



LA SINTESI INTERNA

E. Sabetta, C. Ferraù, L. Patrizio



S.C. Ortopedia e Traumatologia
Direttore: Ettore Sabetta

- FRAGILITA' OSSEA
- ESTENSIONE FRATTURA
- LESIONI ASSOCIATE
- CUFFIA ROTATORI
- TENDENZA ALLA RIGIDITA'

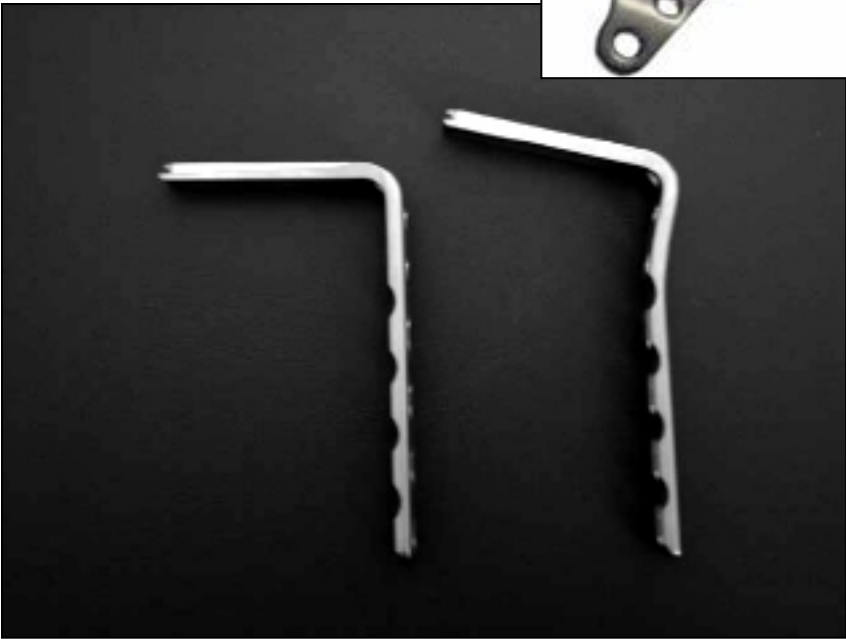


OSTEOSINTESI STABILE



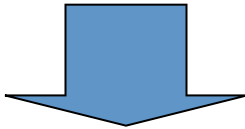
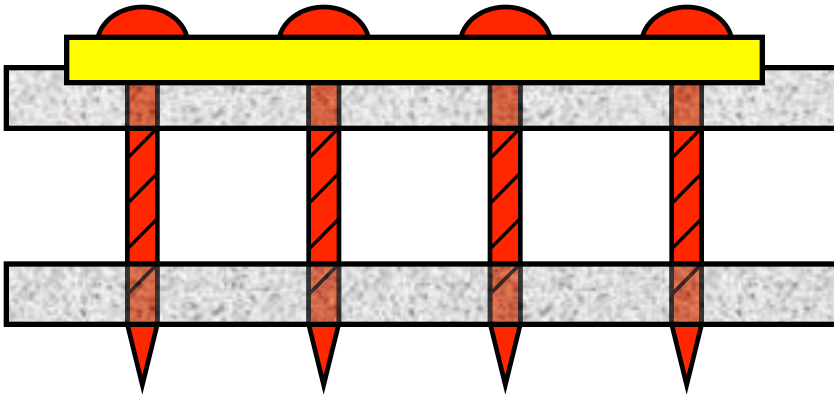
MOBILIZZAZIONE PRECOCE



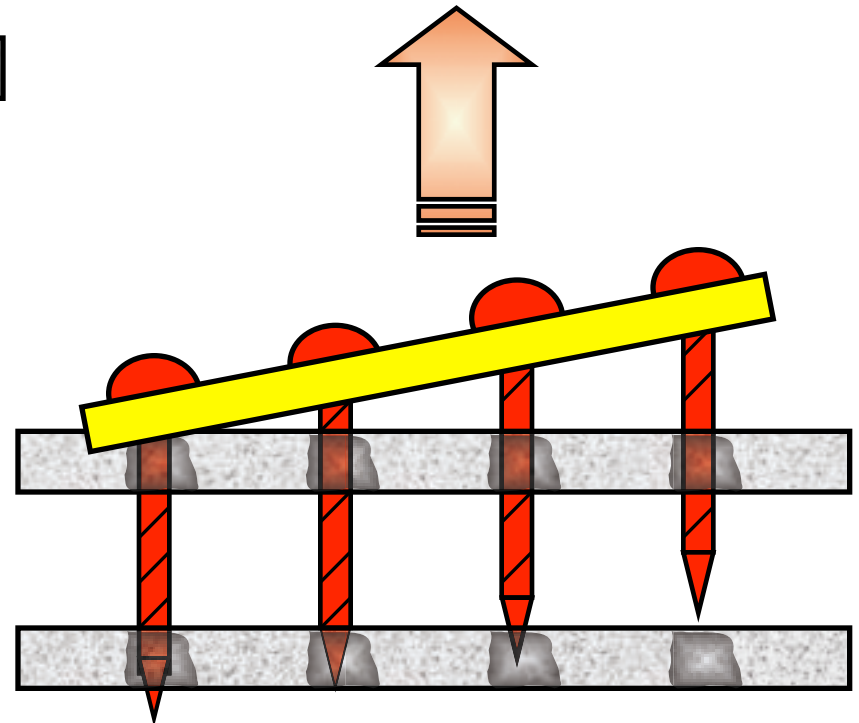
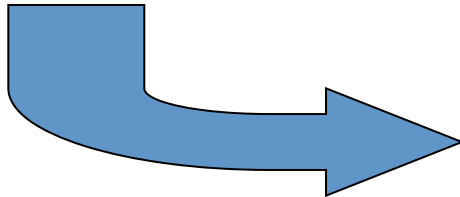


Placca convenzionale vs placca con viti a stabilità angolare

Osteosintesi con placca convenzionale

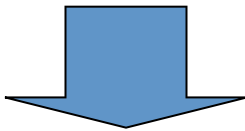
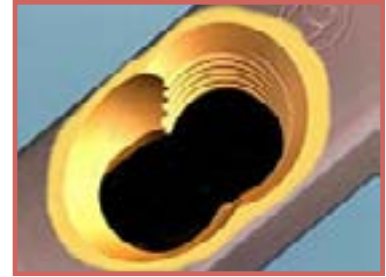
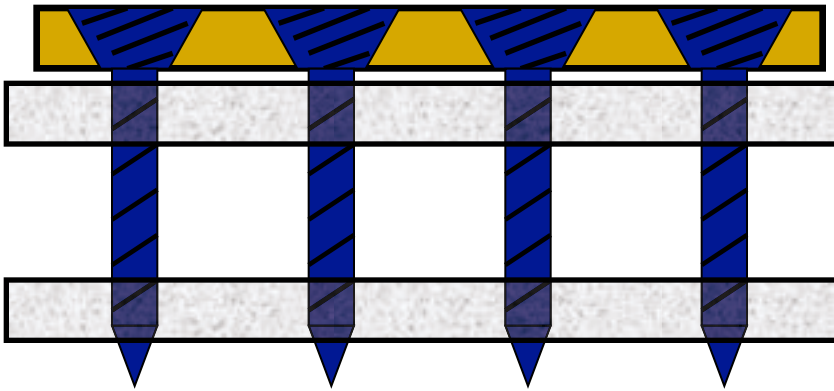


Anche un piccolo riassorbimento osseo può determinare il fallimento dell'impianto

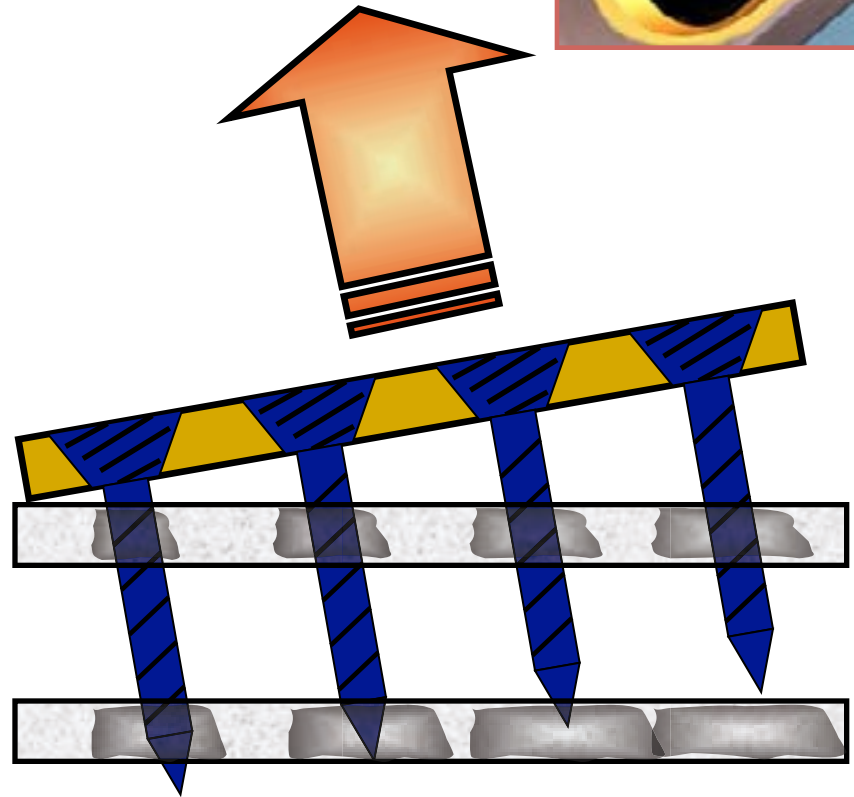
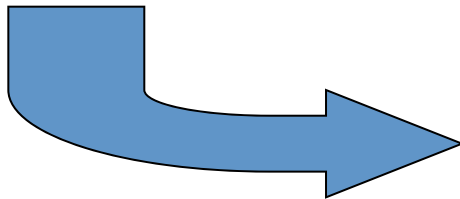


Placca convenzionale vs placca con viti a stabilità angolare

Osteosintesi con placca e viti a stabilità angolare

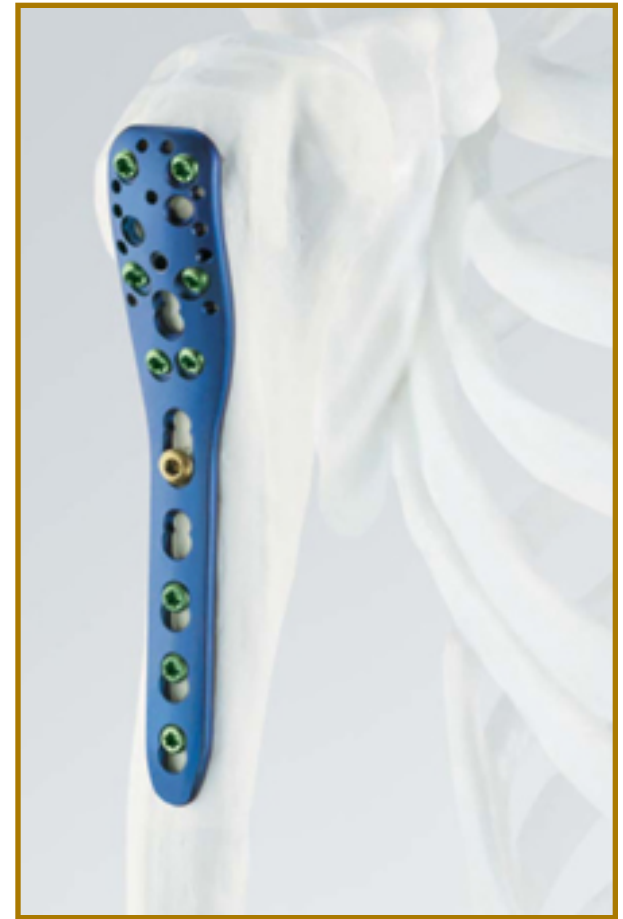
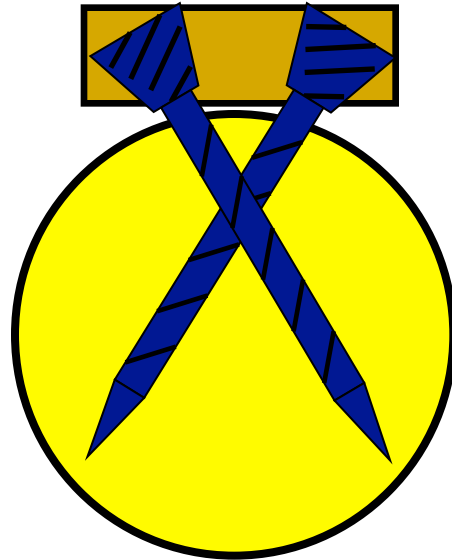


Necessario ampio riassorbimento
perché l'impianto fallisca



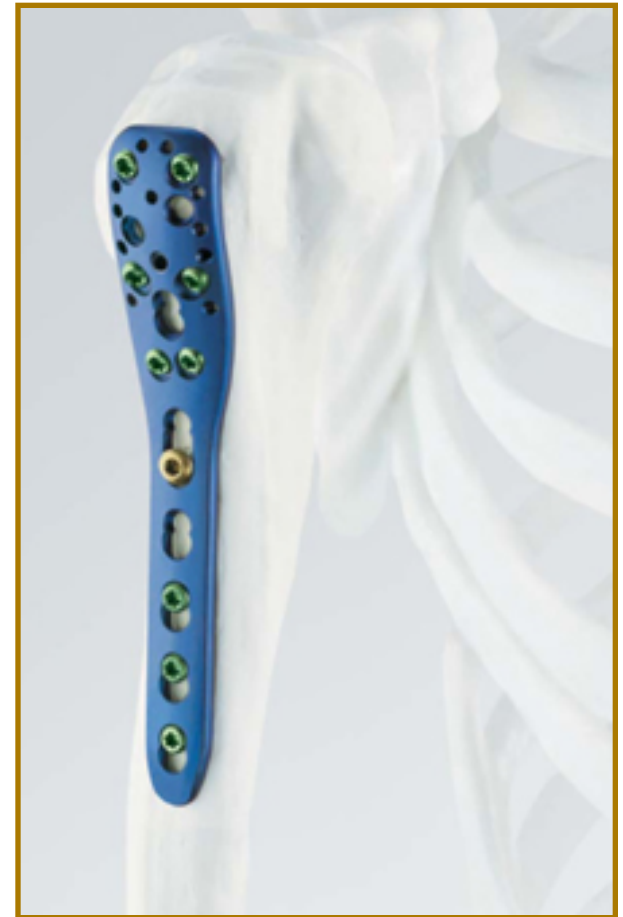
Placca convenzionale vs placca con viti a stabilità angolare

La stabilità
aumenta quando le
viti sono
posizionate su
piani differenti



Placca convenzionale vs placca con viti a stabilità angolare

La stabilità aumenta quando le viti sono posizionate su piani differenti





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Miglior risultati con placca a stabilità angolare versus lama placca
(test torsionali e di flessione su ossa sintetiche e di cadavere)

Siffri PC, Peindi RD, Coley ER, Nortonj. Biomechanical analyssis of blade plate versus locking plate fixation for a proximal humerus fracture: comparison using cadaveric and synthetic humeri . J Orthop Trauma. 2006;20:547-54

INDICAZIONI ALL'OSTEOSINTESI INTERNA



- Frattura dell'epifisi omerale in 3 – 4 parti
- Scomposizione > di 1 cm. tra i più grandi frammenti di frattura
- Angolazione > di 45° della superficie articolare
- Instabilità dei frammenti (da valutare eventualmente sotto intensificatore di brillantezza)

Neer CS. Displaced proximal humeral fractures. Classification and evaluation . J Bone Joint Surg. Am. 1970;50:1077-89

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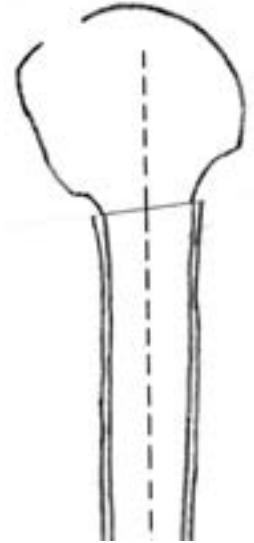


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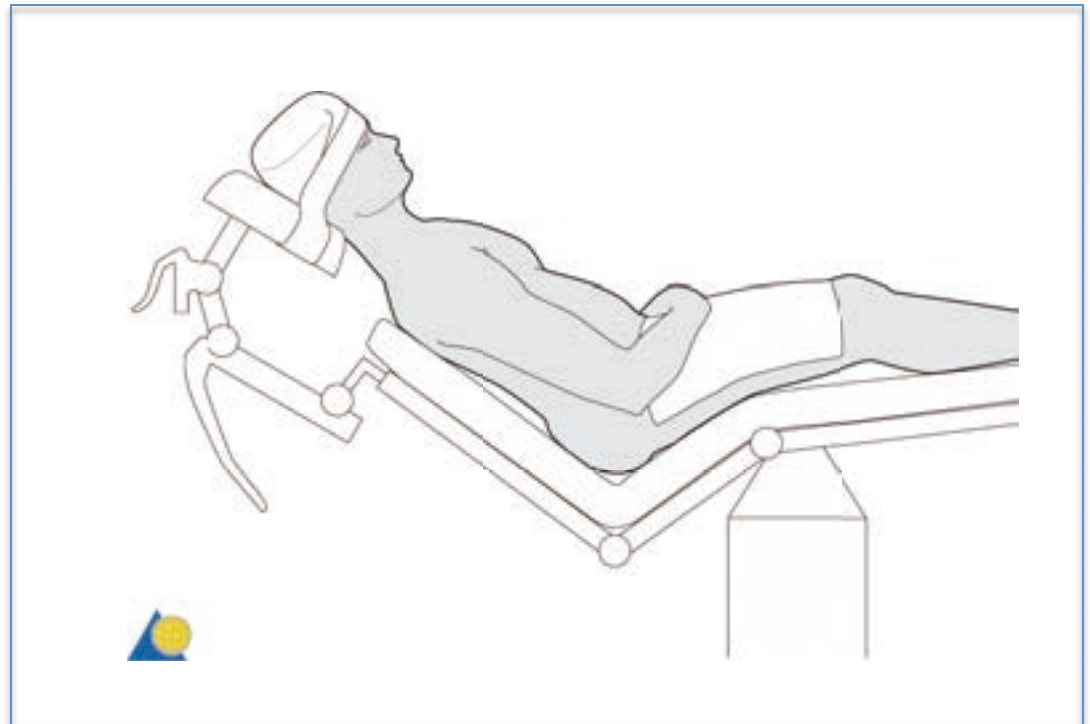
TECNICA OPERATORIA

- **Planning pre-op
RX, TAC, TAC 3D**
- Decubito paziente
- Amplificatore di
brillanza
- Scelta via accesso
- Tecnica di riduzione
e osteosintesi



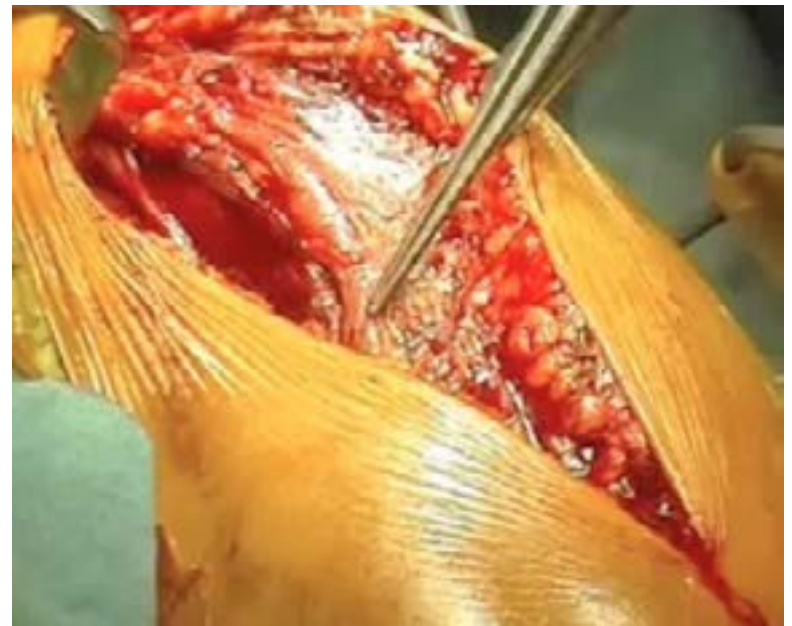
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VIE ACCESSO CHIRURGICHE

- **Deltoideo-Pettorale**
- Deltoideo-Pettorale allargato
- “Mini-invasivo”



VIE ACCESSO CHIRURGICHE

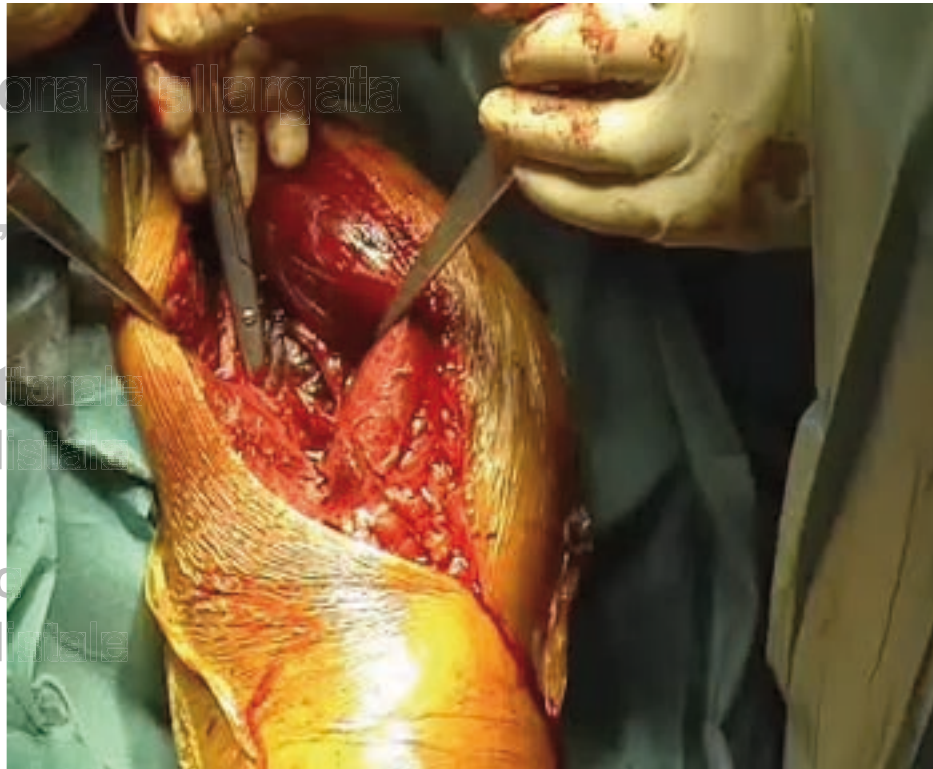
- **Deltoideo-Pettorale**

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- “Mini-invasive”

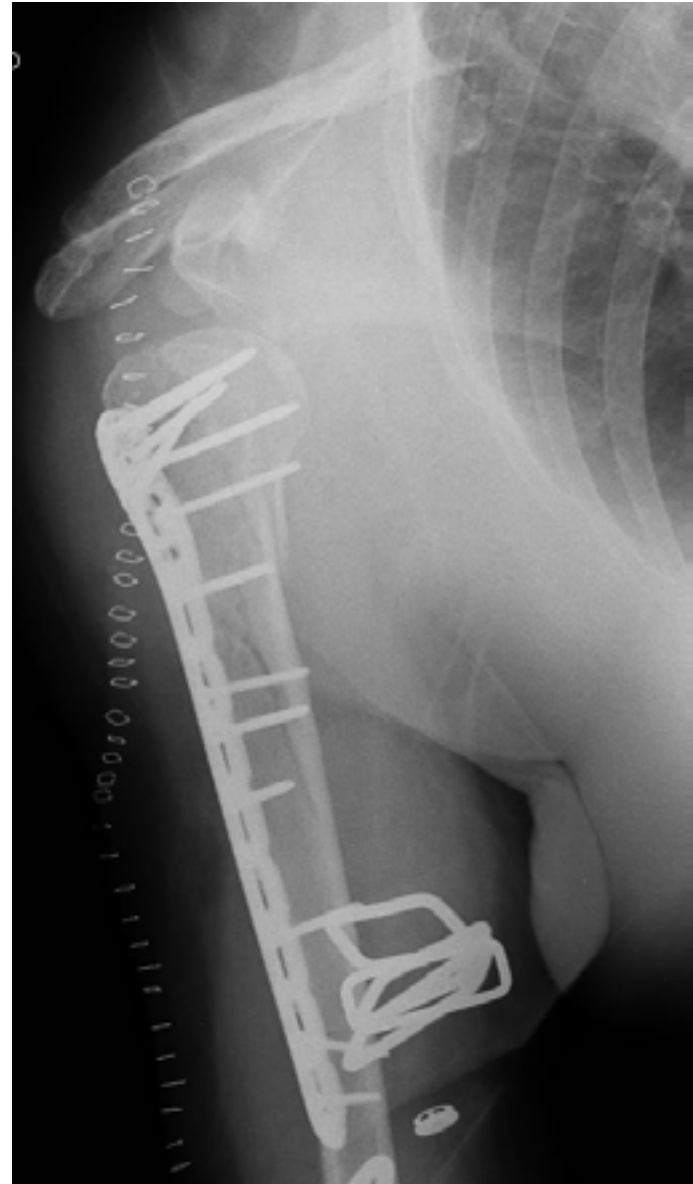
- Deltoideo-Pettorale
con finestra distale

- Split deltoideo
con finestra distale



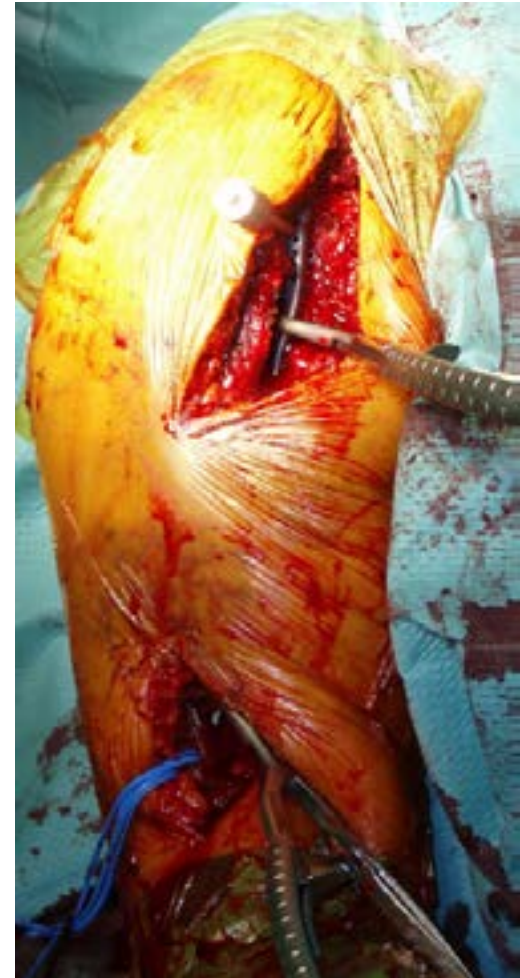
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 - Deltoideo-Pettorale con finestra distale
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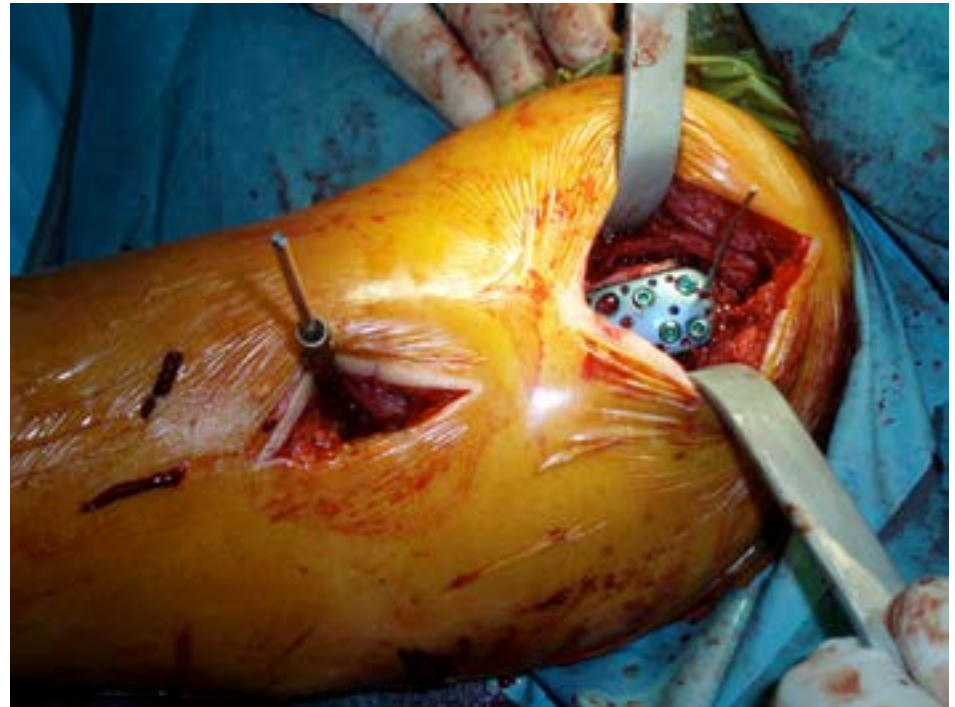
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 - Split deltoideo con finestra distale



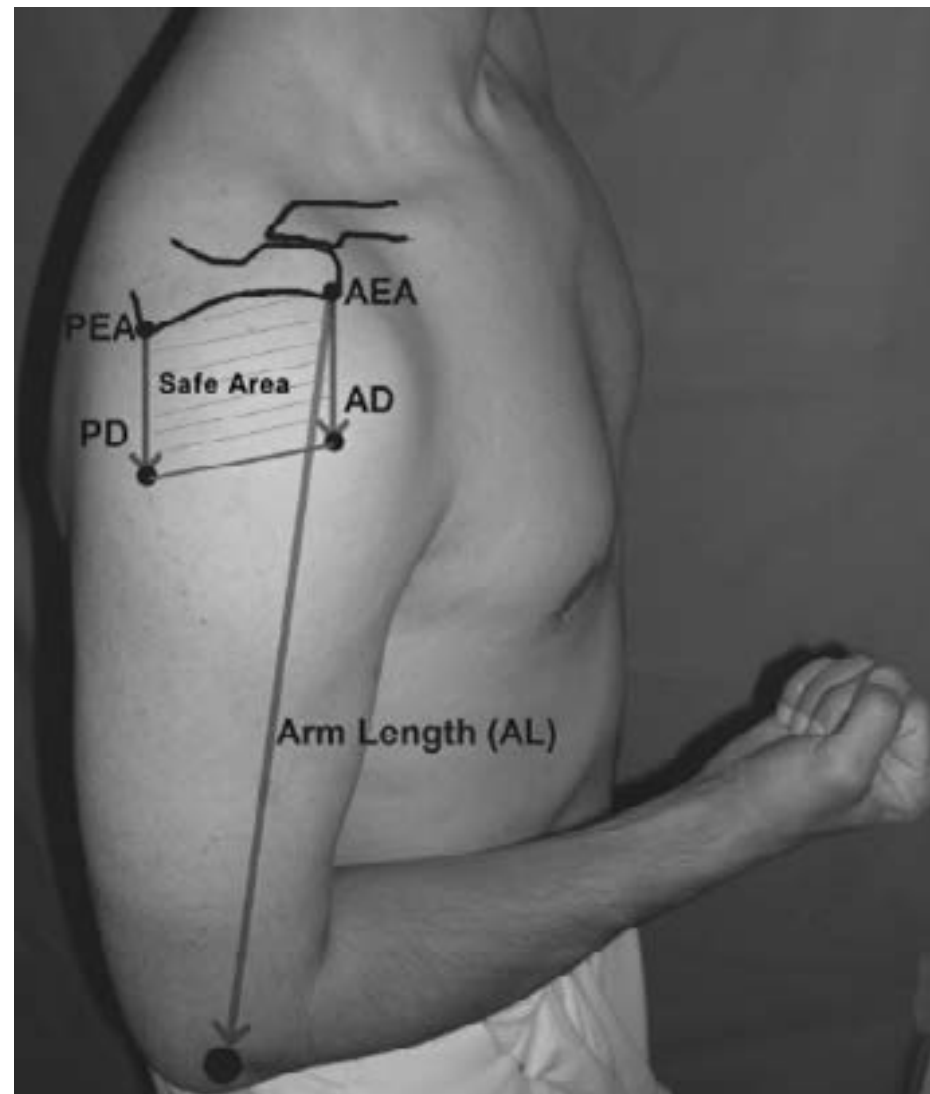
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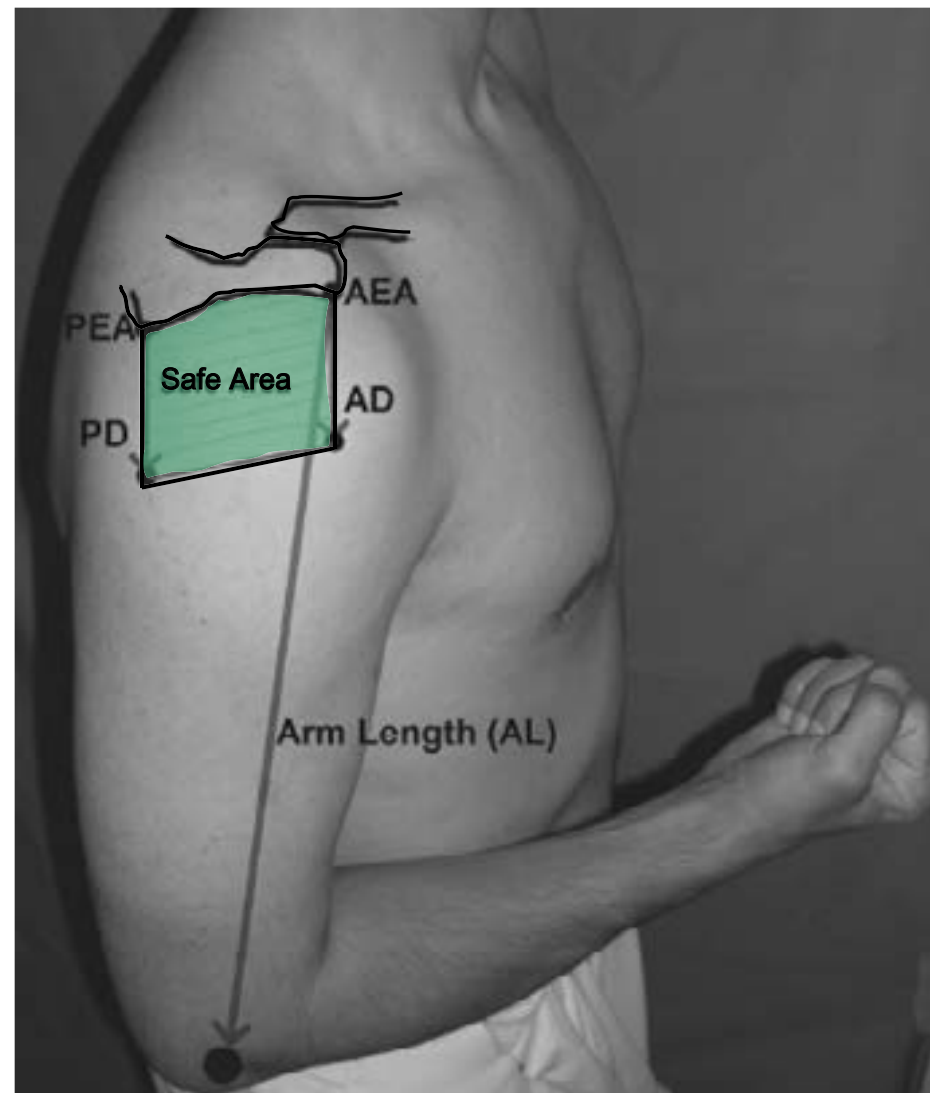




Ozgur Cetik, et al. Is There a Safe Area for the Axillary Nerve in the Deltoid Muscle? A Cadaveric Study J. Bone Joint Surg. Am. 88:2395-2399, 2006.



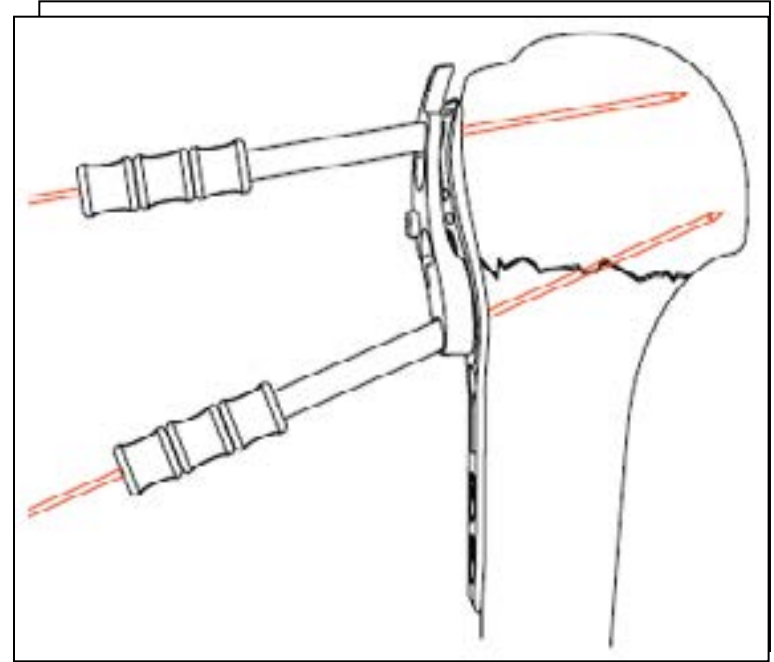
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TECNICA DI RIDUZIONE E OSTEOSINTESI

- Definire la posizione della placca e delle viti
- Finestre articolari per controllare la riduzione
- Stabilizzare le tuberosità
- In caso di fratture “lunghe”: far scivolare la placca in senso cranio-caudale
 - fissare la placca prossimalmente
 - extrarotare il frammento distale di 30° e fissare la placca distalmente (attenzione al nervo radiale!)



RIDUZIONE FRATTURA → STABILITA'

2 gruppi:

CON SUPPORTO MEDIALE (corticale mediale anatomicamente ridotta, frammento ben impattato lateralmente sulla diafisi, vite ben posizionata nel quadrante infero-mediale della testa)

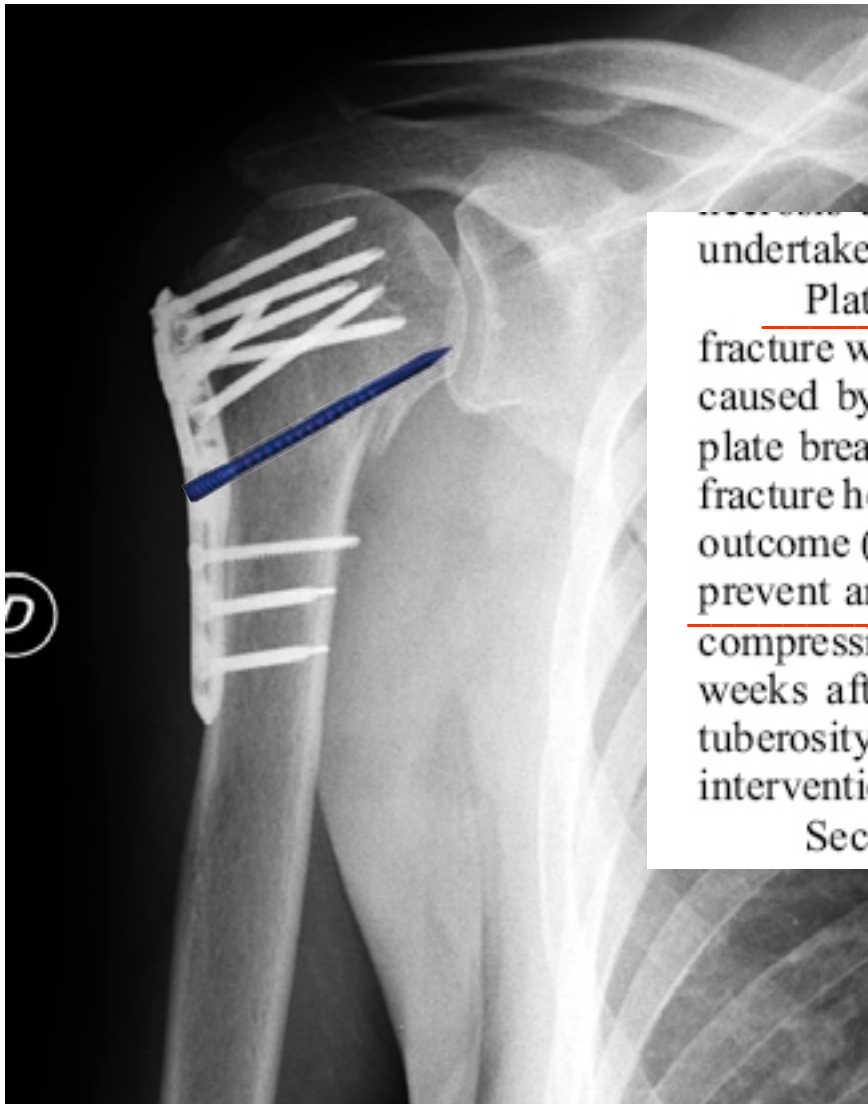
→ perdita dell'altezza della testa 1.2 mm

SENZA SUPPORTO MEDIALE

→ perdita dell'altezza della testa 5.8 mm

Gardner MJ et al. The importance of the medial support in locked plating of proximal humerus fractures. J. OrthopTrauma vol 21, number 3, March 2007

RIDUZIONE FRATTURA → STABILITA'



undertaken.

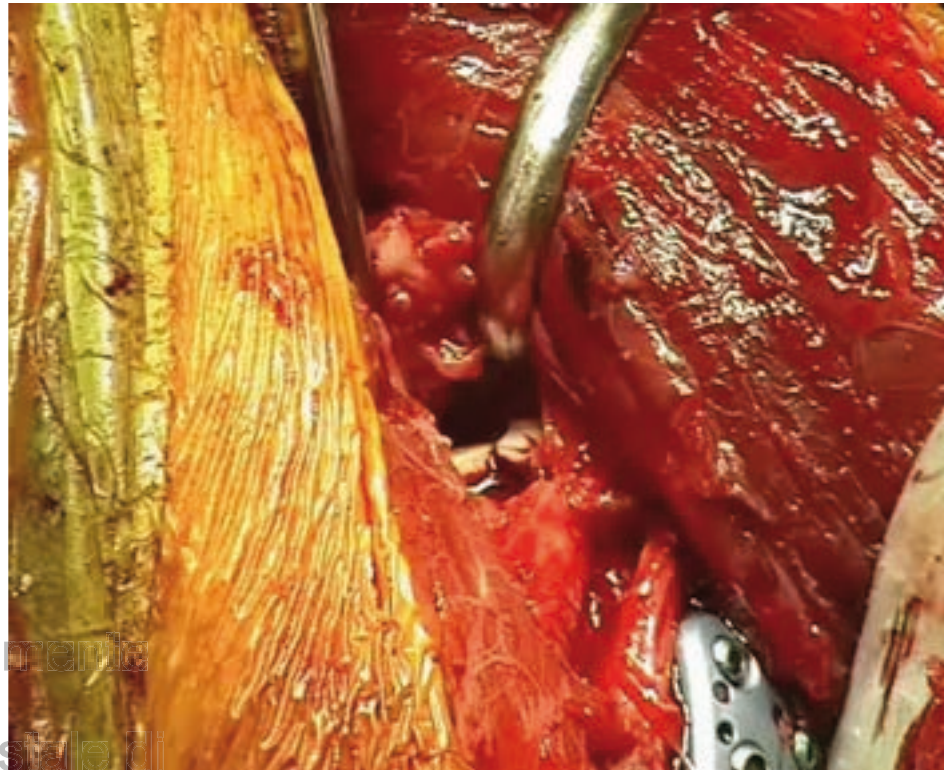
Plate breakage occurred in 1 patient with a 2-part fracture with metaphyseal comminution due to implant fatigue caused by the missing medial support after 6 months. After plate breakage occurred, medial contact was restored and the fracture healed in a minor varus deviation with good functional outcome (Constant score = 80). Medial support is important to prevent any implant fatigue. In another patient, an additional compression screw fixing the greater tuberosity loosened 6 weeks after surgery and was removed, whereby the greater tuberosity displaced again; the fracture healed without further intervention.

Secondary loss of reduction occurred in 5 patients and

Brunner F, Sommer C, Bahrs C, Heuwinkel R, Hafner C, Rillmann P, Kohut G, Ekelund A, Muller M. Open reduction and internal fixation of proximal humerus fractures using a proximal humeral locked plate: a prospective multicenter analysis. J Orthop Trauma. 2009 Mar;23(3):163-72.

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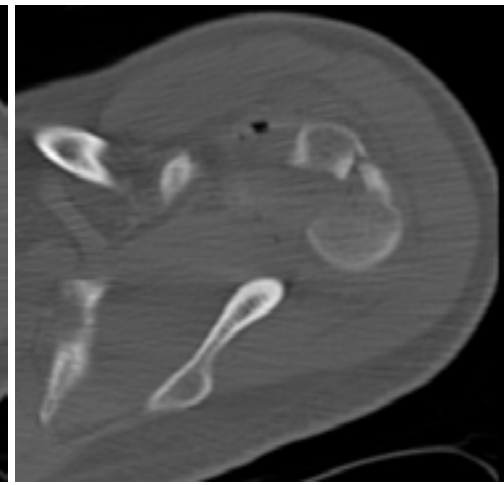
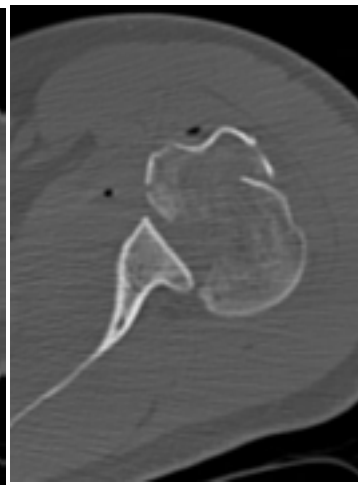
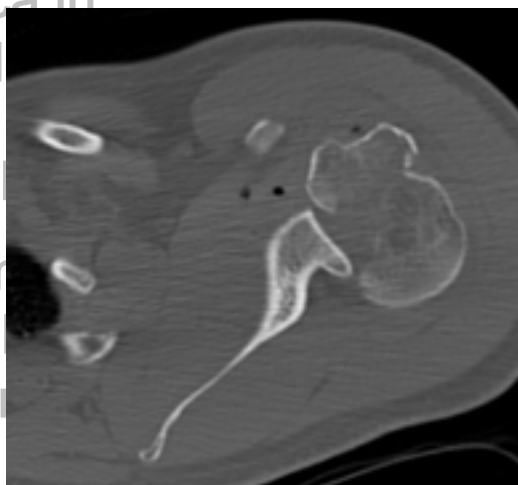


TECNICA DI RIDUZIONE E OSTEOSINTESI

- Definire la posizione della placca e delle viti
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- In caso di fratture "lunghe", far scivolare la placca in senso cranio-caudale
 - fissare la placca
 - extrarotare il frammento 30° e fissare la placca (attenzione al nervo)



Uomo 35 anni



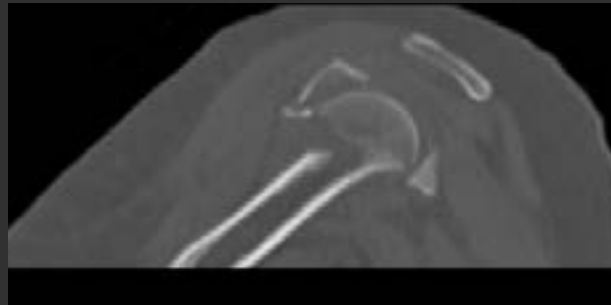
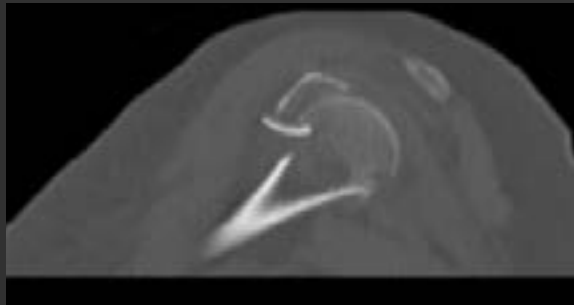
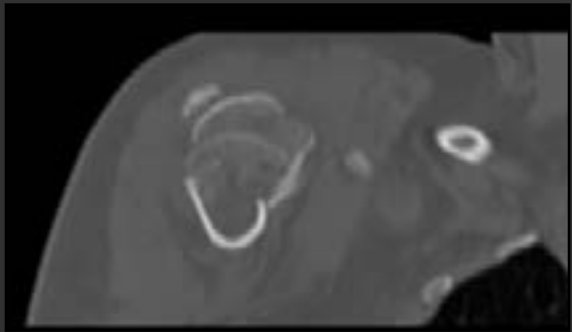
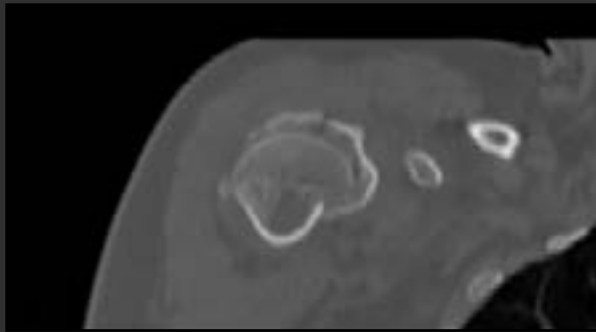
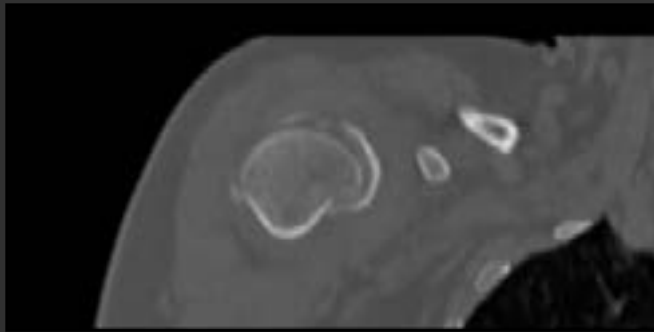
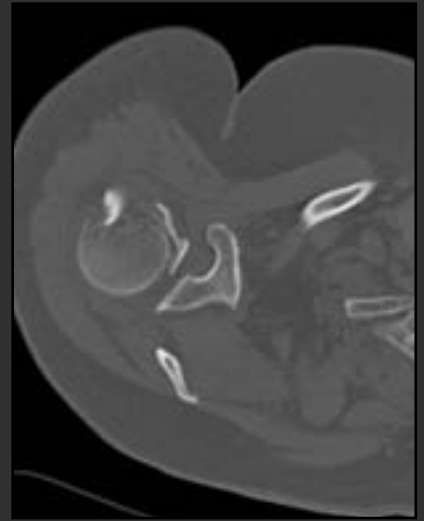
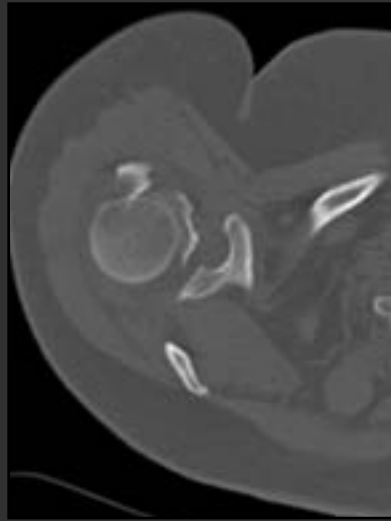
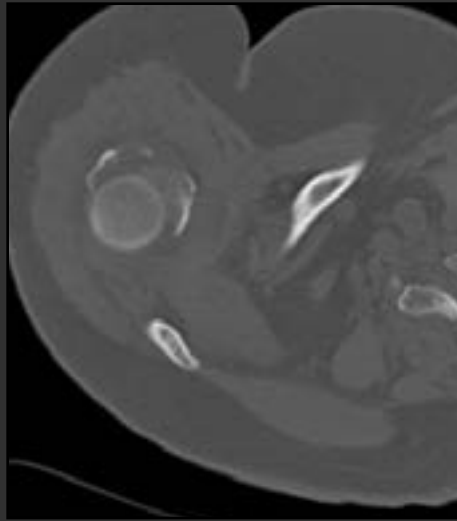
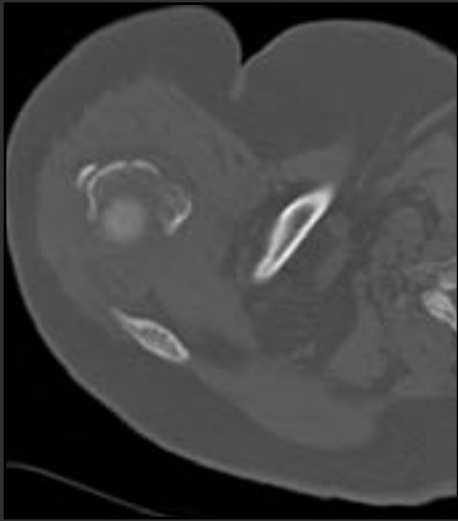


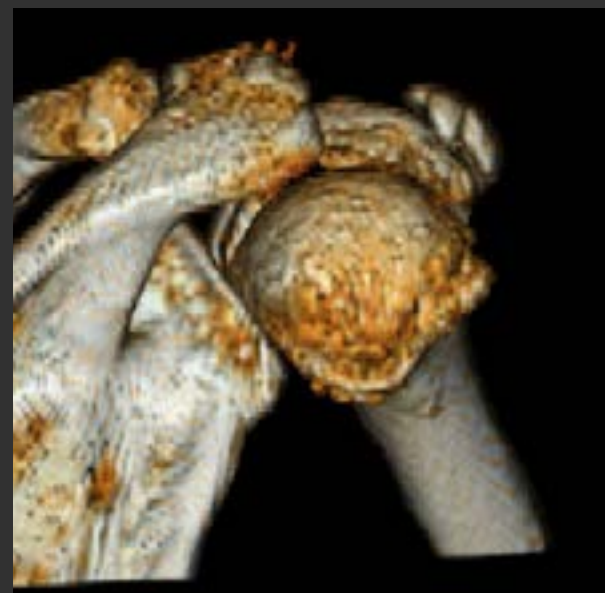
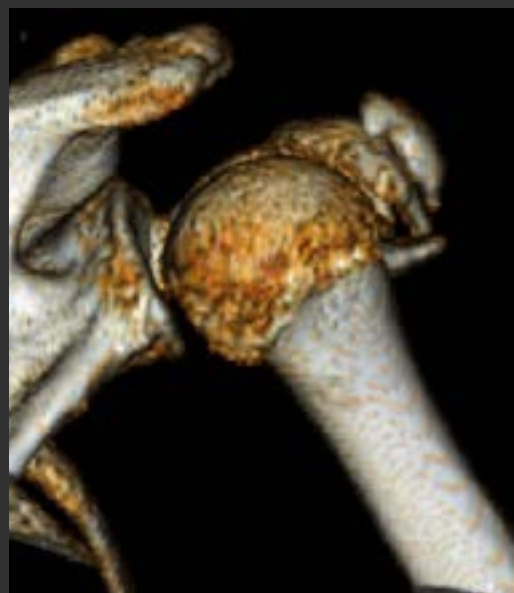
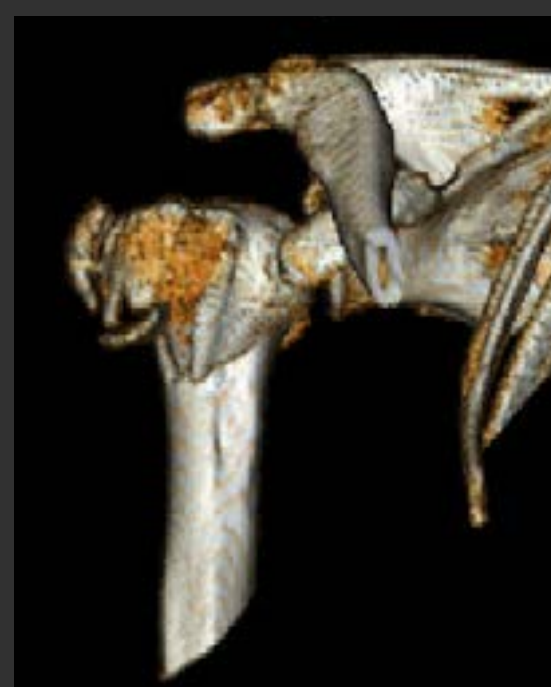
Uomo 35 aa., 4 mesi post-op



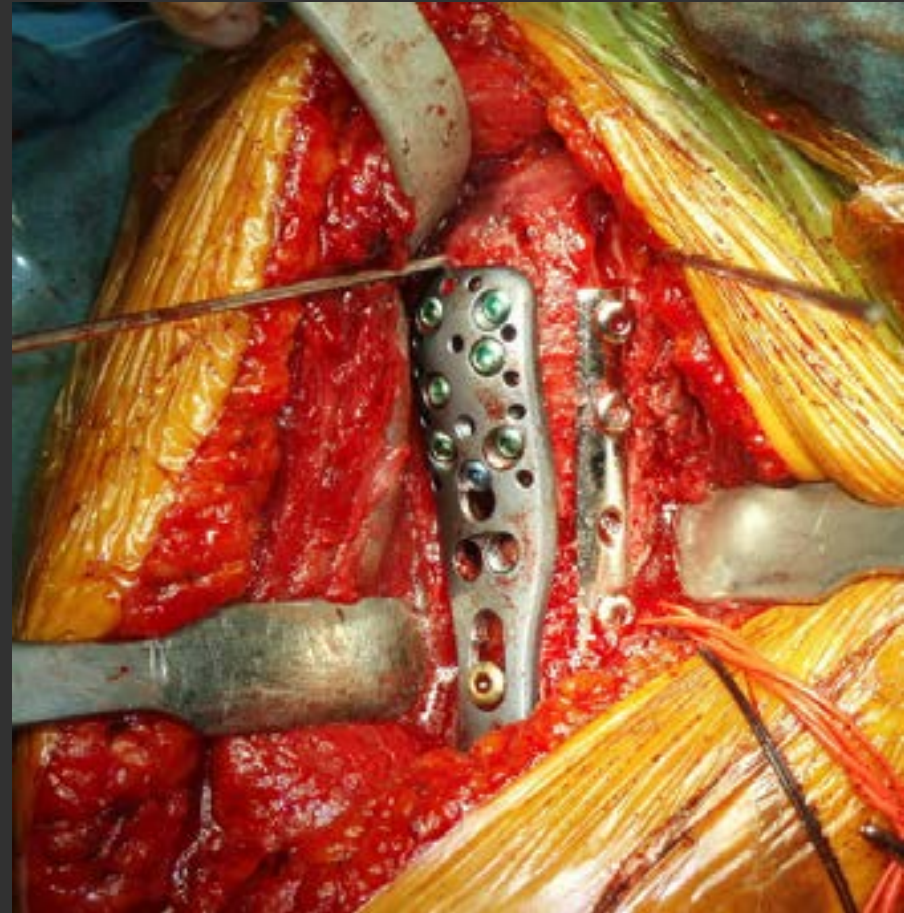
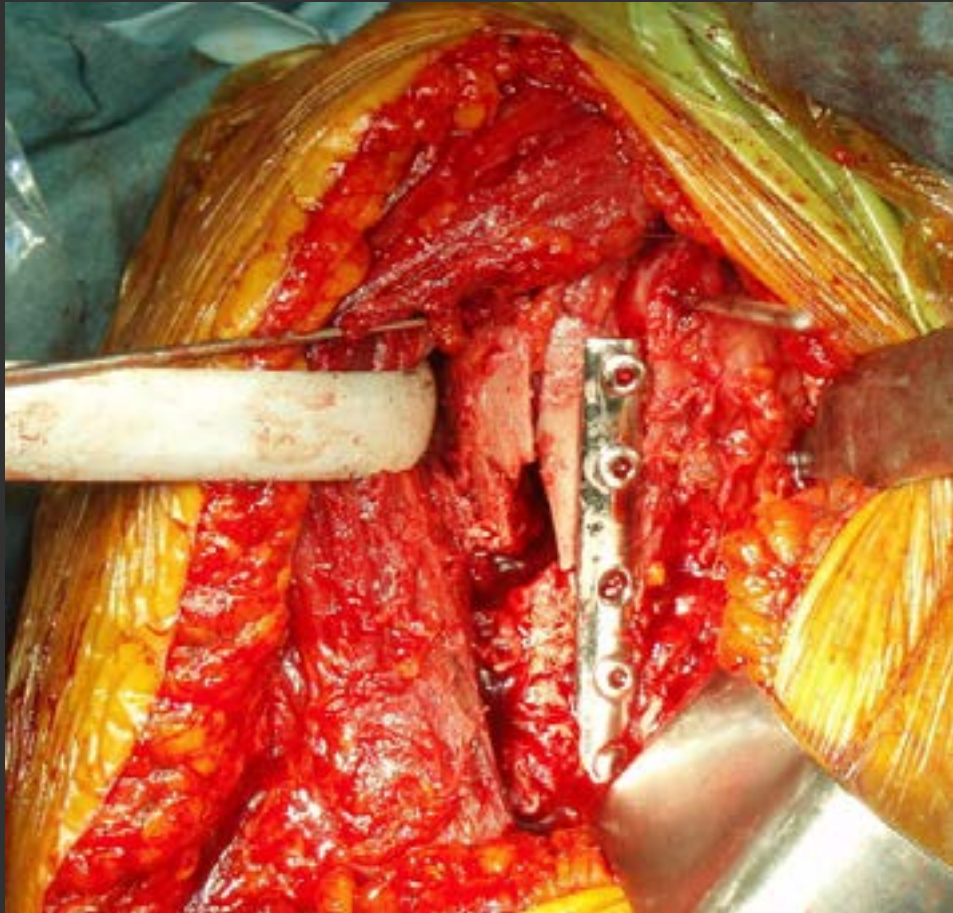
Donna 61 aa







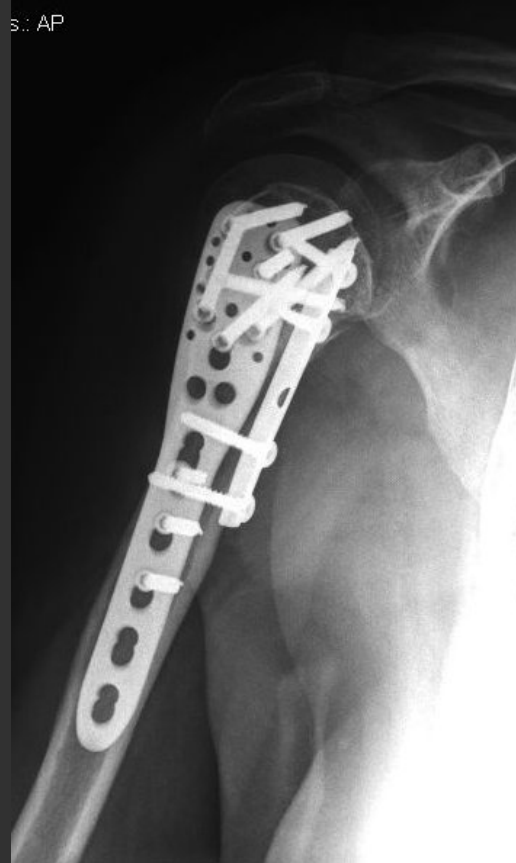
Riduzione provvisoria con fili K., placca 1/3 tubulare antero-lat, innesti ossei omoplastici, placca Phylos



Post-op, immediato inizio mobilizzazione



4 mesi post-op



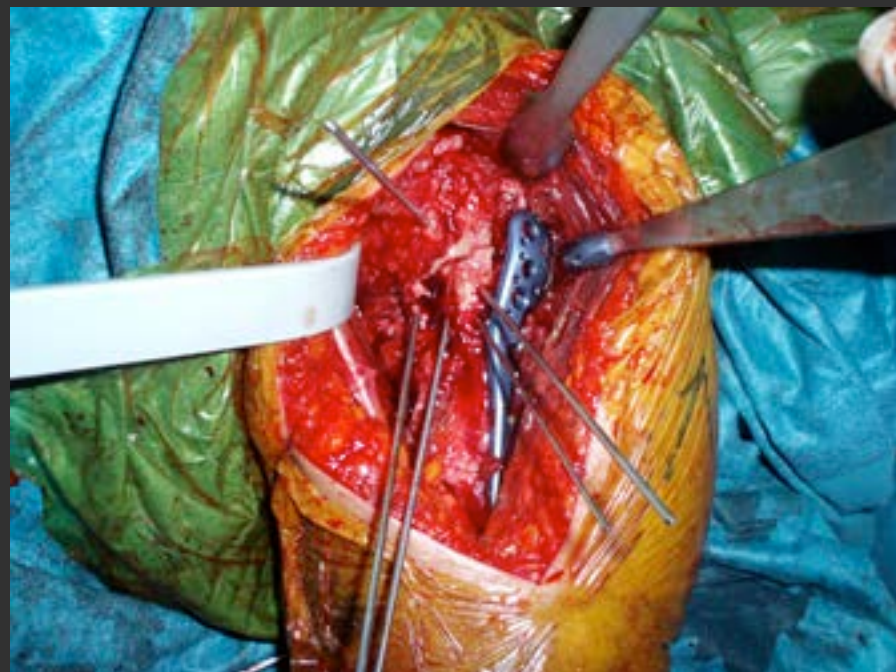
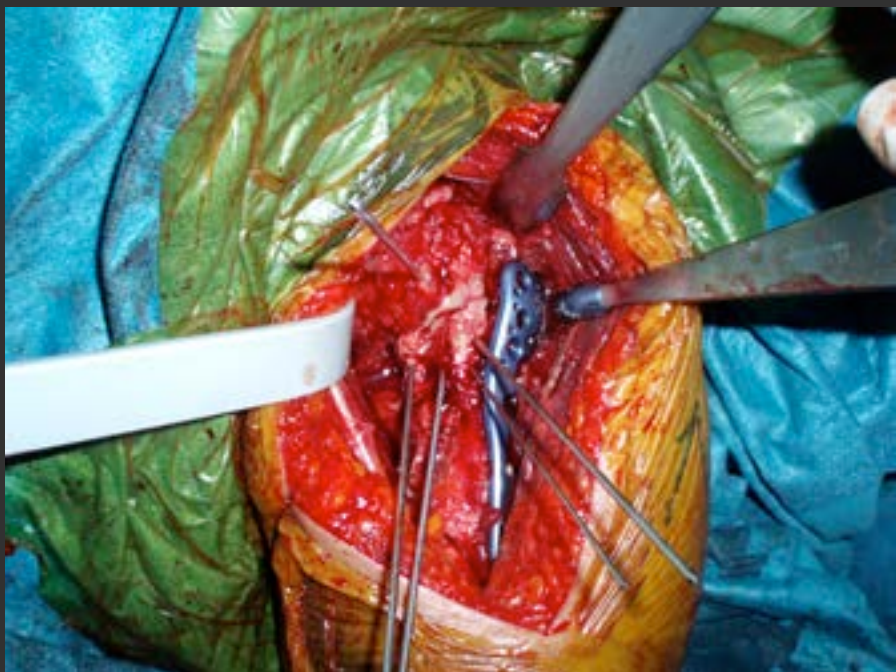
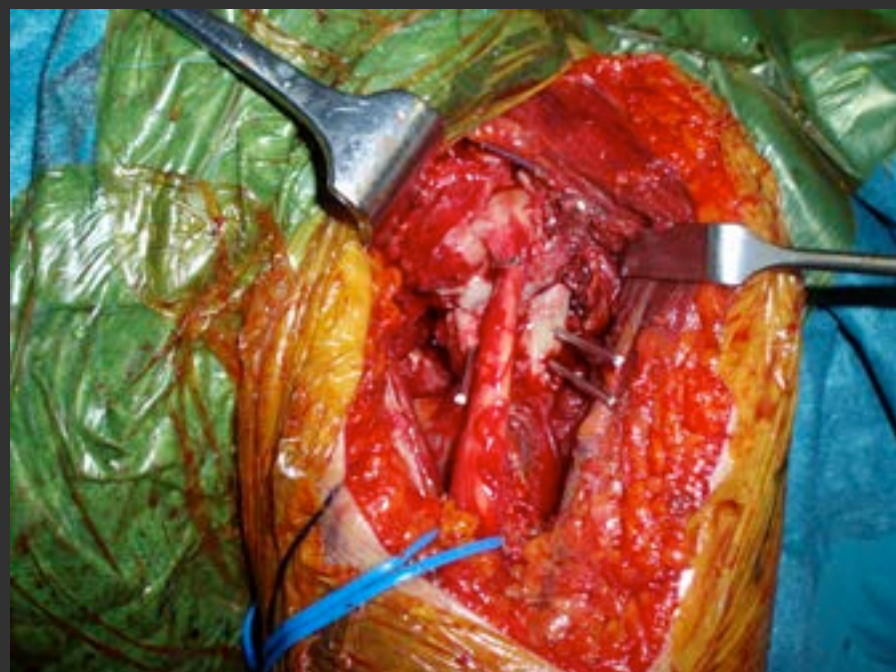
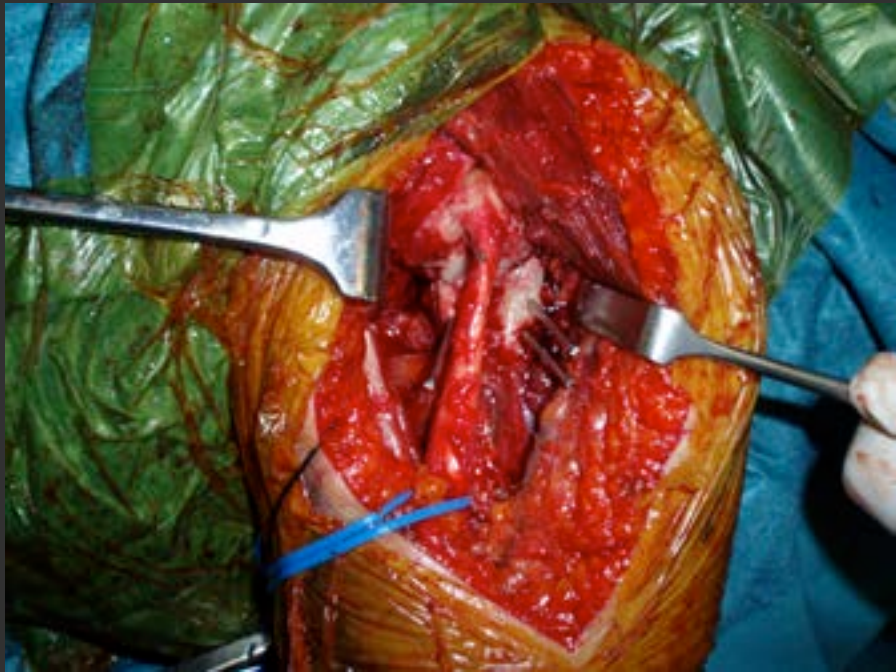
2 anni post-op, no dolore

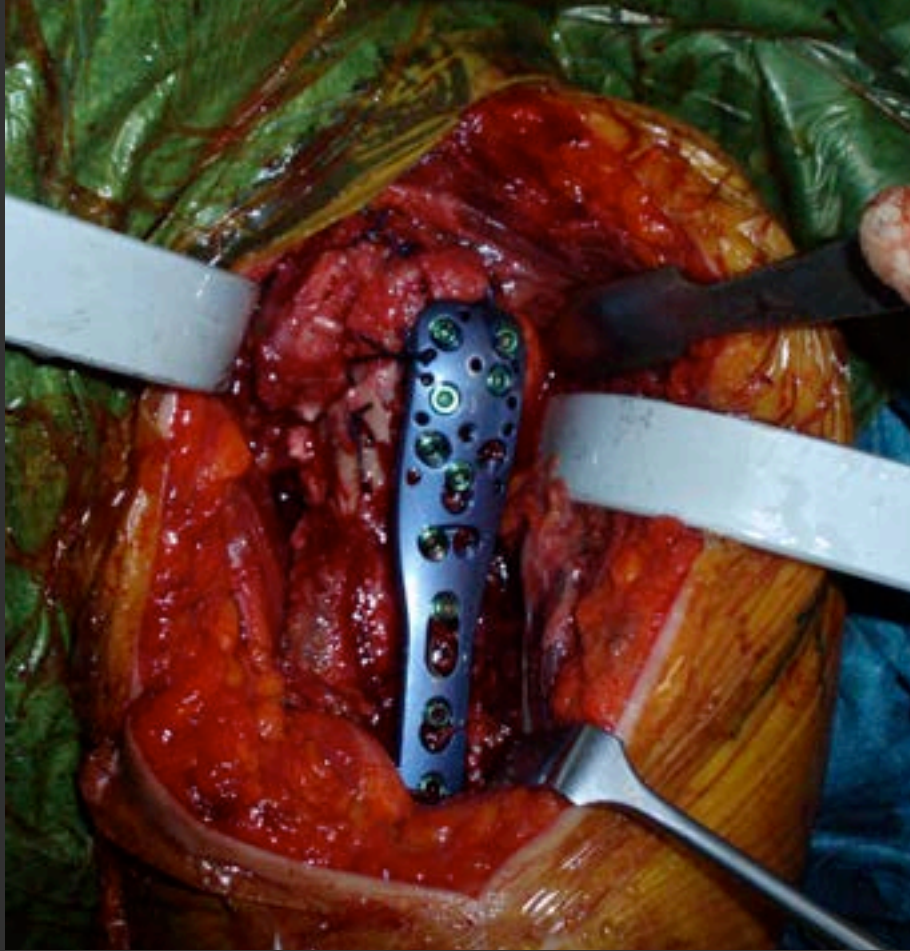


Donna 77 aa. 16-09-09



PROF. VINCENZO
PERI, ORTOPEDO
CHIRURGO
VIALE DELLA VITTORIA, 151
00187 ROMA





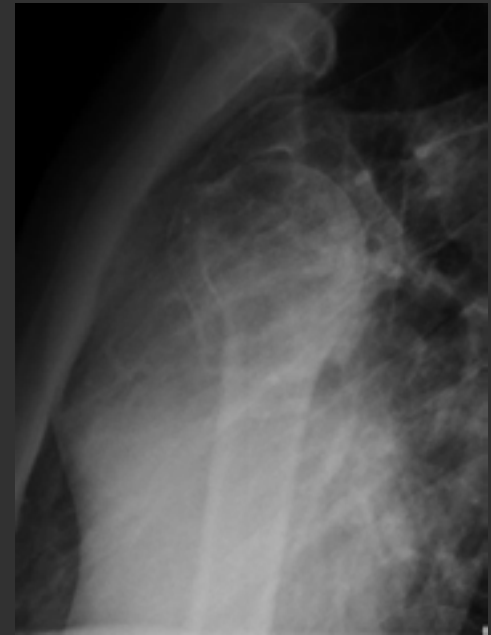


40 gg. Post-op





33 anni, incidente in moto in dicembre '06



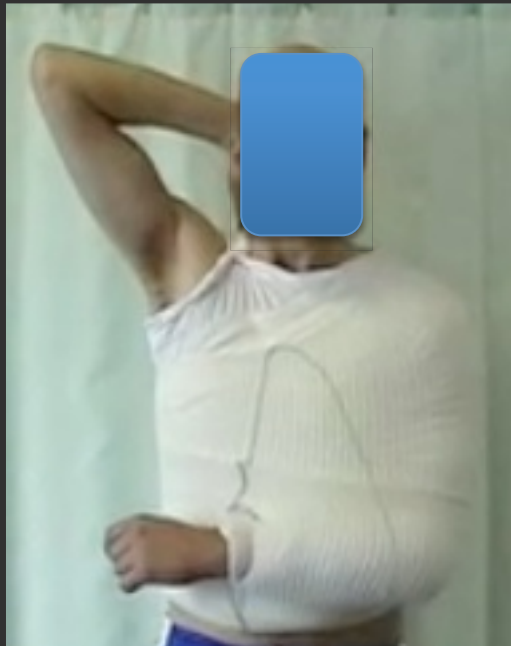


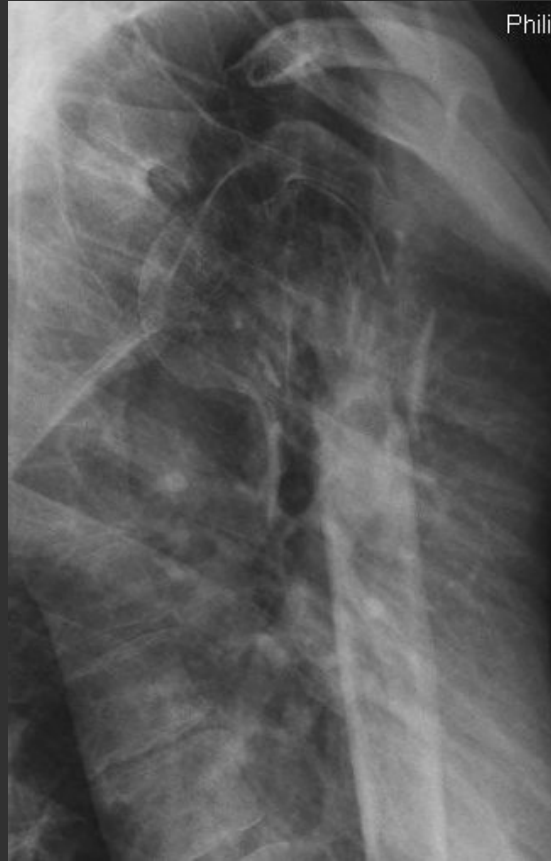
Post-op



2 mesi post-op

7 mesi post-op a destra

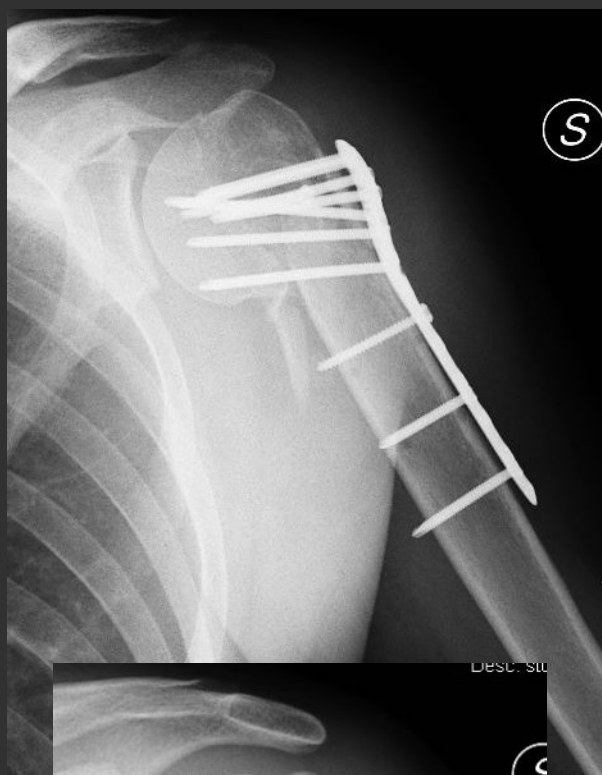




Referto RX: frattura testa e collo omerali



1 mese post-op a sinistra



3 mesi post-op a sinistra



3 anni post-op



2 anni post-op

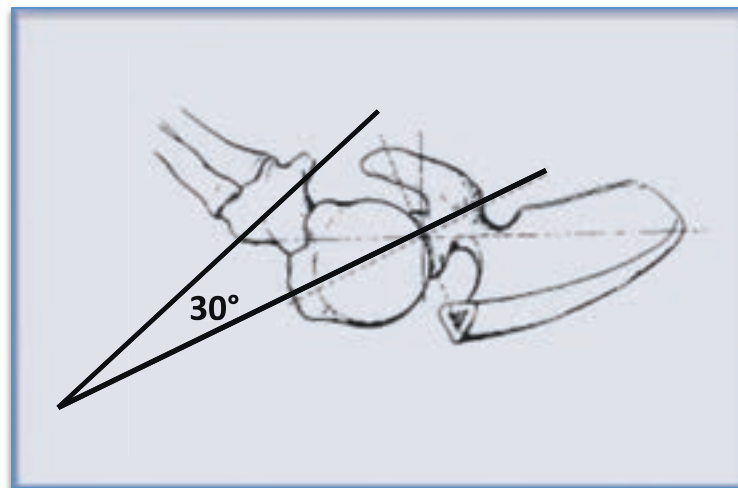


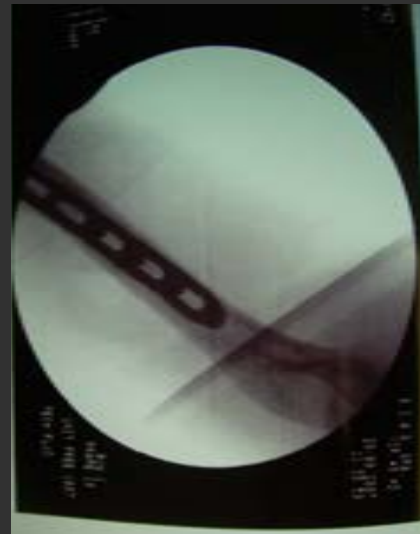
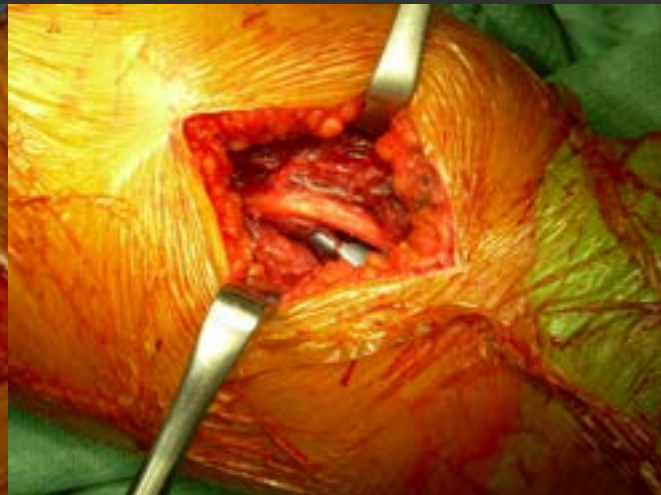
TAKE HOME MESSAGE

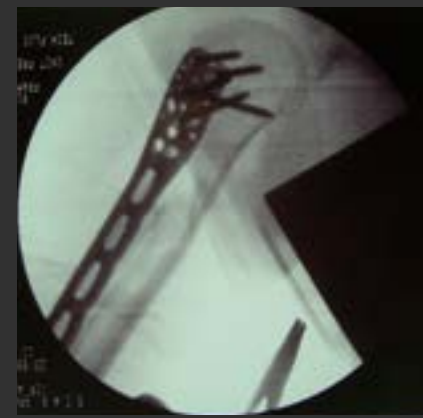
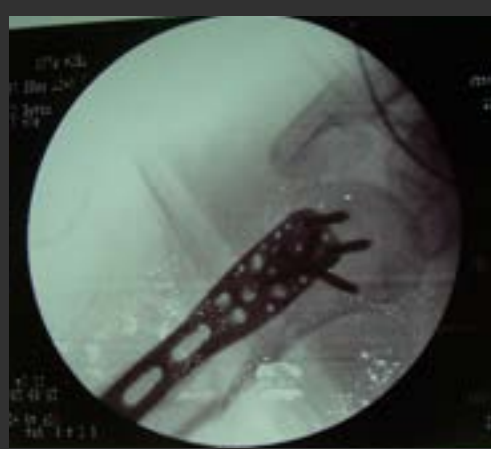
- Riconoscere le lussazioni gleno-omerali posteriori
- Richiedere proiezioni RX adeguate (AP gleno-omeroale)
- Non accontentarsi del referto del Radiologo
- Ridurre le lussazioni in urgenza
- Chirurgia “atraumatica” per ridurre il rischio di necrosi

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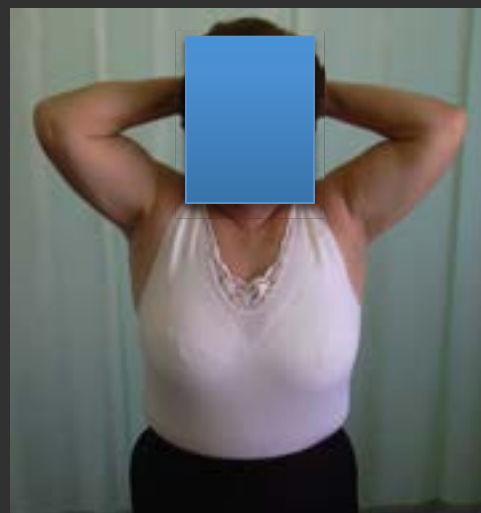
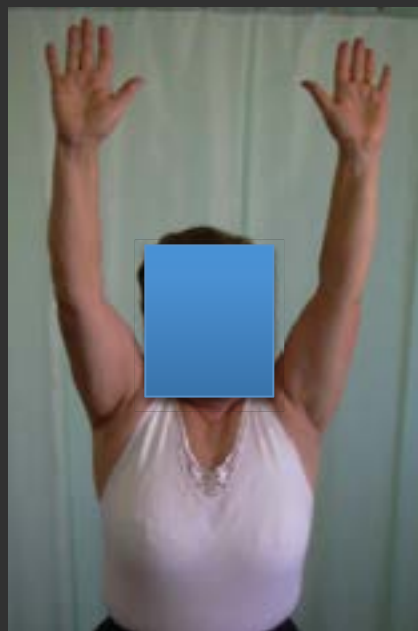








2 anni post-op



Uomo 65 anni





3 mesi post-op



NECROSI AVASCOLARE

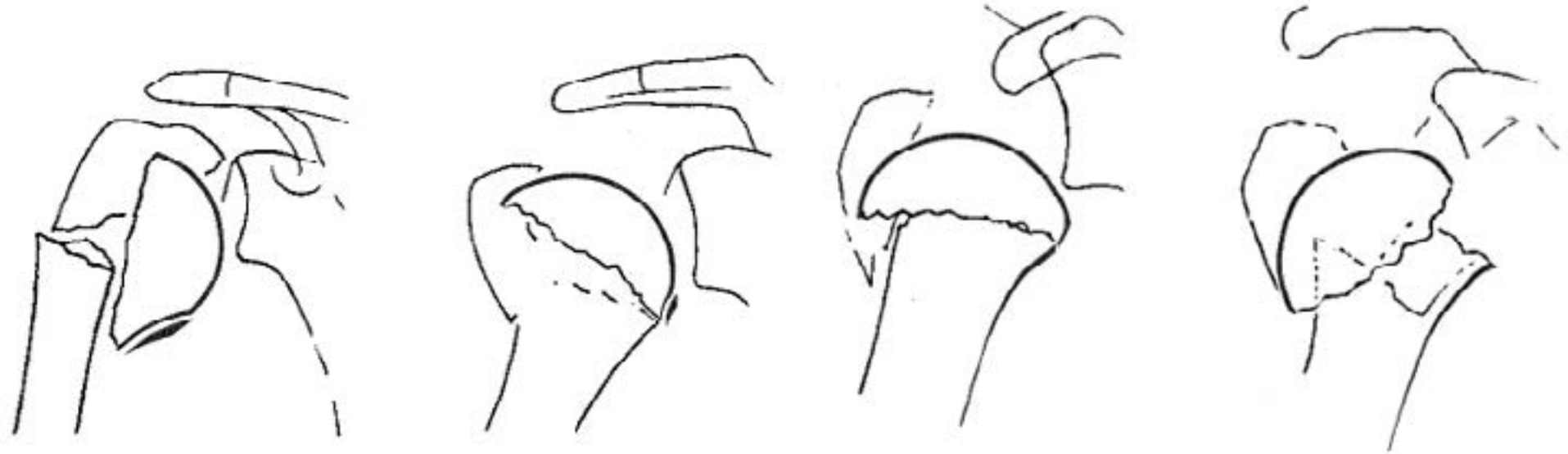


Figure 2 First additional criterion: length of the medial metaphyseal head extension. The longer the extension, the more likely the head is perfused.

Figure 3 Second additional criterion: integrity of the medial hinge. Integrity of the hinge is a predictor of both ischemia and practical feasibility of reduction.

R. Hertel, A. Hemplfing, M. Stiehler, M. Leining. Predictors of humeral head ischemia after intracapsular fracture of the proximal humerus. J Shoulder Elbow Surg. July/August 2004

NECROSI AVASCOLARE

- Dopo sintesi con placca:
 - 3% - 14% per fratture a 3 frammenti
 - 13% - 34% per fratture a 4 frammenti

“ Nelle fratture anatomicamente consolidate, i risultati clinici sono soddisfacenti anche quando si verifica una necrosi parziale o totale”
Constant score= 64 (Follow-up 7.5 anni)

Gerber C, Hersche O, Berberat C. The clinical relevance of posttraumatic avascular necrosis of the humeral head. J Shoulder Elbow Surg. 1998 Nov-Dec (6):586-90

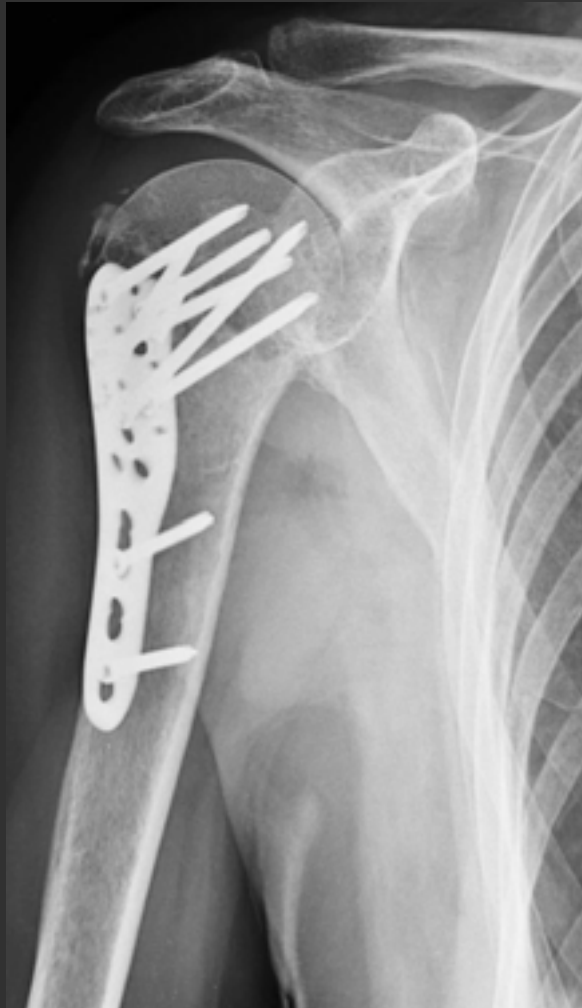
Donna 70 aa.



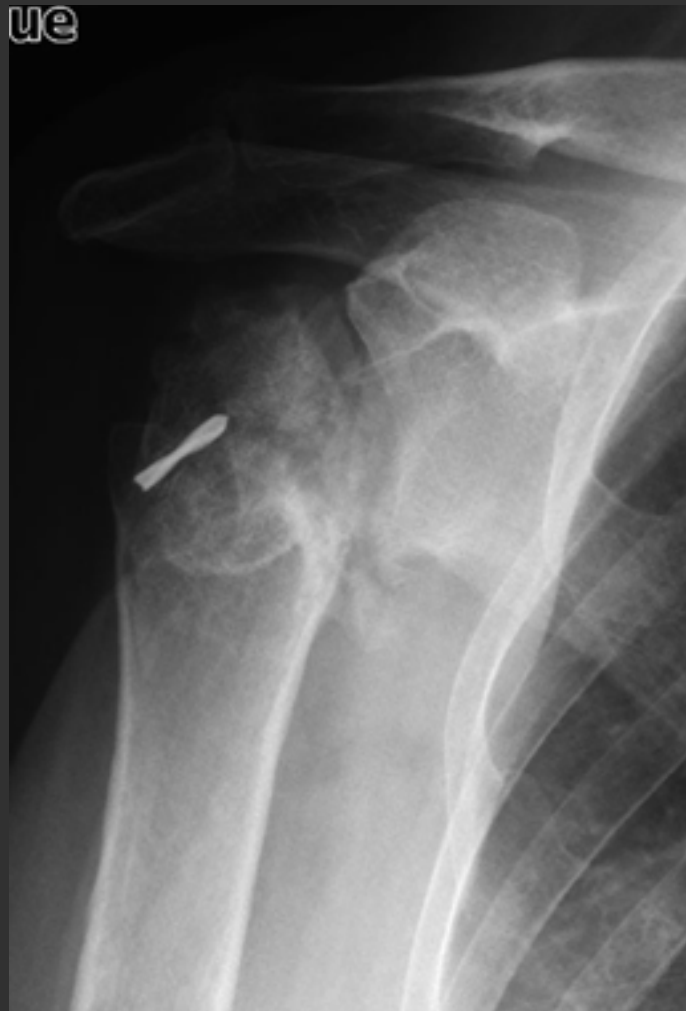
1 mese post-op



4 mesi post-op



18 mesi post-op



COMPLICANZE

STUDIO RETROSPETTIVO

70 PZ.

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graph TD; A(70 PZ.) --> B(46 pz. con frattura a 3 - 4 frammenti impattate in varo.); A --> C(26 pz. con fratture a 3 - 4 frammenti impattate in valgo.);
```

46 pz. con frattura a 3 – 4 frammenti impattate in varo:

- Perforazione della testa 21%
- Rimozione placca per conflitto 63%
- Necrosi avascolare 21%
- Constant score: 63.3

26 pz. con fratture a 3 – 4 frammenti impattate in valgo:

- Perforazione della testa 7%
- Rimozione placca per conflitto 15%
- Necrosi avascolare 15%
- Constant score: 71.2

*Solo accesso deltopettorale

Solberg BD. Et al. Locked plating of 3- and 4-part proximal humerus fractures in older patients: the effect of initial fracture pattern on outcome. J Orthop Trauma. 2009 Feb;23(2):113-9.

COMPLICANZE

STUDIO PROSPETTICO MULTICENTRICO

*Deltoid-splitting in 27 pz.

Correlate alla tecnica operatoria:

- Perforazione della testa 14%
- Conflitto 4 pz.

Secondarie alla frattura/osso:

- Perdita di riduzione 7% (6 pz. senza perforazione della testa; 5 pz. con perforazione della testa)
- Necrosi avascolare 4%
- Constant score: 71 ± 14 a 12 mesi di follow-up

Correlato all'impianto:

- Pull-out della placca: 2 pz.
- Rottura della placca: 3 pz.
- Loosening delle viti: 2 pz.

187 PZ.

55% delle complicanze direttamente correlato alla sintesi iniziale

Südkamp N, Bayer J, Hepp P, Voigt C, Oestern H, Kääh M, Luo C, Plecko M, Wendt K, Köstler W, Konrad G. Open reduction and internal fixation of proximal humeral fractures with use of the locking proximal humerus plate. Results of a prospective, multicenter, observational study. J Bone Joint Surg Am. 2009 Jun;91(6):1320-8.

COMPLICANZE

STUDIO PROSPETTICO MULTICENTRICO

*Deltoid-splitting solo per esporre il trochite
o la parte più prossimale della testa

Tutte guarite ad 1 anno di follow-up

Constant score: 72 punti ad 1 anno

157 PZ.
(158 fratture)

Brunner F, Sommer C, Bahrs C, Heuwinkel R, Hafner C, Rillmann P, Kohut G, Ekelund A, Muller M. Open reduction and internal fixation of proximal humerus fractures using a proximal humeral locked plate: a prospective multicenter analysis. J Orthop Trauma. 2009 Mar;23(3):163-72.

TABLE 1. Detailed Listing of Complications With Indication of Underlying Cause

Complications	Implant	Nonimplant	All	Reoperation*
Hematoma and bleeding				
Hematoma	—	1	1	1
Wound infections				
Superficial	—	1	1	1
Deep	—	1	1	1
Soft tissue				
Impingement	—	4	4	4
Adhesion, frozen shoulder	—	4	4	3
Rotator cuff lesion	—	3	3	0
Neurologic complication	—	4	4	1
Reduction				
<u>Secondary loss of reduction</u>	5	—	5	5
Secondary dislocation of greater tuberosity	—	4	4	1
Secondary impaction	—	11	11	—
Plate and screws				
Primary screw perforation	—	22	22	10
Secondary screw perforation	13	—	13	4
Loosening	—	1	1	1
Screw backing out	1	1	2	1
Breakage	1	—	1	—
Proximal screw and plate pullout	2	—	2	1
Distal screw and plate pullout	—	2	2	1
Head necrosis				
Partial head necrosis	—	7	7	2
Complete head necrosis	—	6	6	1
General				
Abdominal wall hematoma	—	1	1	1
Posttraumatic cervicobrachial pain syndrome	—	1	1	—
Total number of complications†	15	56	71	39
Complication risk (%) (95% CI)	9 (5–15)	35 (28–43)		25 (18–32)

*Reoperations are indicated by the event that led most likely to the intervention because an associated complication may also lead to a reoperation.

†The total number of complications takes into account associated events, for example, secondary impaction with screw perforation.

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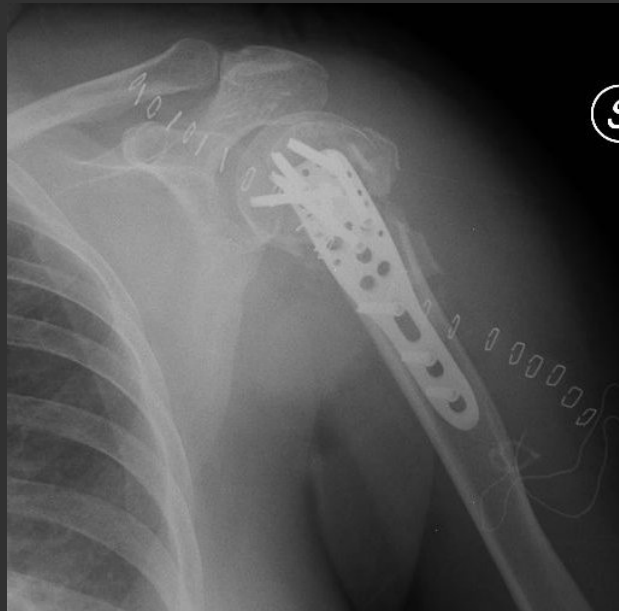
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LESIONI ASSOCIATE

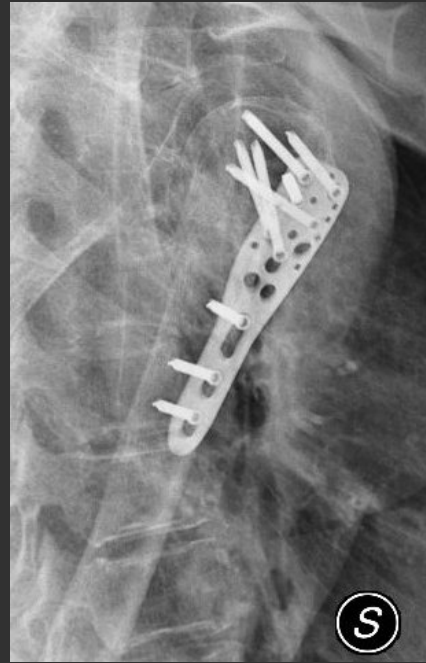
-  59 anni, caduta dall'alto in giugno 07 (1° giorno di ferie).
- RX + Desault, proposto ricovero per intervento.
- La paziente preferisce rientrare in città





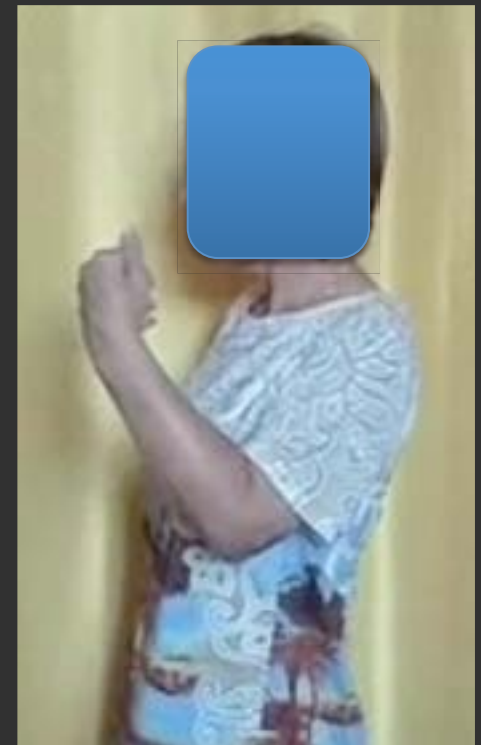
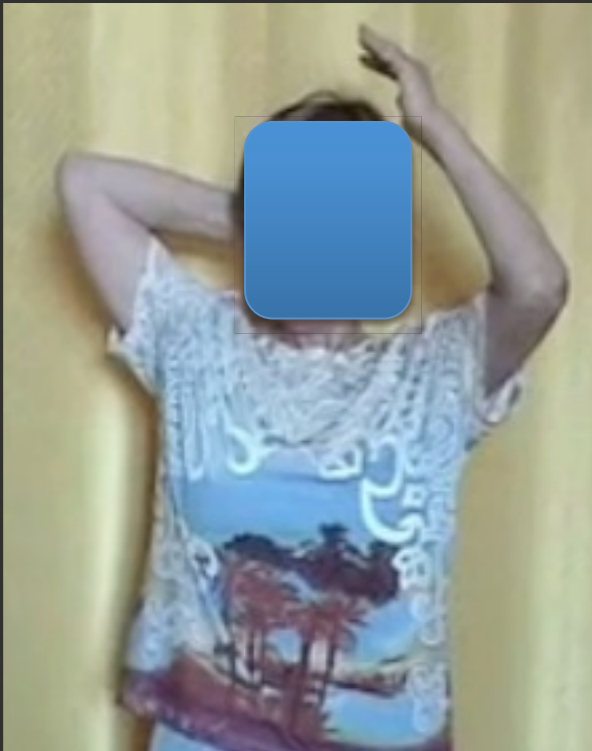


2 mesi e ½ post-op



1 ora di KT al giorno: 30 min. per la spalla e 30 min. per il gomito

2 mesi e ½ post-op



1 ora di KT al giorno: 30 min. per la spalla e 30 min. per il gomito

TAKE HOME MESSAGE

- Attenzione ai pazienti con diagnosi già fatta altrove e già immobilizzati
- Nei traumi per caduta dall'alto sospettare fratture degli arti a più livelli
- Le fratture a più livelli nello stesso arto hanno prognosi peggiore perché la rieducazione post-operatoria è più difficile
- La rieducazione post-operatoria in questi casi deve essere particolarmente attenta e prolungata
- I controlli post-operatori devono essere più frequenti e numerosi

CONCLUSIONI

- Le fratture dell'omero prossimale sono difficili e insidiose
- L'osteosintesi interna è una tecnica efficace, ma richiede esperienza e precisione
- La frattura deve essere accuratamente studiata e l'osteosintesi pianificata in tutti i dettagli
- Valutare e trattare le lesioni associate o pre-esistenti
- Controlli periodici
- Collaborazione con Fisiatra e Fisioterapista

GRAZIE