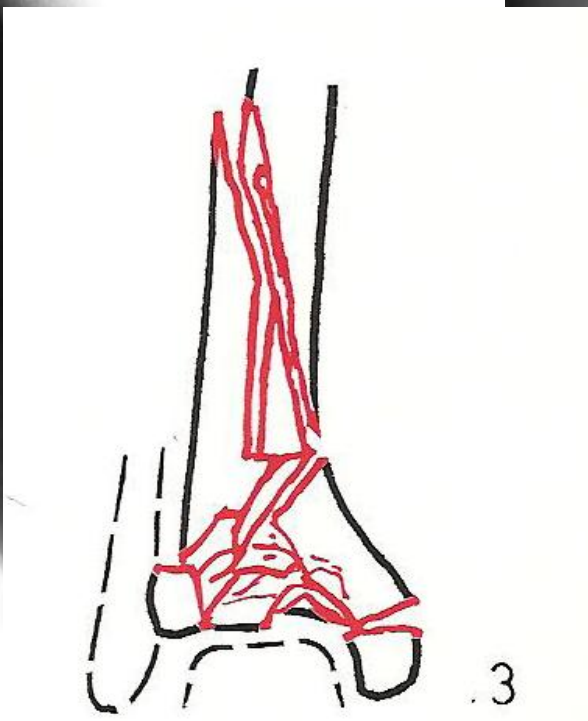




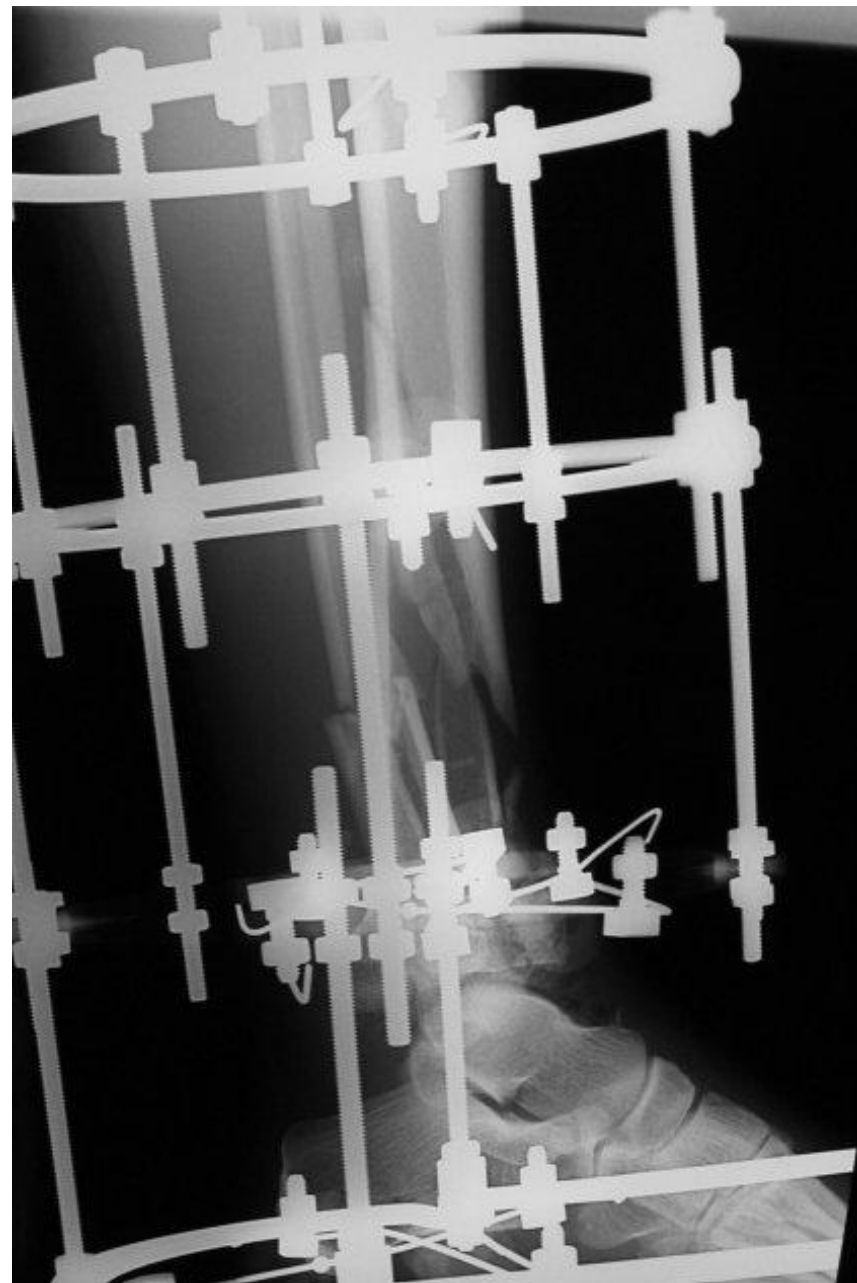
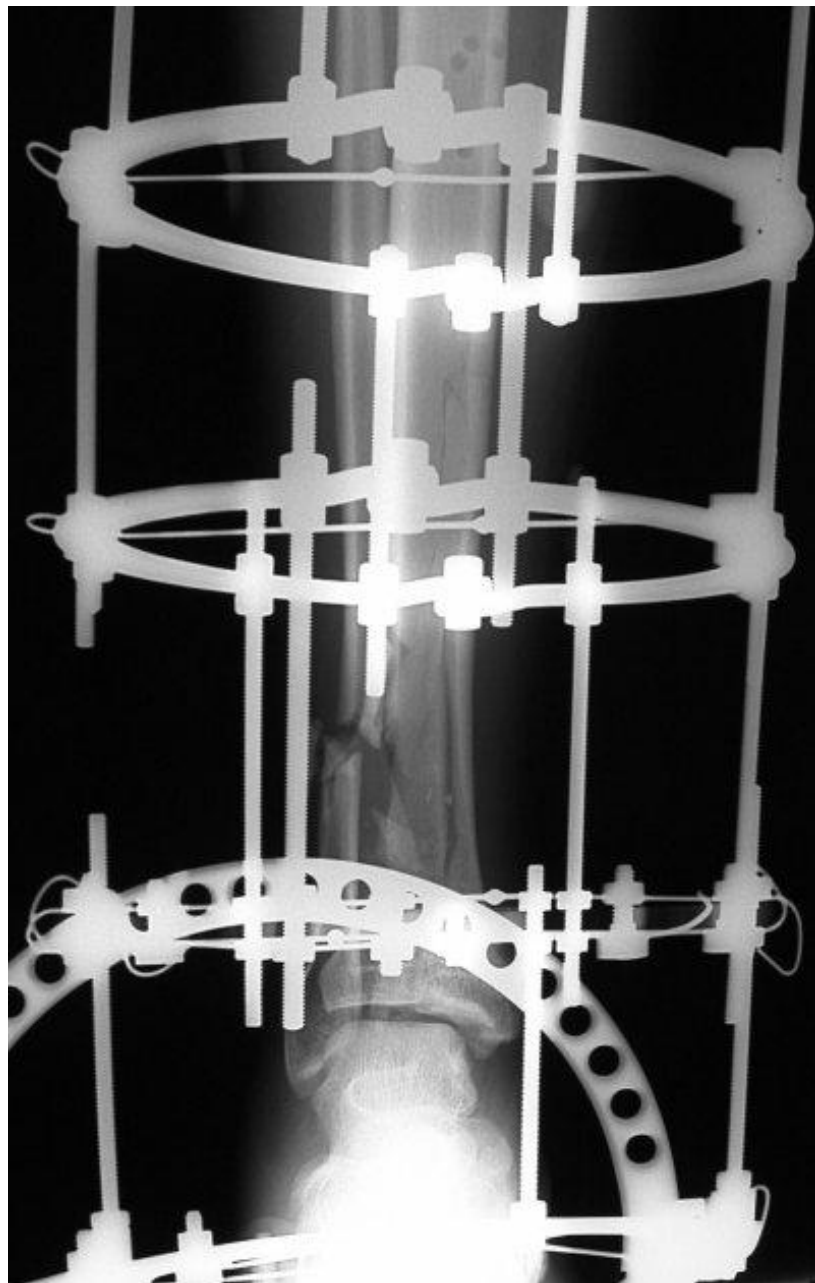










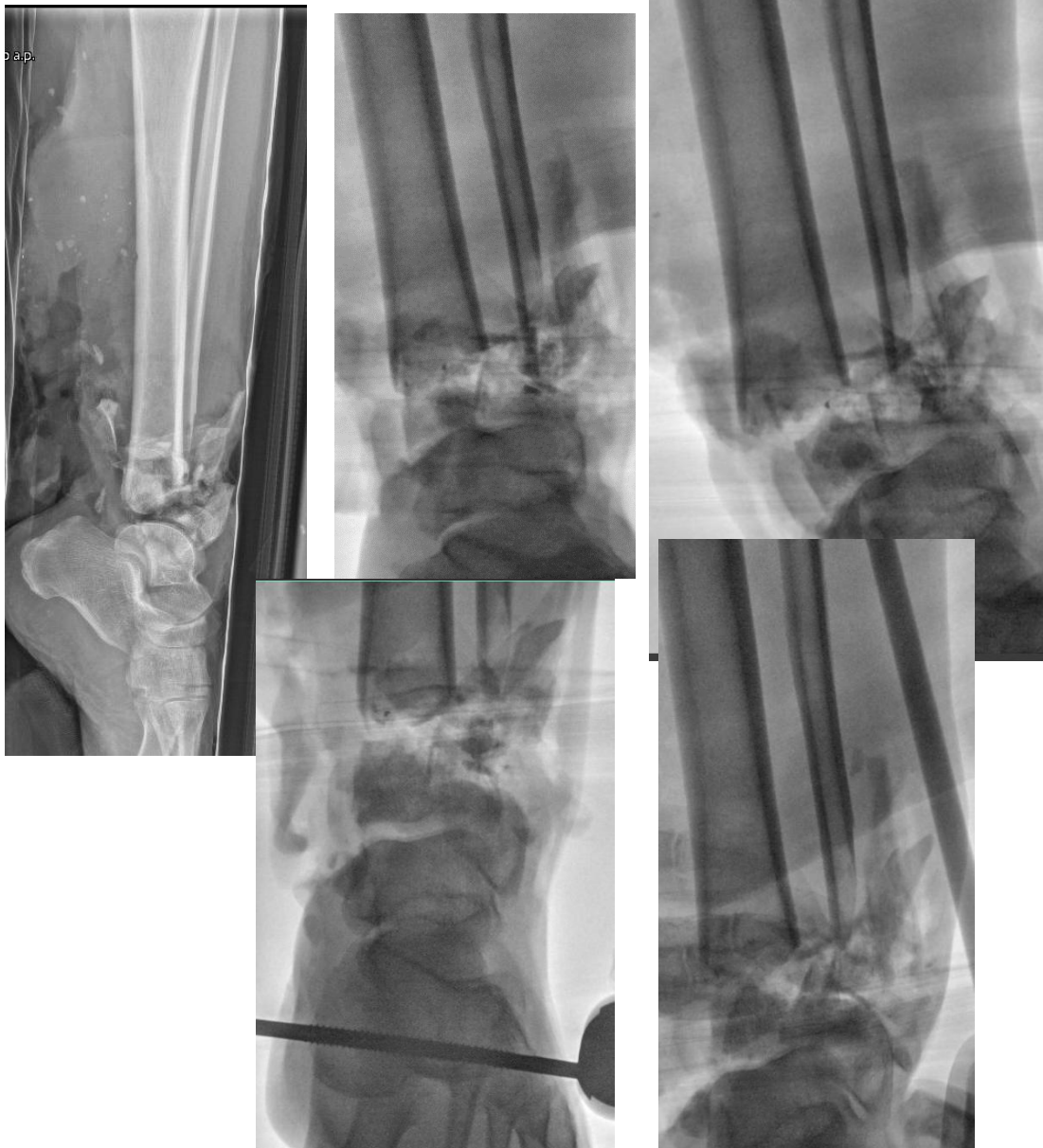


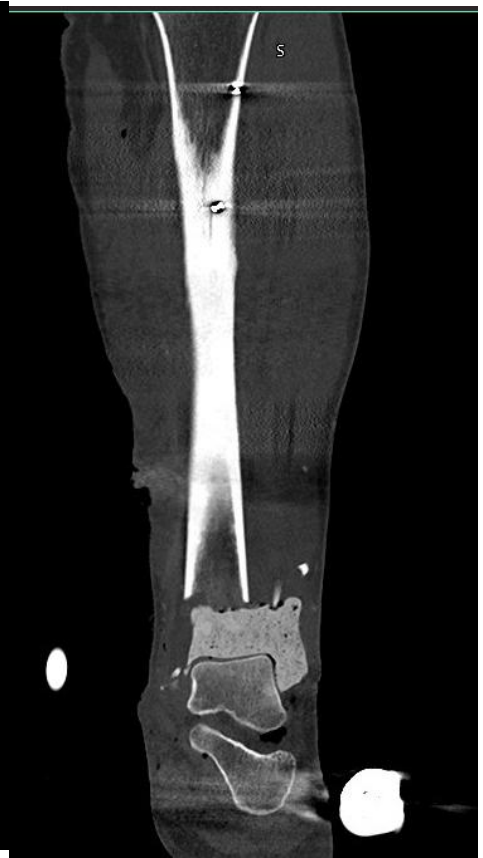


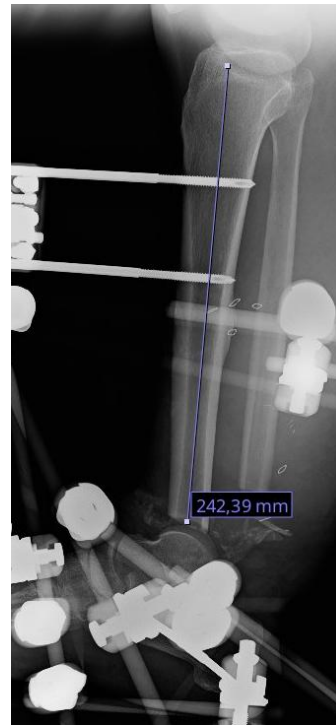
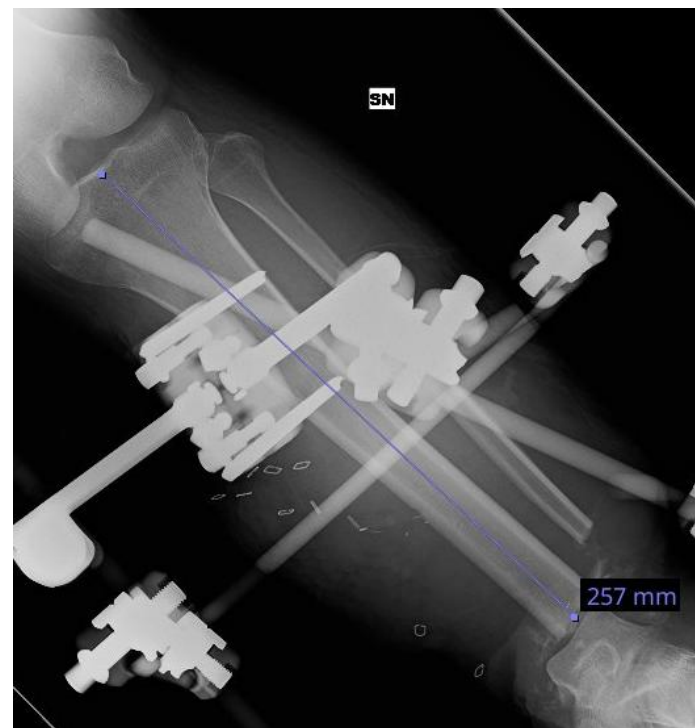
F.U. 3
aa.

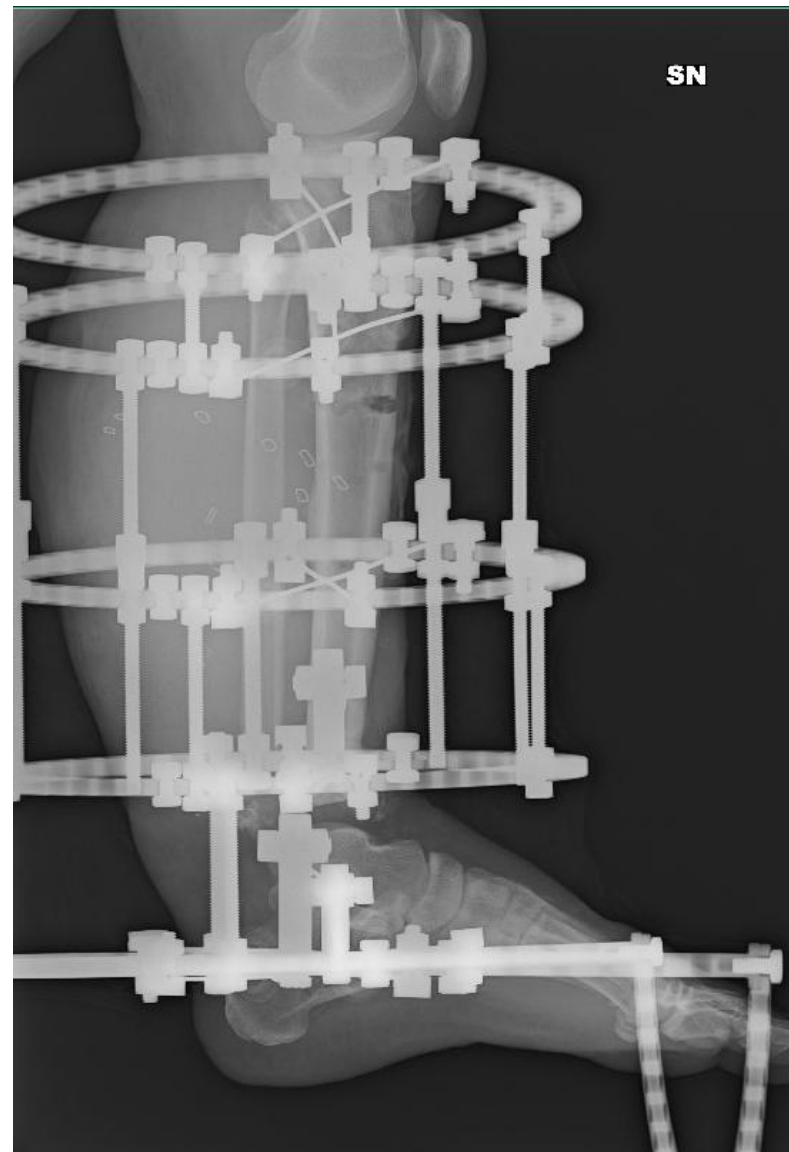
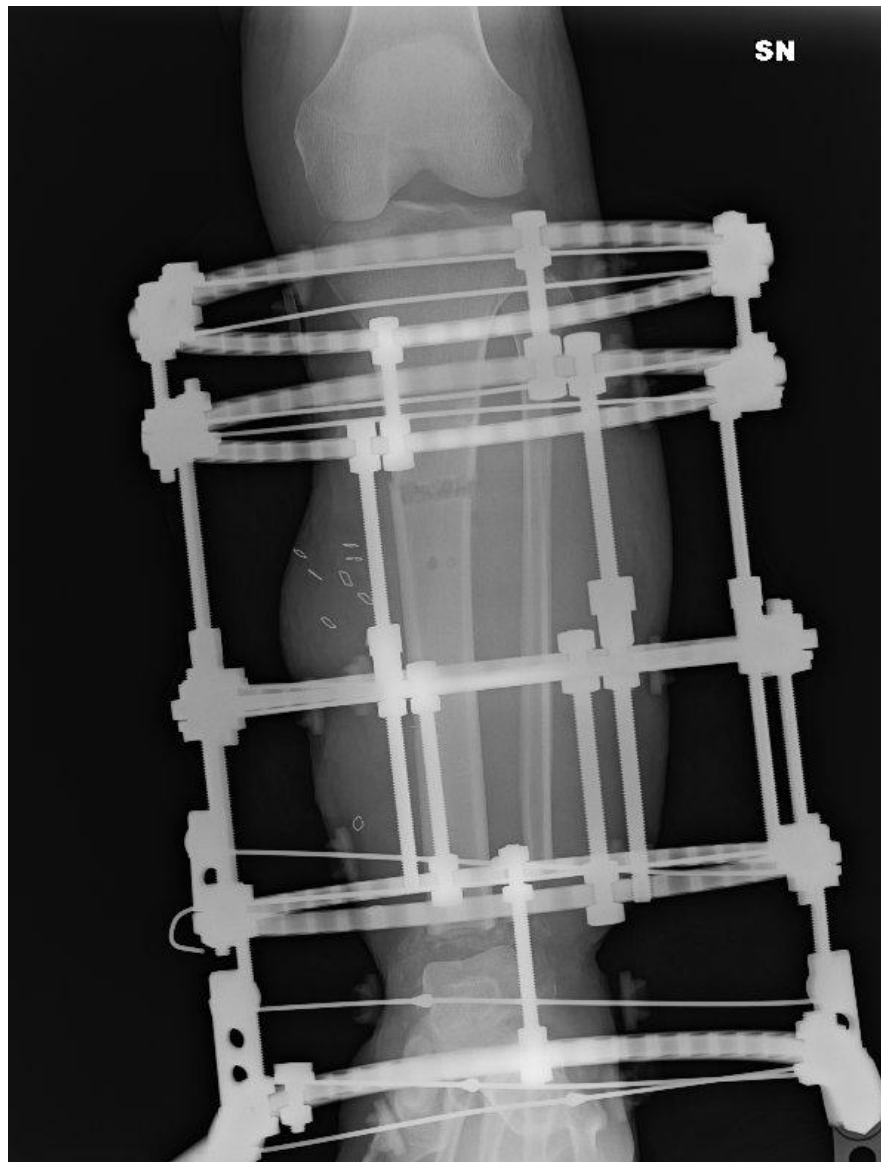


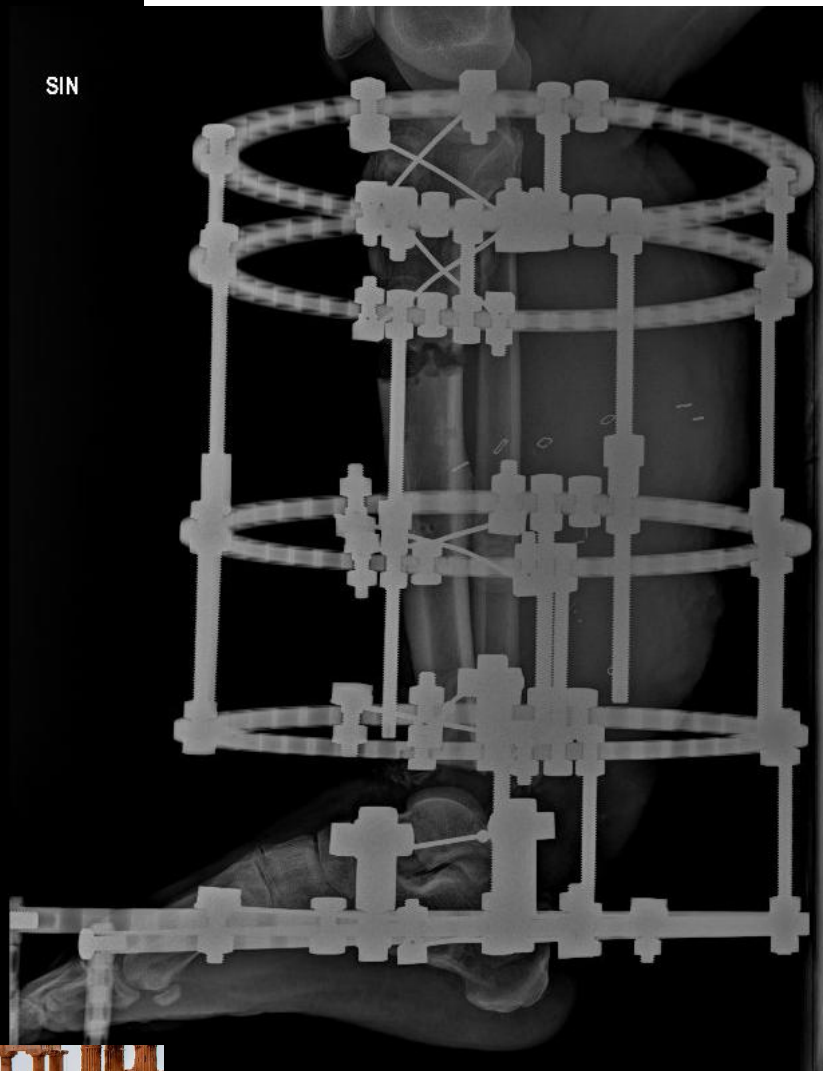
D.T. f 48



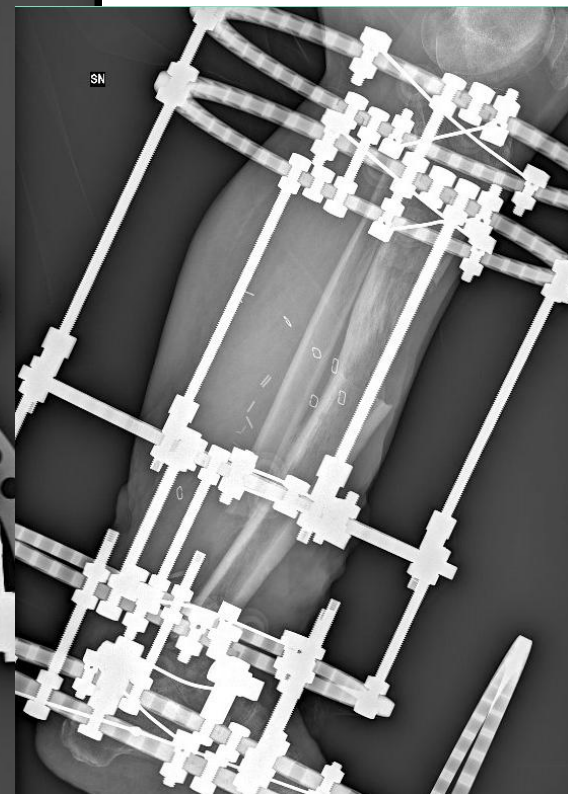
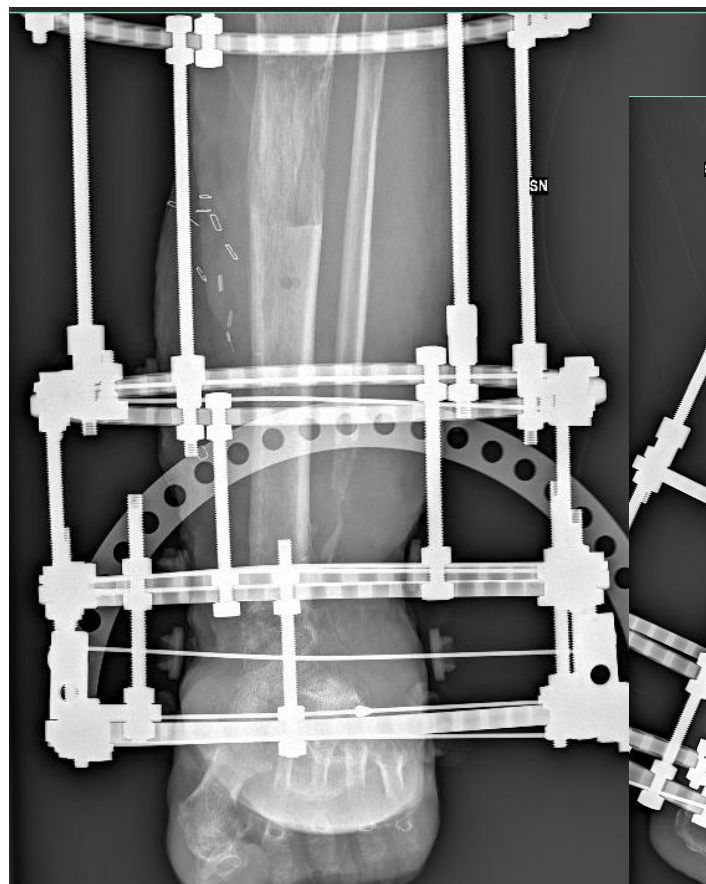
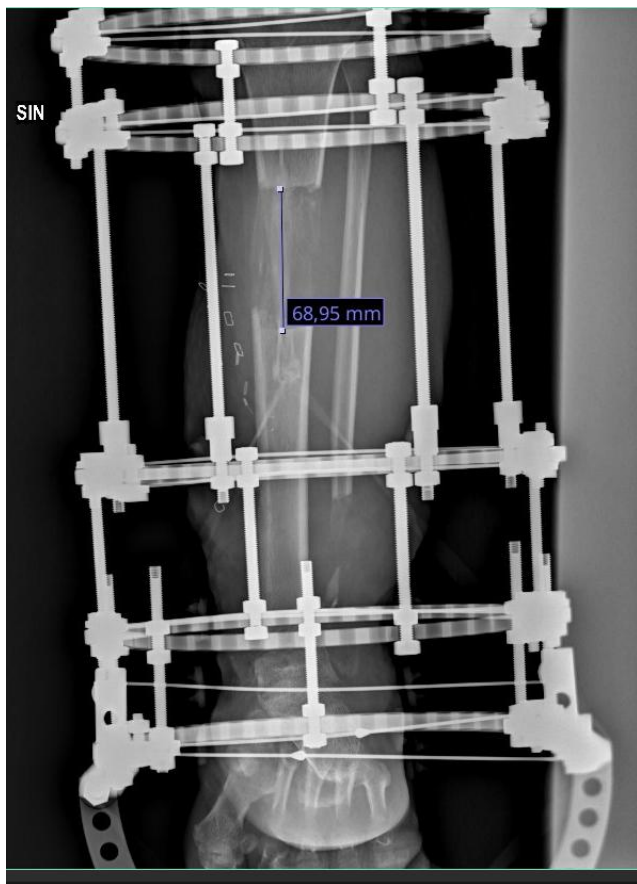
















Casistica dal 2015 al 2022

Interventi: 72

Controllati: 56 (77%)

Dati tel.: 5

Deceduti: 1

Persi: 3

AO Classification:

43C1: 15

43C2: 21 (6 esposte)

43C3: 36 (13 esposte)

Eta' media: 40,3 aa (range 23-77)

F-UP medio 27 mm (range 8-40)

Sistemi impiegati:

FE esapodalico : 11

Ilizarov: 61

- Score AOFAS : 69/100
- TEMPO medio di GUARIGIONE: 26 settimane

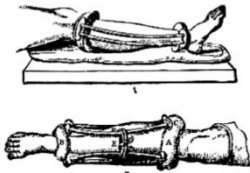
Complicanze:

- Infezioni profonde: **1** (sequestrectomia)
- Flogosi superficiale: 20%
- Vizi di consolidazione $> 10^\circ$: NO
- Artrodesi : 3/56

In conclusione: il fissatore esterno circolare si configura come una strategia terapeutica avanzata e versatile per le fratture complesse del pilone tibiale. La sua capacità di combinare stabilità meccanica con rispetto dei tessuti molli lo rende particolarmente indicato nei casi più difficili, contribuendo a migliorare gli esiti funzionali e a ridurre le complicanze a lungo termine. Tuttavia, richiede competenza tecnica e un'attenta gestione postoperatoria per massimizzare i benefici.

Nessuna tecnica è universalmente superiore all'altra; la decisione terapeutica deve considerare il profilo di rischio individuale. La fissazione esterna rappresenta una valida alternativa soprattutto in presenza di tessuti molli compromessi o fratture altamente comminute.

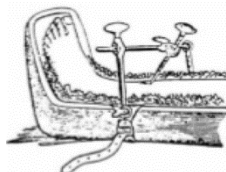
IPPOCRATE 400 a.C



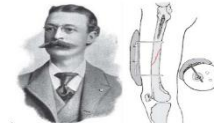
1843 MALGAIGNE



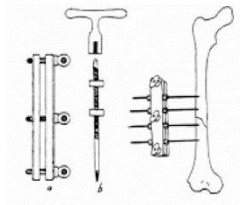
1839 KEETLEY



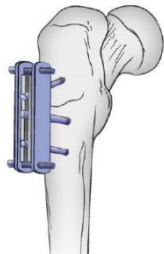
1897 KEETLEY



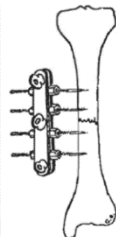
1897 PARKHILL



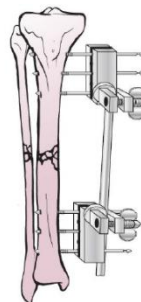
1900 FREEMAN



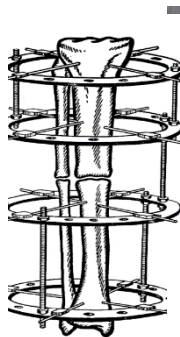
1902 LAMBOTTE



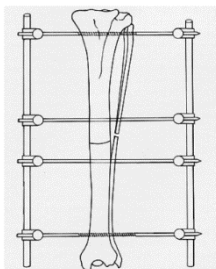
1938 HOFFMANN



1950 ILIZAROV



1938 ANDERSON



**In sostanza e verita' tutto questo
non e' nient'altro che un gioco**

Il mondo salvato dai ragazzini E. Morante

