



Quattrini Fabrizio – Maniscalco Pietro

Il Pilone Tibiale: cosa fare cosa non fare



SERVIZIO SANITARIO REGIONALE
EMILIA-ROMAGNA
Azienda Unità Sanitaria Locale di Piacenza



UNIVERSITÀ
DI PARMA

Dipartimento di Chirurgia
U.O. Ortopedia e Traumatologia Piacenza



THERMAE
DI SALSOMAGGIORE



DODICESIMO CONVEGNO DI TRAUMATOLOGIA CLINICA E FORENSE
19° Corso di Ortopedia, Traumatologia e Medicina Legale

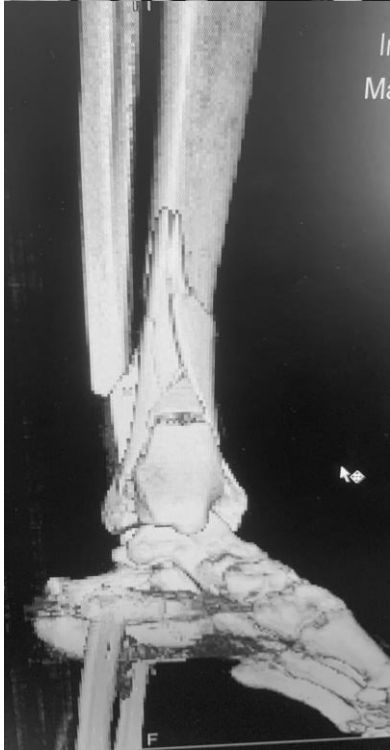
Presidenti
F.M. Donelli, M. Gabbrielli, C. Varacca

4-5 Novembre 2022
Salsomaggiore Terme (PR)



Foto Colombo/FIDAL


Yassine Rachik
Maratoneta olimpico



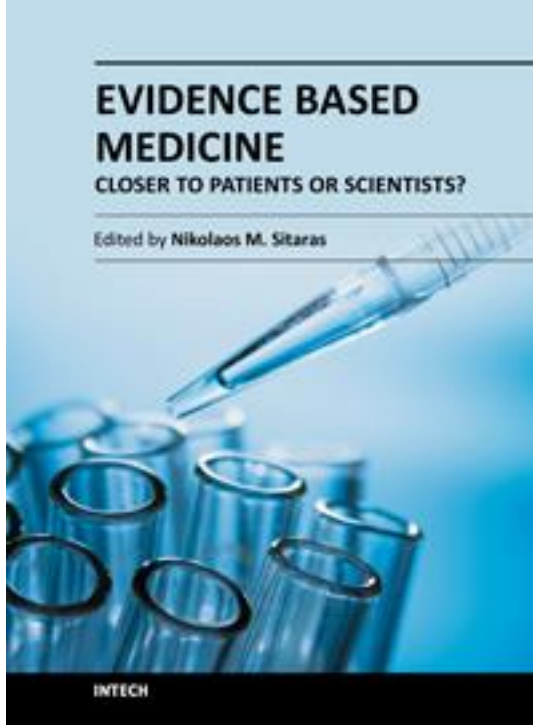




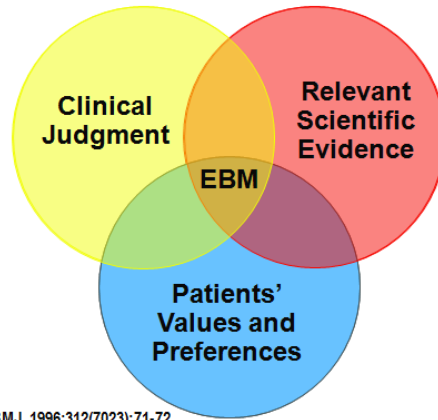
20%
esposte







What Is Evidence-Based Medicine?

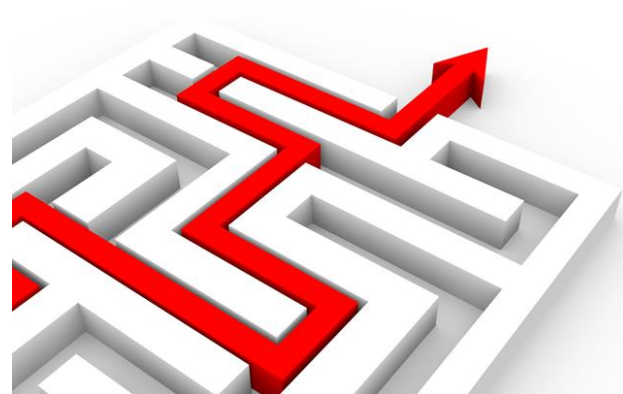


Sackett DL, et al. BMJ. 1996;312(7023):71-72.

Cure appropriate

Recupero Clinico Ottimale del Paziente

Autotutela del Medico



Fratture di pilone tibiale

Evidence summary

> Literature summary for distal tibia fractures

2. Operative treatment:

- Studies comparing open reduction with internal fixation (ORIF) with external fixation reveal no statistically significant differences in treatments.
- Pooled estimates of total complications for ORIF, hybrid ORIF, and external fixation indicate no statistically significant differences. However, ORIF may have a slightly lower rate of complications than external fixation.
- Studies comparing ORIF with external fixation for distal tibia fractures indicate that functional outcomes are similar.

Fratture da compressione ad alta energia Associate ad alte % di complicanze ed a Risultati scadenti

- ORIF may have advantages over other techniques, based on reported complication rates around 2%, with the exception of skin necrosis which was high (13%).
- IM nailing with screws, may have comparable complication rates to ORIF. Further studies are needed to confirm this.
- Studies of types B and C fractures indicate that: ORIF may have high rates of arthritis (62%) and limited range of motion (55%), infection (17%), revision (17%), and arthrodesis (17%).

Prognosis of distal tibia fractures

- High energy compression pilon fractures may be associated with high complication rates and poor outcomes.

COMPLICANZE 11-54%

- Necrosi Cutanea } 9-30%
- Sofferenze ferita } 9-30%
- Scomposizioni secondarie
- Viziose Consolidazioni 6-14%
- Pseudoartrosi 5%
- Complicanze Infettive 5-15%
- Artrosi Post-traumatica

Fratture di pilone tibiale

Evidence summary

> Literature summary for distal tibia fractures

2. Operative treatment:

- Studies comparing open reduction with internal fixation (ORIF) with external fixation (EF) reveal no statistically significant differences in treatments.
- Pooled estimates of total complications for ORIF, hybrid ORIF, and EF indicate no statistically significant differences. However, skin necrosis is slightly lower for ORIF than either hybrid ORIF or EF.
- Studies comparing ORIF with hybrid ORIF indicate no statistically significant differences in functional outcomes.

O.R.I.F.

**Vantaggiosa rispetto ad altre metodiche
Con l'eccezione di una alta % di necrosi
cutanea**

Prognosis of distal tibia fractures

- High energy compression pilon fractures may be associated with high complication rates and poor outcomes.

Il risultato finale dipende da:

• Energia del trauma



• Compromissione dei tessuti molli

• Esperienza e scelte del chirurgo

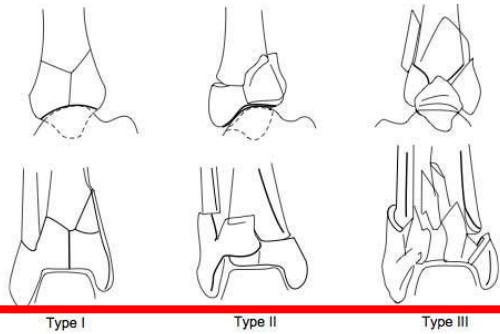
«Primum Non Nocere, Secundum Cavere, Tertium Sanare»

1. non fare del male
2. agisci in sicurezza e con attenzione
3. favorisci la guarigione

medico *Scribonius Largus* della corte dell'imperatore Tiberio Claudio

Danno Tessuti Molli

Ruedi Allgower 1979



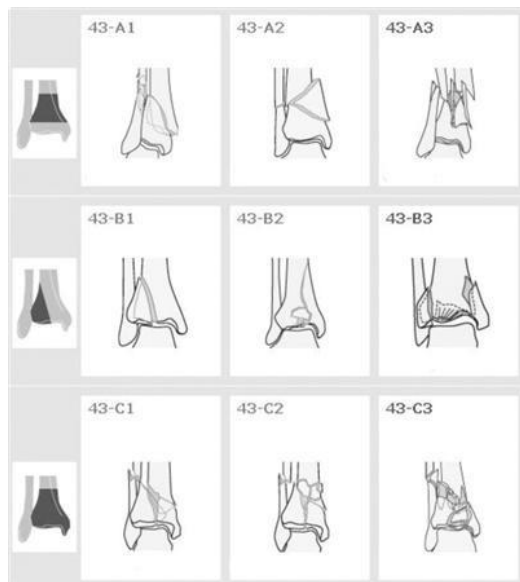
Type I Type II Type III

SKIN INJURY	
AO soft-tissue classification: closed skin lesions (IC).	
IC 1	No skin lesion
IC 2	No skin laceration, but contusion
IC 3	Circumscribed degloving
IC 4	Extensive, closed degloving
IC5	Necrosis from contusion

AO soft-tissue classification: open skin lesions (IO).	
IO 1	Skin breakage from inside out
IO 2	Skin breakage from outside in < 5 cm, contused edges
IO 3	Skin breakage from outside in > 5 cm, increased contusion, devitalized edges
IO 4	Considerable, full-thickness contusion, abrasion, extensive open degloving, skin loss
IO5	Extensive degloving

Thomas Rüedi: "A fracture is first and foremost a soft-tissue injury in which the bone happens to be broken!"

AO



MT 1		No muscle injury
MT 2		Circumscribed muscle injury, one compartment only
MT 3		Considerable muscle injury, two compartments

MT 4		Muscle defect, tendon laceration, extensive muscle contusion
MT 5		Compartment syndrome/crush syndrome with wide injury zone

NV 1		No neurovascular injury
NV 2		Isolated nerve injury
NV 3		Localized vascular injury

NV 4		Extensive segmental vascular injury
NV 5		Combined neurovascular injury, including subtotal or even total amputation

Tab 1.6-5 AO soft-tissue classification: muscle and tendon lesions (MT).

«Una necrosi della cute equivale dunque ad una soluzione di continuità della stessa»

Frattura con
grave sofferenza
cutanea



Frattura esposta



PUNTI CHIAVE

1. **Timing** Trattamento
2. **Planning** e scelta approccio chirurgico
3. Scelta mezzo di **Osteosintesi**

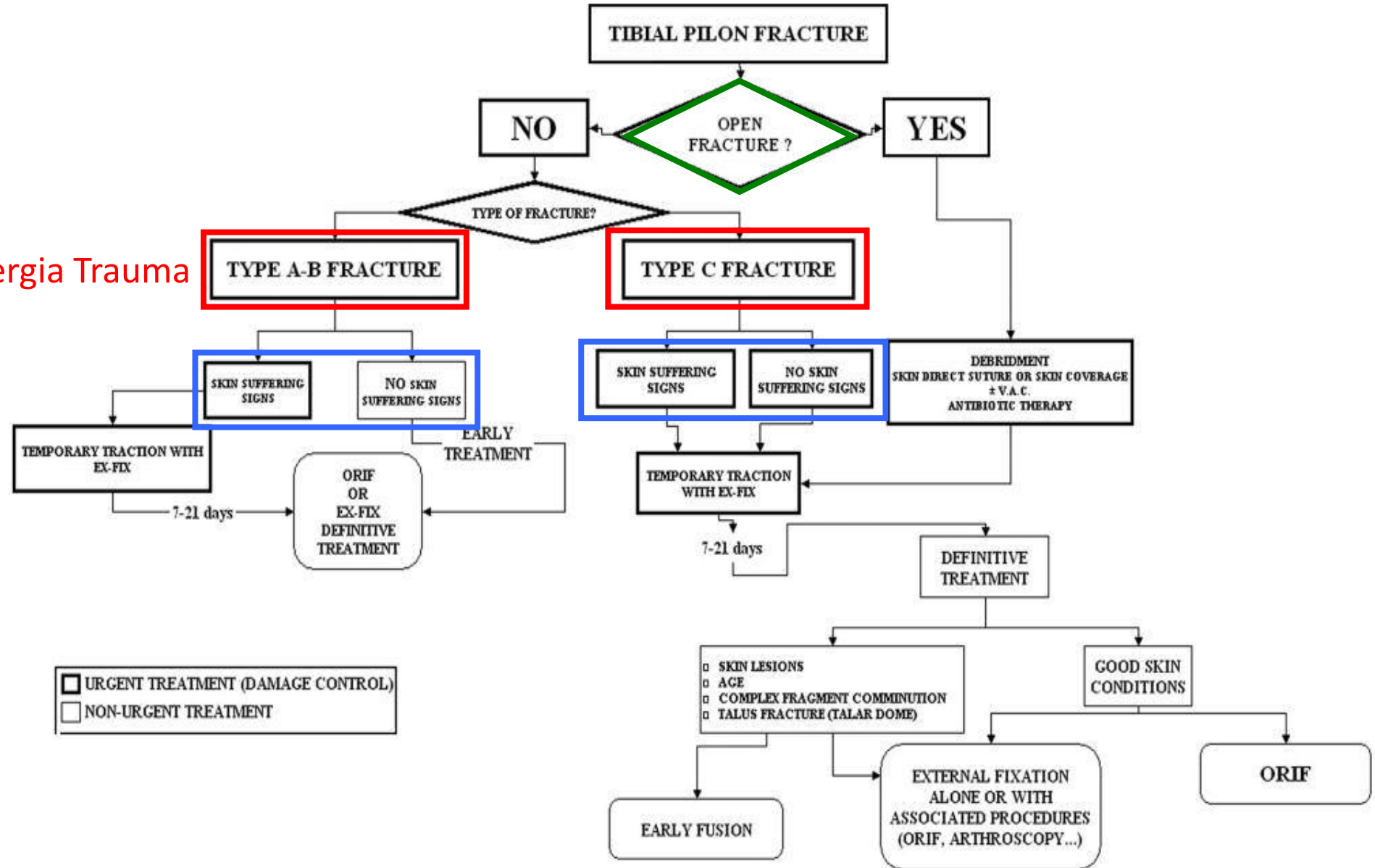


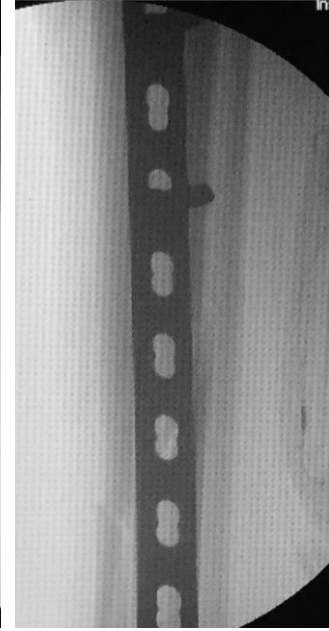
1.TIMING

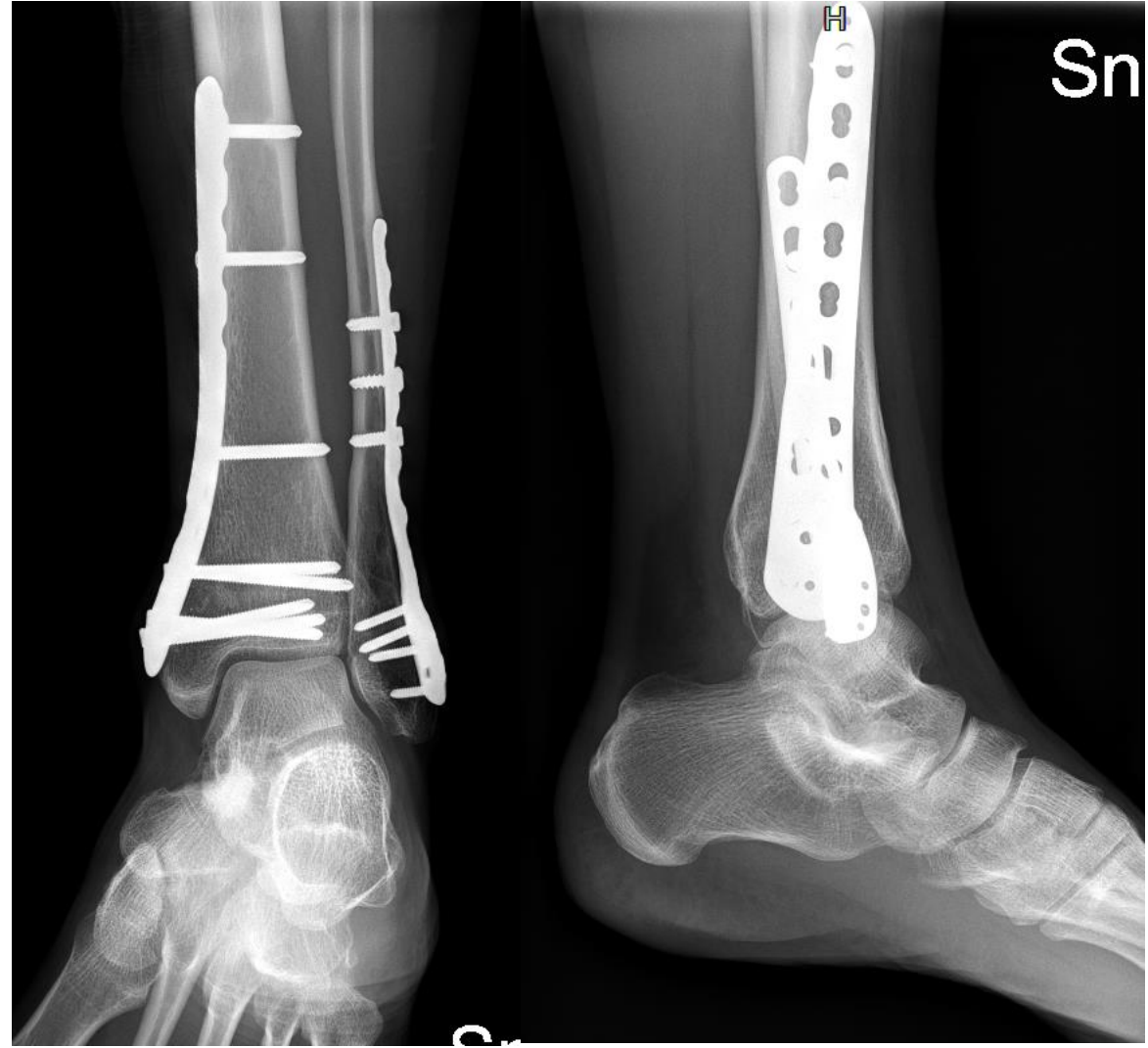
Esposta?

Tipologia Frattura = Energia Trauma

Tessuti Molli







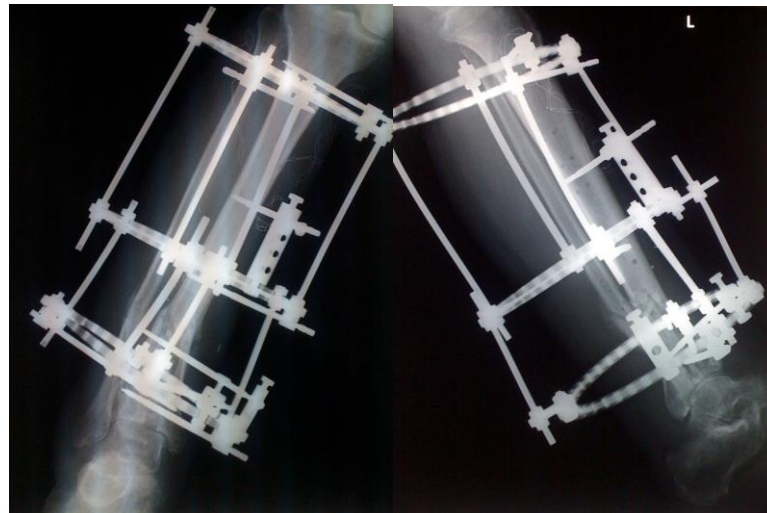
TIMING

Non rispettato: chirurgia in urgenza con sofferenza mediale



TIMING

Non rispettato

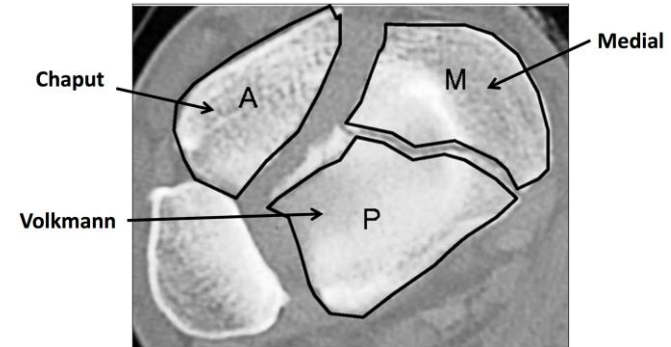


Procedura in due tempi

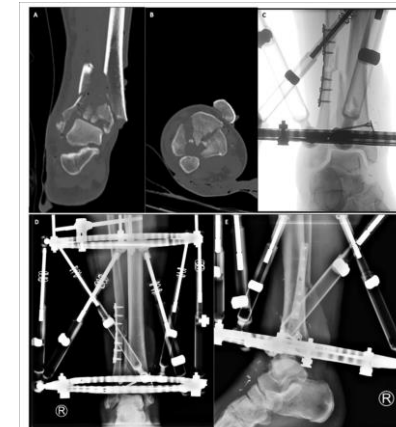
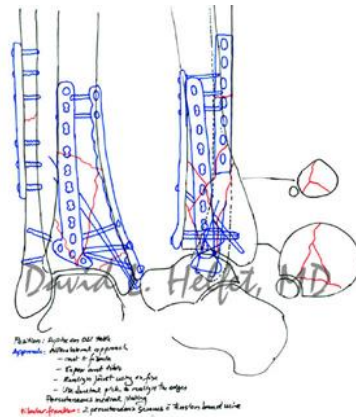
SPAN



SCAN



PLAN

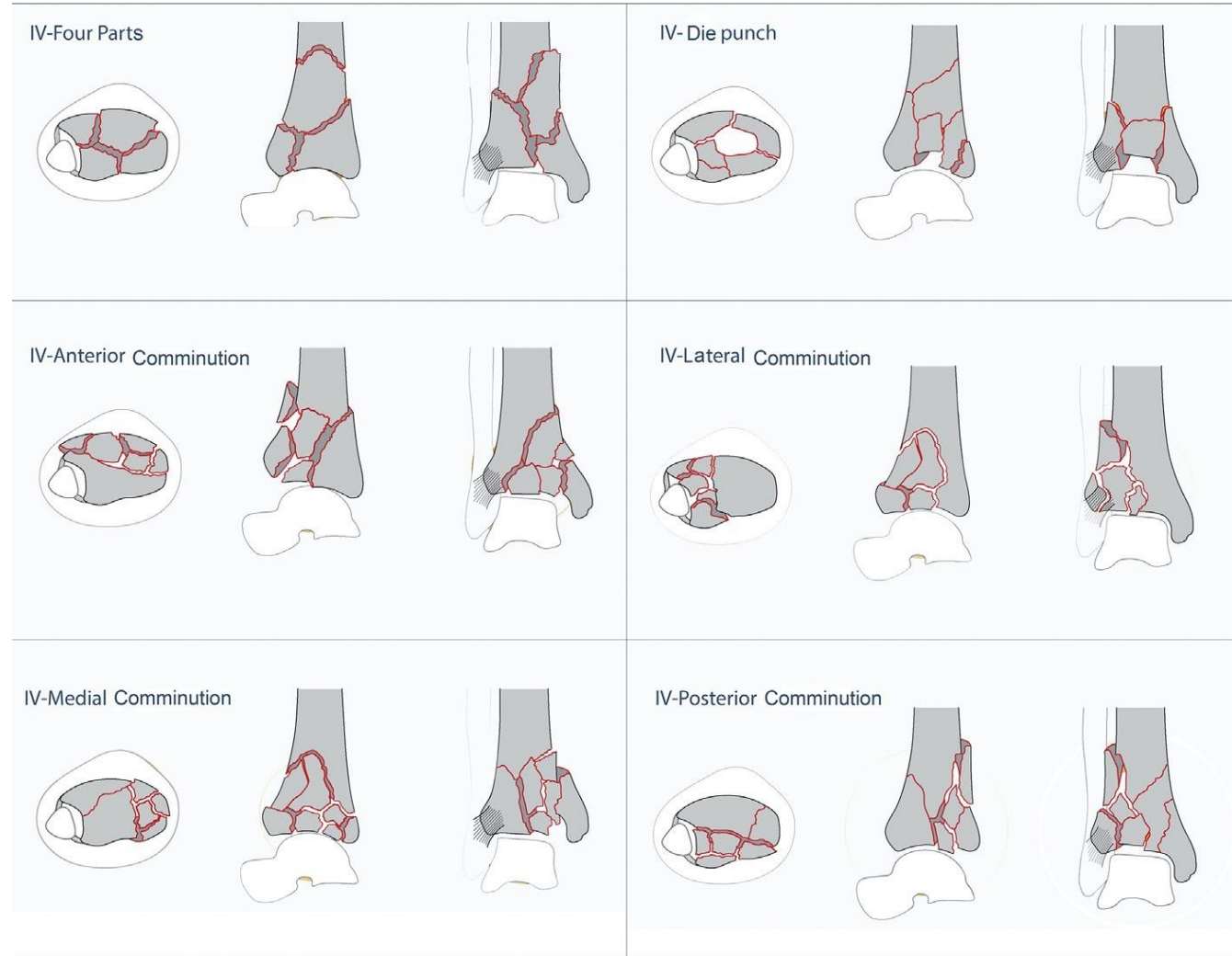


2. PLANNING

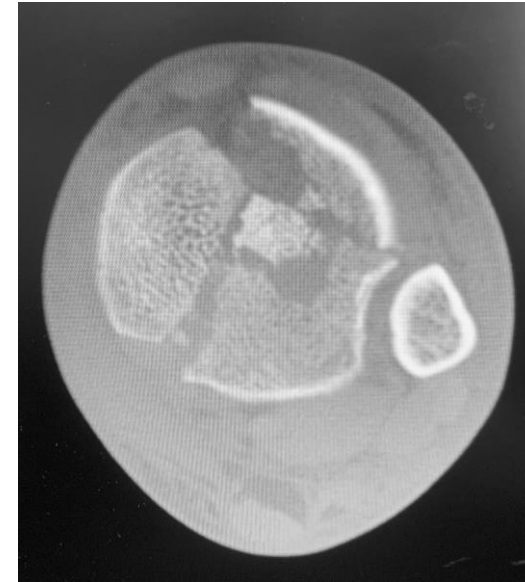
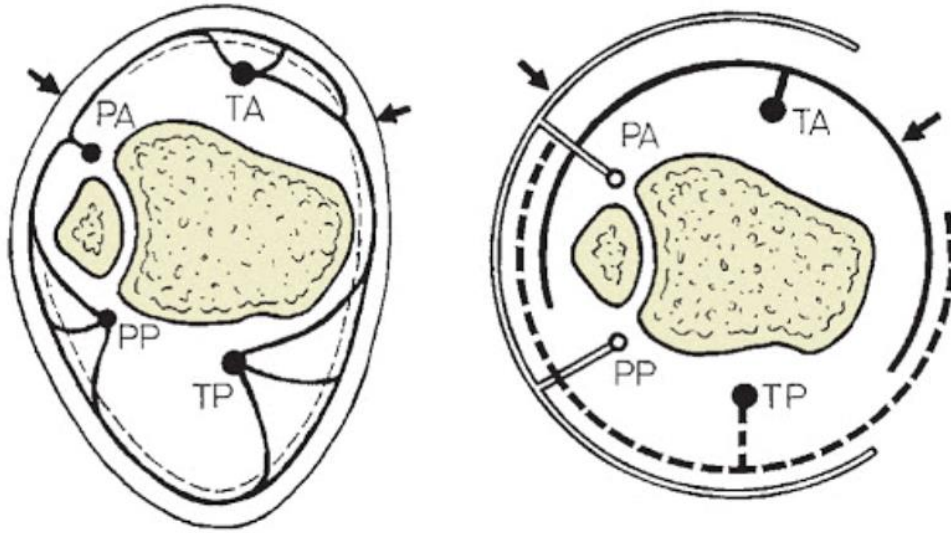
- Studio TC
- Scelta approccio chirurgico
- Ripristinare lunghezza
- Riduzione anatomica superficie articolare
- Ricostruzione metafisaria
- Eventuale innesto



Studio TC



Accesso Chirurgico



Spesso necessario
doppio accesso

Figure 8-9. The arterial blood supply to the distal tibial metaphysis is shown in an axial section on the *left*. The *arrows* represent standard anteromedial and anterolateral surgical approaches to this area. The diagram to the *right* represents the arterial blood supply to the skin in this same region. Overlapping areas are noted, except along the anteromedial surface of the tibia. This is a critical junctional zone that is supplied only by the anterior tibial artery. It logically follows that surgical approaches in this area in the face of an anterior tibial artery injury would be more dangerous. PA, Anterior peroneal artery; PP, posterior peroneal artery; TA, anterior tibial artery; TP, posterior tibial artery. (Source: From Heim U: *The pilon tibial fracture: classification, surgical techniques, results*, in which it was modified from Aubry P, Fievé J (1984) *Vascularisation osseuse et cutanée du quart inférieur de jambe*, Rev Chir Orthop 70:596, 1995.)

Almeno 7 cm distanza ?

Sicuramente > 5 cm

J Orthop Trauma. 2008 May-Jun;22(5):299-305; discussion 305-6. doi: 10.1097/BOT.0b013e318172c811.

A prospective study evaluating incision placement and wound healing for tibial plafond fractures.

[Howard JL1, Agel J, Barei DP, Benirschke SK, Nork SE.](#)

Fracture Types by Approach.

Type	P-L	P-M	M	A	A-M	A-L	L	Total
B	18	2	36	13	13	65	10	157
C	56	3	111	72	66	176	92	576
Total	74 (10%)	5 (<1%)	147 (20%)	85 (11.6%)	79 (11%)	241 (33%)	102 (14%)	733

Abbreviations: P-L, posterolateral approach; P-M, posteromedial approach; A-M, anteromedial approach; A-L, anterolateral approach; L, lateral approach.

Percent Type C Fractures by Approach.

	P-L	P-M	Medial	Anterior	A-M	A-L	Lateral
% Type B	24%	40%	24%	15%	17%	27%	10%
% Type C	76%	60%	76%	85%	83%	73%	90%

Abbreviations: P-L, posterolateral approach; P-M, posteromedial approach; A-M, anteromedial approach; A-L, anterolateral approach

Foot & Ankle
SPECIALIST

Foot Ankle Spec. 2016 Apr;9(2):163-8.

A Systematic Review of the Role of Surgical Approaches on the Outcomes of the Tibia Pilon Fracture.

[Liu J1, Smith CD2, White E2, Ebraheim NA2.](#)

L'accesso anterolaterale è il più utilizzato

L'approccio anteriore ha basso tasso di complicanze con un'ampia base di pazienti che presentano fratture di tipo C.

L'approccio mediale ha una bassa percentuale di complicanze su un'ampia base di pazienti con fratture di tipo B.

Fracture Types and Complications From Reviewed Articles.

Approach	Article	Study Type	OTA B	OTA C	Complications
Anterior	Assal et al	Retrospective	0	21	None
	Beaman and Gellman	Retrospective	0	12	Primary ankle arthrodesis
	Ketz and Sanders	Prospective	0	10	Partial WD, nonunion, malunion, arthrodesis
	McCann et al	Retrospective	3	8	OA x2
Anterolateral	He et al	Retrospective	0	36	Superficial infection
	Cannada	Retrospective	11	32	Nonunion, cellulitis x2, deep infection (soft tissue, resulted in amputation)
	McCann et al	Retrospective	1	6	Superficial infection x2, WD
	Gardner et al	Retrospective	0	10	Deep infection x2 (one resulted in amputation)
Anteromedial	Wang et al	Randomized control	3	24	Superficial infections x3, delayed union, nonunion, malunion
	McCann et al	Retrospective	4	7	Superficial infections x2, secondary OA x2
	Davidovitch et al	Retrospective	0	21	Superficial infection x3, deep infection x3, nonunion, delayed/malunion x2
Lateral	Grose et al	Retrospective	8	32	Nonunion x4, deep infection x, WD
	Boraiah et al	Retrospective	2	57	Superficial infection x3, deep infection x2, delayed union x, amputation
Medial	Sirkin et al	Retrospective	0	56	Osteomyelitis x, WD, partial skin-thickness necrosis x7
	McCann et al	Retrospective	3	5	Superficial infection x, OA
Posterolateral	Bhattacharyya et al	Retrospective	6	13	WD x, nonunion x4, deep infection x3
	Ketz and Sanders	Retrospective	0	16	WD, deep infection
	Ketz and Sanders	Prospective	0	9	Deep infection
	McCann et al	Retrospective	0	6	Superficial infection, malunion

Abbreviations: WD, wound dehiscence; OA, osteoarthritis.

Ripristinare Lunghezza: Sintesi Perone

75% frattura pilone tibiale associata frattura perone

Trattare il perone:

- Migliori outcomes clinici
- Minor rischio vizi consolidazione
- Minor incidenza artrosi post-traumatica



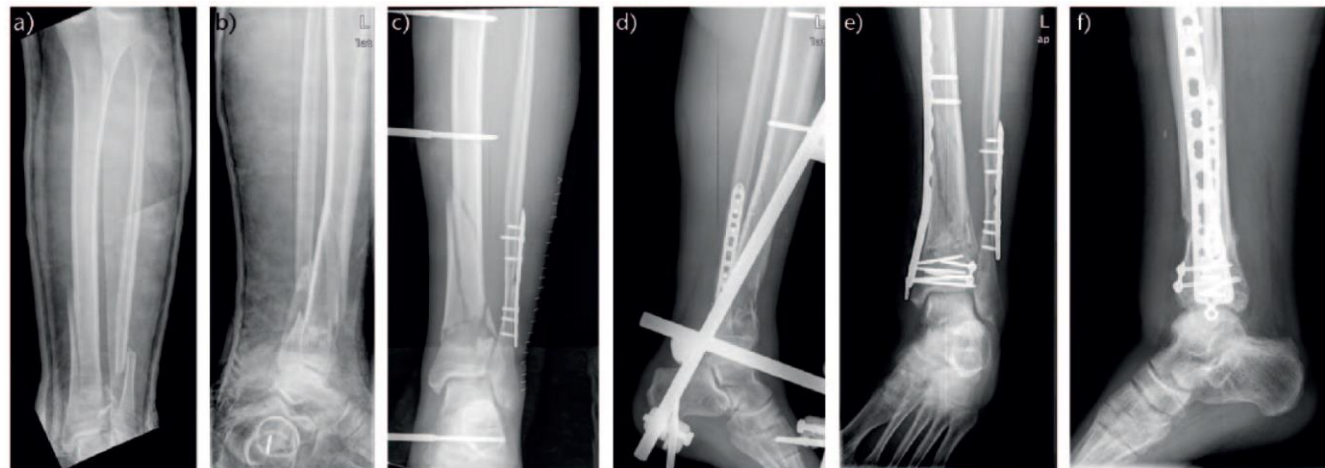
[Int Orthop. 2009 Jun; 33\(3\): 695–699.](#)

[Foot Ankle Int. 2017 Jun;38\(6\):650-655](#)

Se possibile anche nel first stage



[Indian J Orthop. 2013 Sep-Oct; 47\(5\): 487–492.](#)



Prima il perone

Non un dogma

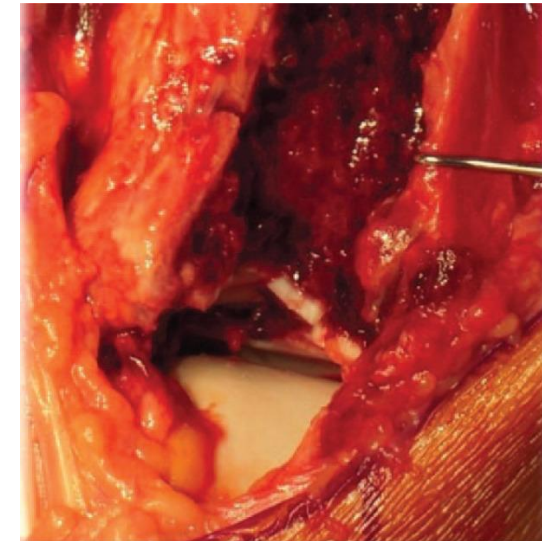
Ripristinare Superficie Articolare

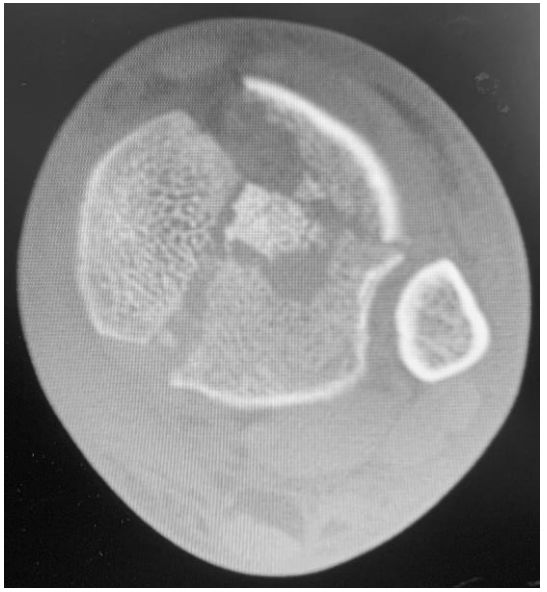
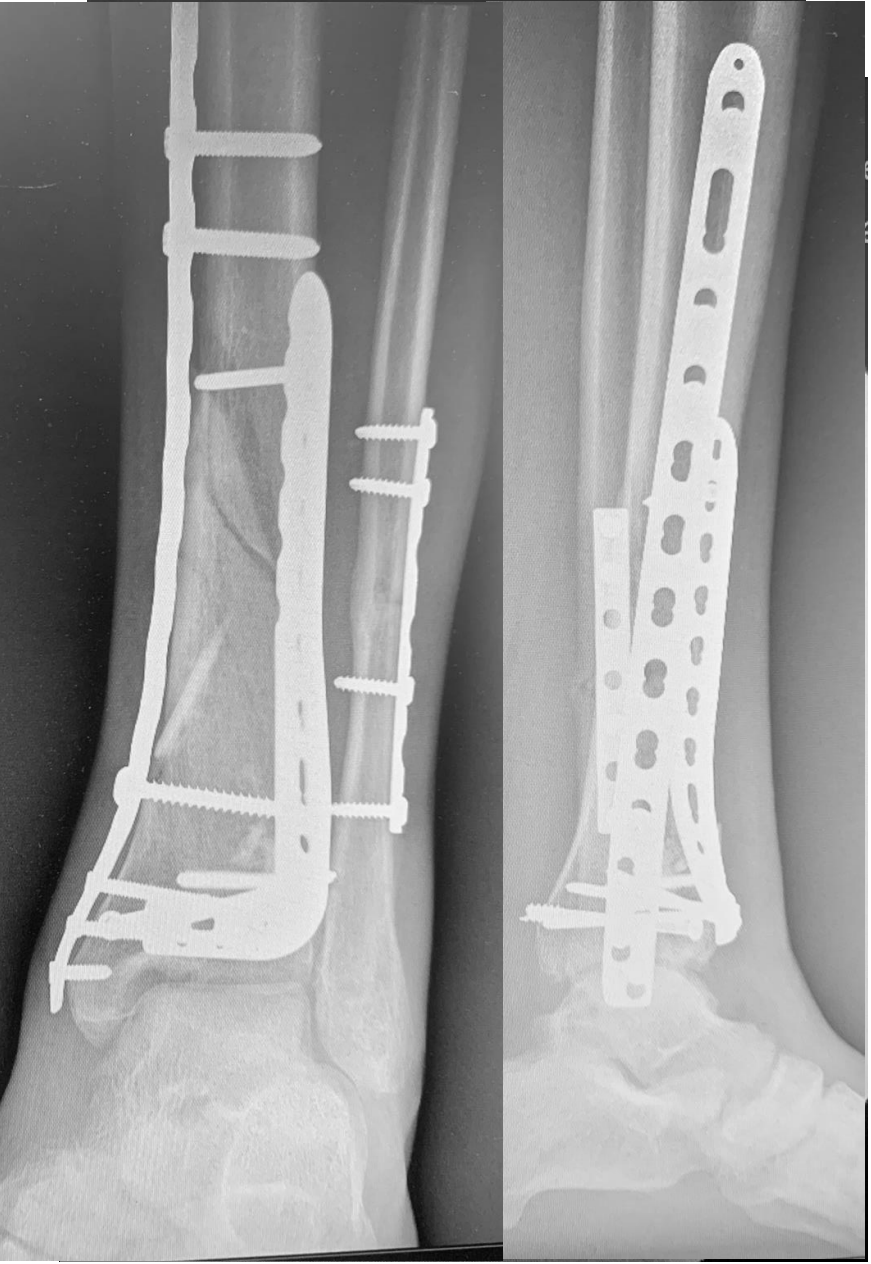
Determinante sul risultato clinico

- Solitamente partendo dal frammento laterale
- Mobilizzare i frammenti e disimpattare quelli affondati
- Eventuale innesto a supporto
- Stabilizzazione temporanea e poi sintesi definitiva

Injury

Injury. 2013 Oct;44(10):1270-4.





Artroscopia Fratture Pilone

Characteristics	Group A (n=115)	Group B (n=115)	P-value
Age (years), median (interquartile range)	65 (62–68)	65 (63–69)	0.347
Males, n (%)	81 (70.4)	76 (66.1)	0.479
Females, n (%)	34 (29.6)	39 (33.9)	
Causes, n (%)			0.555
Fall accidents	34 (29.6)	41 (35.7)	
Physical sports	8 (7.0)	9 (7.8)	
Traffic accidents	73 (63.5)	65 (56.5)	
Sides, n (%)			0.690
Left	49 (42.6)	52 (45.2)	
Right	66 (57.4)	63 (54.8)	
Types, n (%)			0.759
Open	27 (23.5)	29 (25.2)	
Closed	88 (76.5)	86 (74.8)	

Fr Pilone Type III, Patient age > 60

Group A: external fixation combined with limited internal fixation

Group B: arthroscopy-assisted minimally invasive therapy

Characteristics	Group A (n=115)	Group B (n=115)	P-value
Reduction result, n (%)			0.040
Anatomical	56 (48.7)	75 (65.2)	
Acceptable	54 (47.0)	37 (32.2)	
Poor	5 (4.3)	3 (2.6)	
Bone union, n (%)			0.048
Nonunion	1 (0.9)	0 (0)	
Malunion	3 (2.6)	1 (0.9)	
Delayed union	10 (8.7)	2 (1.7)	
Normal union	101 (87.8)	112 (97.4)	
Screw loosening, n (%)	4 (3.5)	3 (2.6)	0.701
Mazur system, n (%)			0.036
Excellent	61 (53.0)	80 (69.6)	
Good	31 (27.0)	15 (13.0)	
Fair	17 (14.8)	16 (13.9)	
Poor	6 (5.2)	4 (3.5)	
Patient satisfaction, n (%)	102 (88.7)	107 (93.0)	0.252
Infection prevalence, n (%)			0.620
No infection	99 (86.1)	102 (88.7)	
Superficial infection	12 (10.4)	8 (7.0)	
Deep infection	4 (3.5)	5 (4.3)	
Traumatic arthritis, n (%)			0.044
Grade 1	42 (36.5)	58 (50.4)	
Grade 2	48 (41.7)	46 (40.0)	
Grade 3	19 (16.5)	8 (7.0)	
Grade 4	6 (5.2)	3 (2.6)	

Riduzione Anatomic
+19%

Clinica Ottima
+19%

Artrosi post-trauma
-14%

3. SCELTA MEZZO DI SINTESI

Trattamento individualizzato

- Tessuti molli
- Tipo frattura
- Comorbilità e condizioni generali
- Possibilità tecniche e preferenze individuali



ORIF rimane la procedura di scelta nelle fratture articolari della tibia distale. I risultati riportati nelle ultime due decadi sono migliorati con la conoscenza del ruolo dei tessuti molli. Le complicanze di ferite variano dal 3% al 14%, le infezioni profonde dal 2% to 4.8% e le pseudoartrosi dallo 0% al 9%.

IMN solo un articolo con pochi casi nelle fratture articolari tipo C.

Utilizzato nelle fratture tipo A o B dopo sintesi di minima della superficie articolare. Rispetto a ORIF minori infezioni, minor tempo operatorio, miglior dorsiflessione caviglia, maggior incidenza di vizi di consolidazione.

EF in caso di severo danno dei tessuti molli rimane il trattamento di scelta.

Fissazione a ponte ha una maggiore incidenza di viziose consolidazioni e complicanze a lungo termine.

Migliori risultati delle fissazione con fili con possibilità di associare tecniche di fissazione interna mininvasive



J Trauma; 59:1219-23

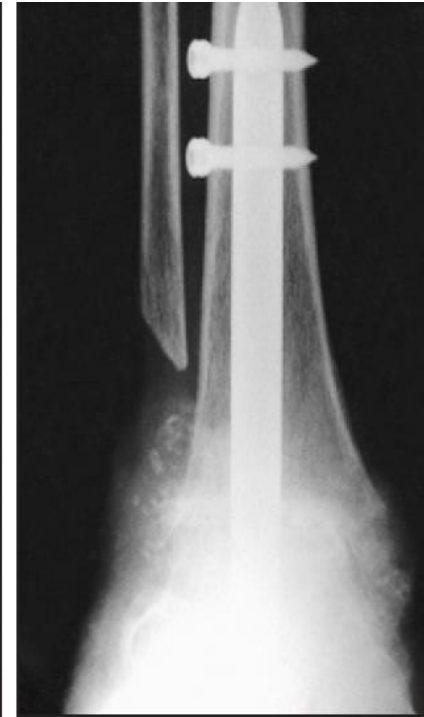
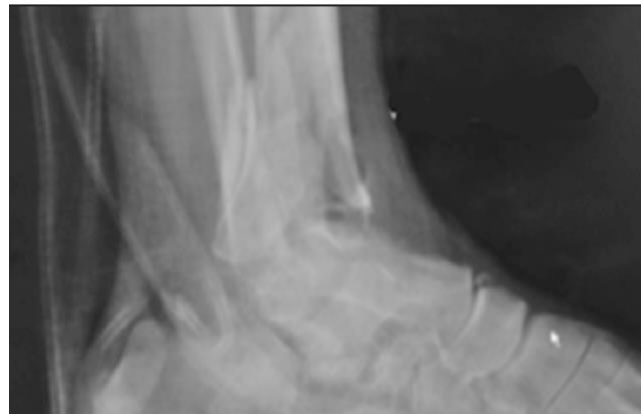
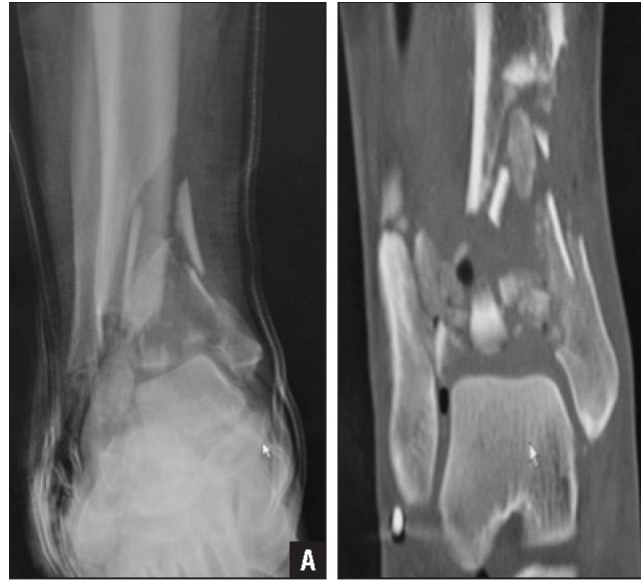


Foot Ankle Int. 2011 Oct;32(10):955-61.

In fratture OTA 43C: ORIF and EF associata a fissazione di minima hanno risultati clinici sovrapponibili in termini di articolarietà della caviglia, sviluppo di artrosi e score clinici

Artrodesi

- Condizioni tessuti molli
- Grave comminuzione superficie articolare
- Associata frattura astragalo
- Età e condizioni paziente
- Comorbilità



CONCLUSIONI

- **TESSUTI MOLLI**
- Span Scan Plan
- Chirurgo Esperto
- Ortoplastico o Ch. Plastico

