



61° Congresso Nazionale

Società Italiana di Chirurgia della Mano

Genova 20 – 21 Ottobre 2023



LA SINTESI CON PLACCA APTUS

Fratture e Pseudoartrosi

Dr. Alessandro Fagetti



- Le fratture dello scafoide sono lesioni comuni e rappresentano circa **l'80%** di tutte le fratture carpali
- Il **trattamento** delle fratture e delle pseudoartrosi dello scafoide carpale è un argomento molto dibattuto in letteratura
 - per l'elevata **incidenza** di tali lesioni
 - per la difficoltà della **diagnosi**
 - per la scelta del **trattamento**
- La **pseudoartrosi** è l'evoluzione naturale di una frattura che non è giunta a consolidazione ed ha perso la capacità di ottenerla. L'incidenza di tale evento varia dal **5% al 50%** dei casi nelle casistiche riportate dai vari autori.
- Le cause che possono favorirla sono riconducibili ad una mancata diagnosi, oppure al fallimento di un trattamento conservativo o chirurgico.

OBIETTIVI



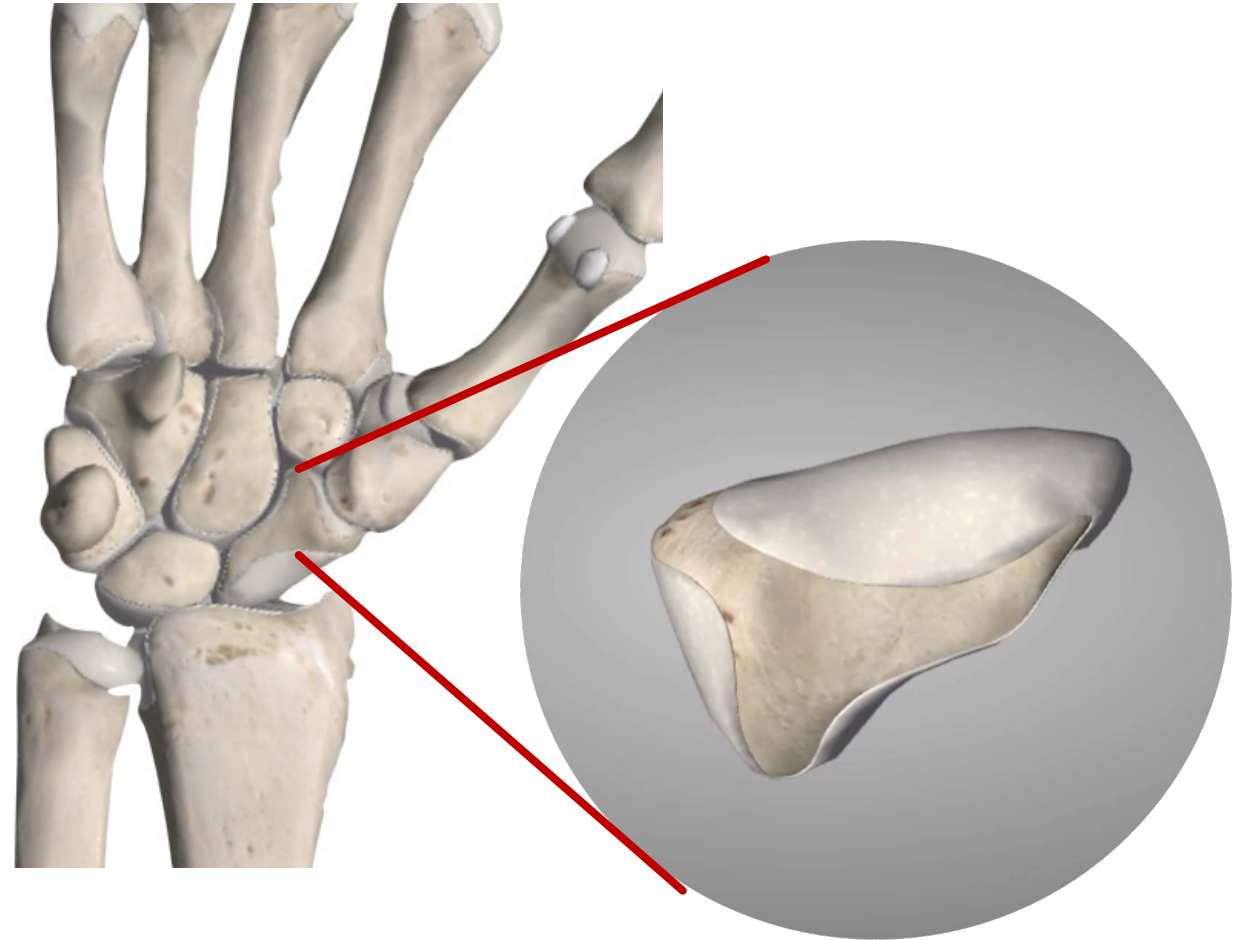
Gli obiettivi quindi da raggiungere affrontando questo spettro di lesioni sono:

- Rispristino della anatomia
- Ripristino della biomeccanica
- Consolidazione
- Recupero articolare
- Riduzione del dolore
- Ritorno precoce all'attività lavorativa

PECULIARITÀ DELLO SCAFOIDE

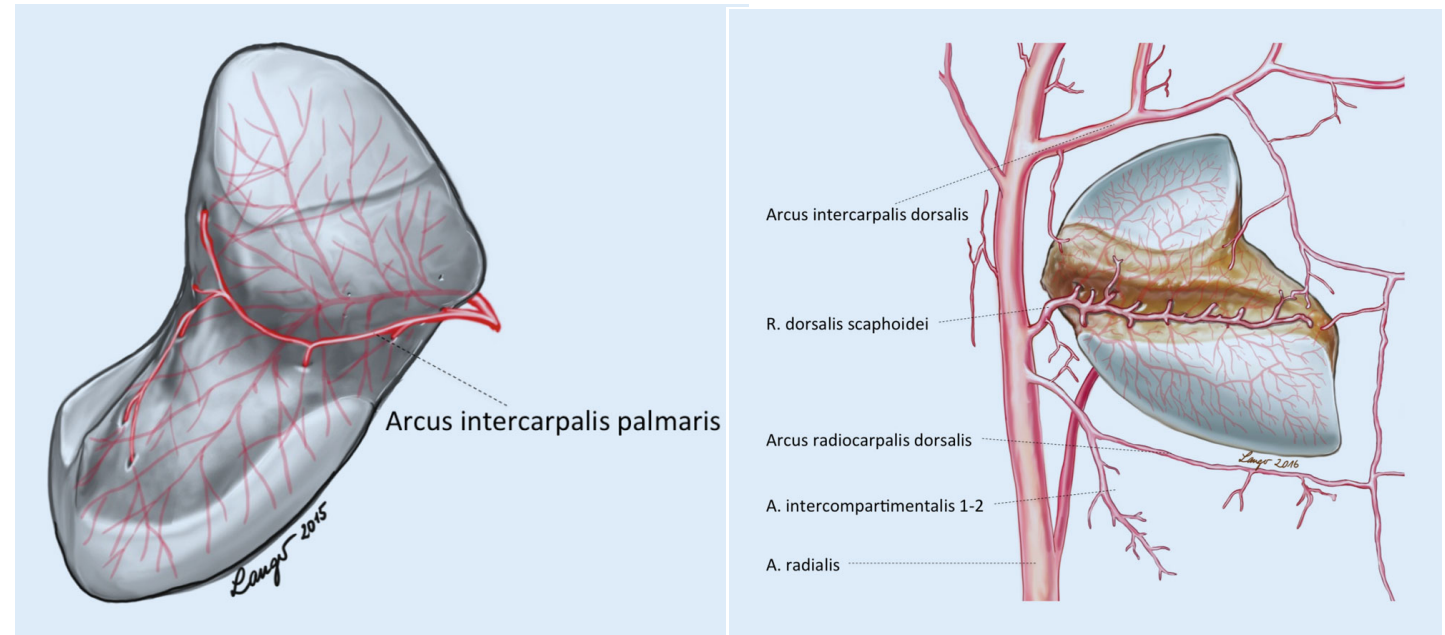
ANATOMICHE

- La superficie è per l'**86% articolare** con un rivestimento di cartilagine ialina
- La superficie non articolare è ristretta e localizzata in corrispondenza del corpo dove sono presenti numerosi forami per i vasi sanguigni e si inseriscono i legamenti e la capsula



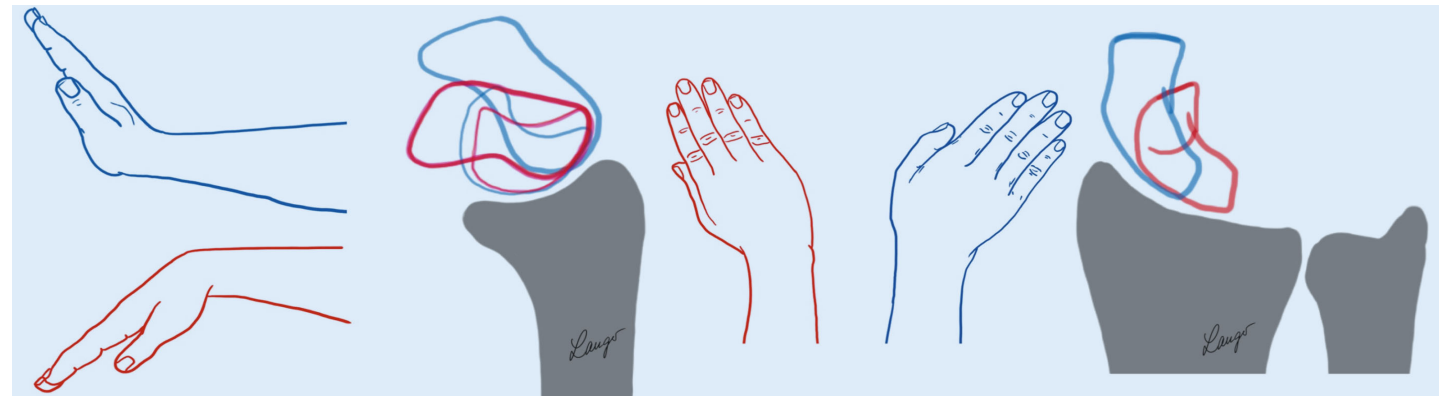
VASCOLARI

- Vasi latero-volari raggiungono lo scafoide disto-lateralmente alla superficie articolare con il radio
- Vasi dorsali penetrano nell'osso lungo la cresta spirale del corpo
- Vasi distali entrano nell'osso dalla superficie volare del tubercolo



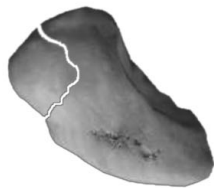
BIOMECCANICHE

Movimento, stabilità e trasmissione della forza sono il risultato di un'interazione complessa fra le articolazioni della radio-scafoidea e della radio-carpica



CLASSIFICAZIONE DELLE FRATTURE E PSEUDOARTROSI DI SCAFOIDE

Type A: Stable Acute Fractures

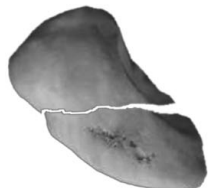


A1 Fracture of the tubercle

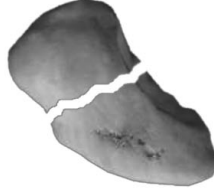


A2 Incomplete fracture through the waist

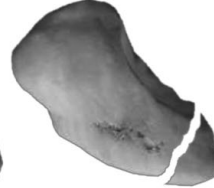
Type B: Unstable Acute Fractures



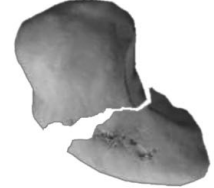
B1 Distal oblique fracture



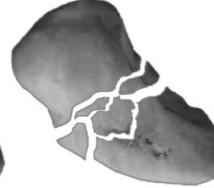
B2 Complete fracture through the waist



B3 Proximal pole fracture
a Scapho-lunate angle < 60deg
b Scapho-lunate angle > 60deg

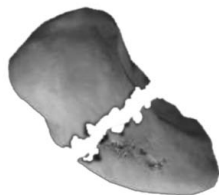


B4 Trans-scaphoid-perilunate fracture dislocation of carpus



B5 Comminuted

Type C: Delayed Union

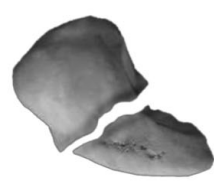


C Delayed Union

Type D: Established Non-union



D1 Fibrous Non-union
a Shortened < 2mm
b Shortened > 2mm
c with SLAC changes



D2 Sclerotic Non-union
a Shortened < 2mm
b Shortened > 2mm
c with SLAC Changes

Classificazione Krimmer / Herbert (basata su TC di fratture dello scafoide)

Tipo A: fratture stabili

- A1 frattura del tubercolo,
- A2 frattura composta del corpo,

Tipo B: fratture instabili

- B1 frattura trasversale,
- B2 frattura scomposta della corpo,
- B3 frattura del polo prossimale,
- B4 associata a lussazione trascafo-perilunare del carpo
- B5 frattura pluriframmentaria del corpo

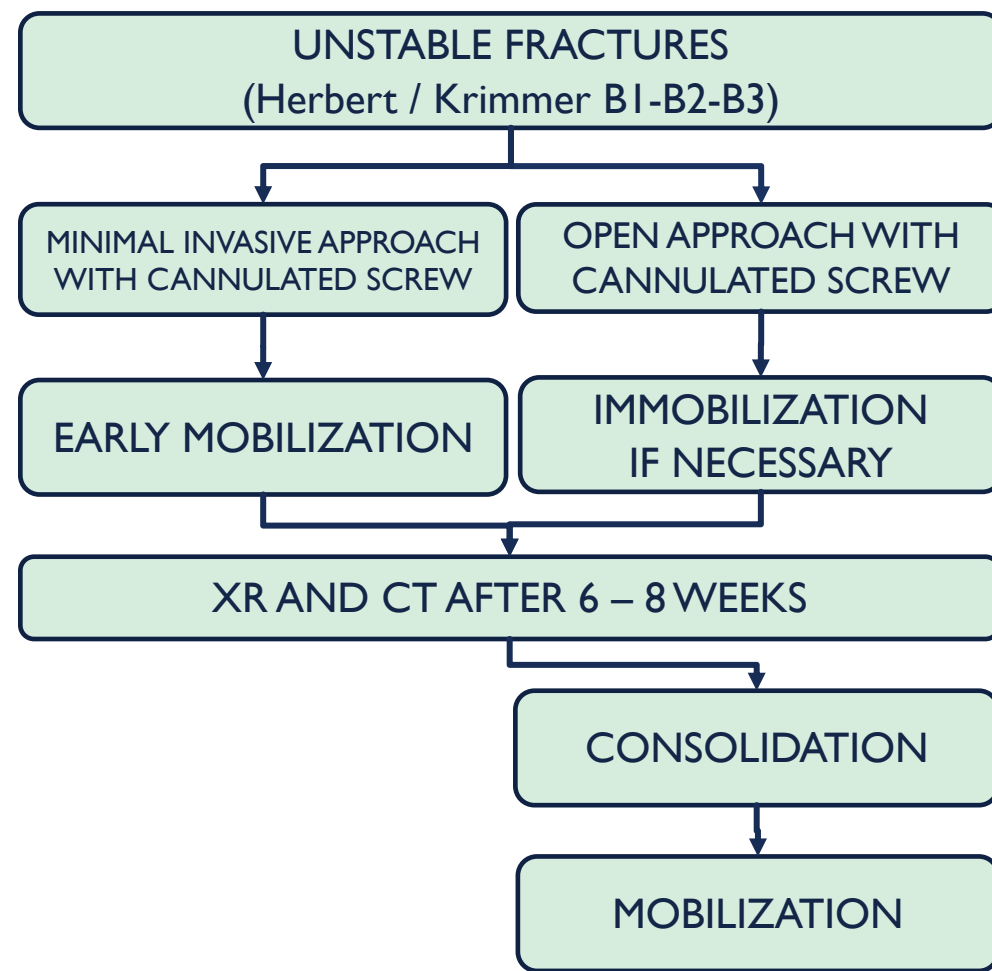
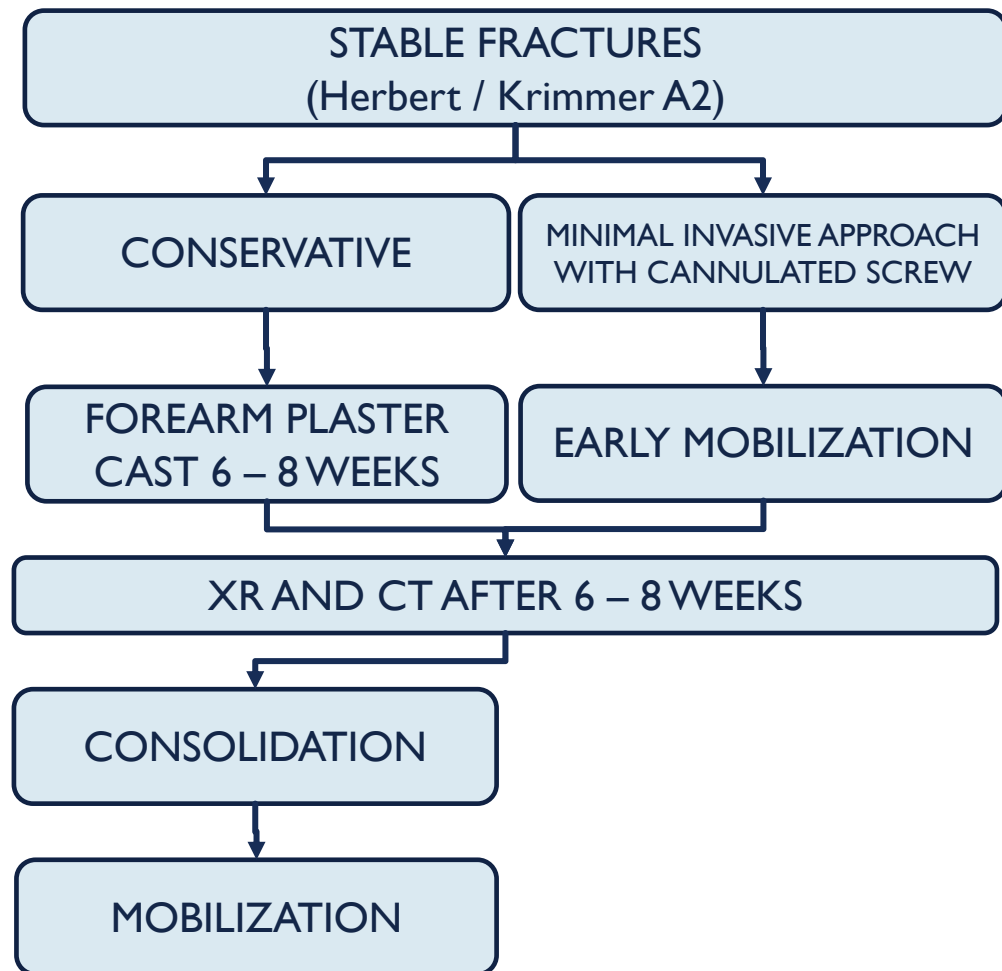
Tipo C: ritardo di consolidazione

Tipo D: pseudoartrosi

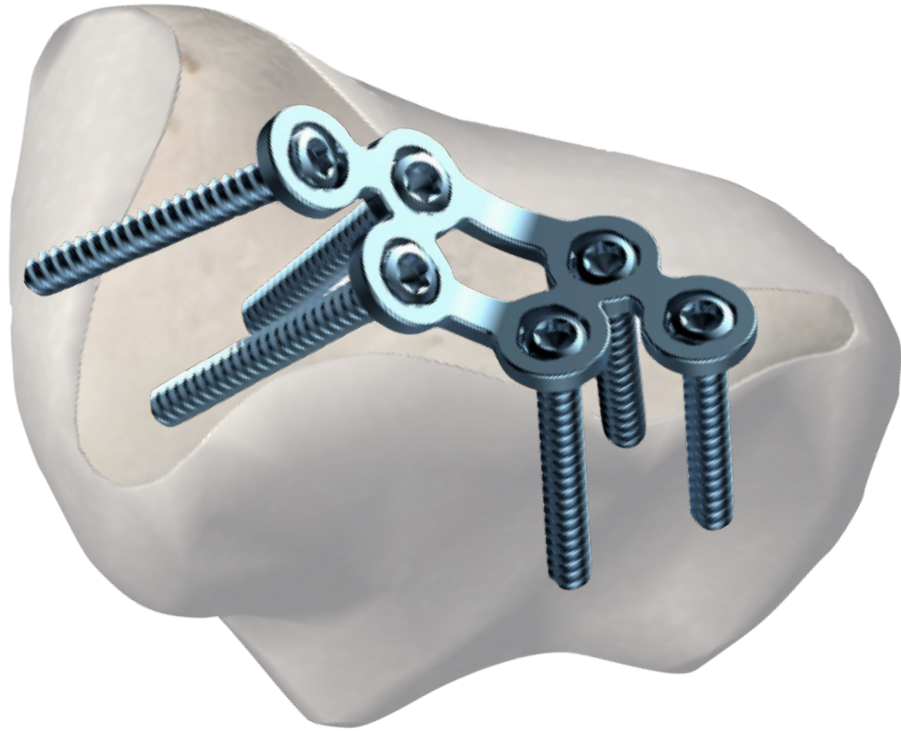
D1 pseudoartrosi fibrosa

D2 pseudoartrosi sclerotica

ALGORITMO DI TRATTAMENTO



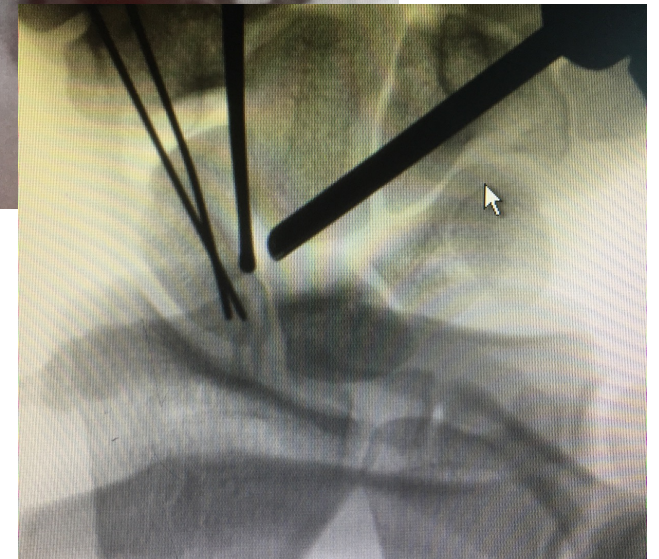
PLACCA DI SCAFOIDE



Caratteristiche

- Eccellente stabilità della riduzione dovuta alla struttura della griglia
- Due barre nel mezzo mantengono in posizione l'innesto osseo
- È possibile posizionare fino a 3 viti TriLock su ciascun lato della placca
- Placca anatomicamente presagomata per un uso intraoperatorio semplice e veloce
- I fori marginali hanno solo una barra per adattarsi facilmente alla forma dello scafoide
- Bloccaggio angolare variabile ($\pm 15^\circ$) in ciascun foro della placca
- Placca a basso 0,8 mm

Le fratture di scafoide e le PSA guariscono per guarigione primaria; non creano callo. La guarigione dell'osso primario richiede stabilità rigida e contatto diretto con l'osso dei frammenti di frattura. La compressione attraverso il sito di frattura o di pseudoartrosi può certamente essere vantaggiosa, ma non è un requisito

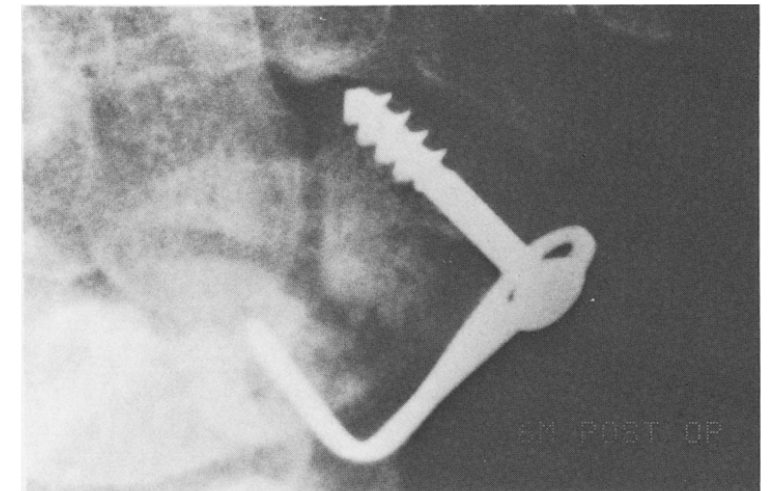
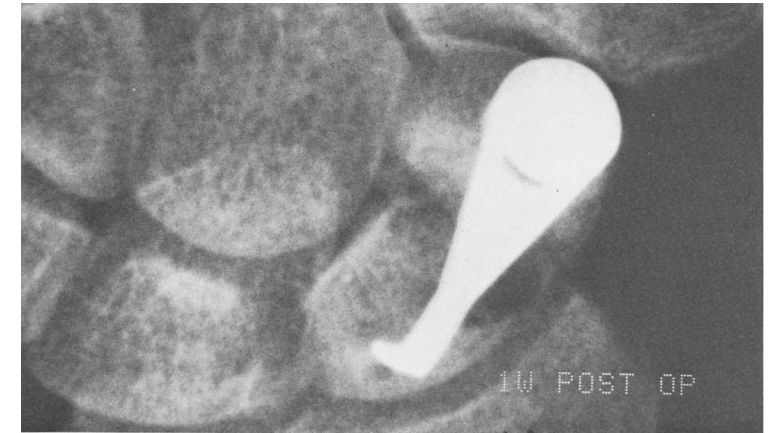
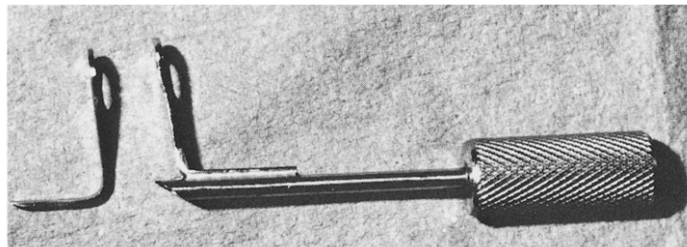


COSA SUGGERISCE LA LETTERATURA

Treatment of nonunions of the scaphoid with the Ender compression blade plate system

A relatively high failure rate is associated with bone grafting with or without screw fixation in scaphoid nonunions. Complicating factors include avascular necrosis, cystic degeneration, and osseous size discrepancy or compromise. The Ender blade plate is suitable for adding stability in these cases, in spite of the necessity for late removal and the possibility of articular impingement. Twenty patients were treated with this technique. Nine of these patients had had previous unsuccessful attempts at nonunion repair. Nineteen had satisfactory results, but one had a persistent nonunion. The use of the Ender blade plate system is applicable for treatment of these difficult cases that are not ideally suited to compression screw fixation. (J HAND SURG 1991;16A:913-22.)

Donald R. Huene, MD, *Fresno, Calif.*, and Donald S. Huene, MD, *Stanford, Calif.*

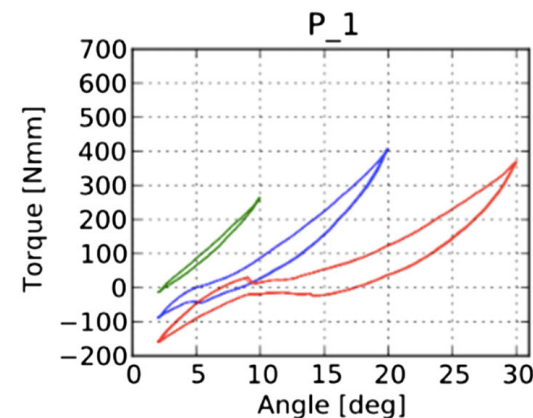
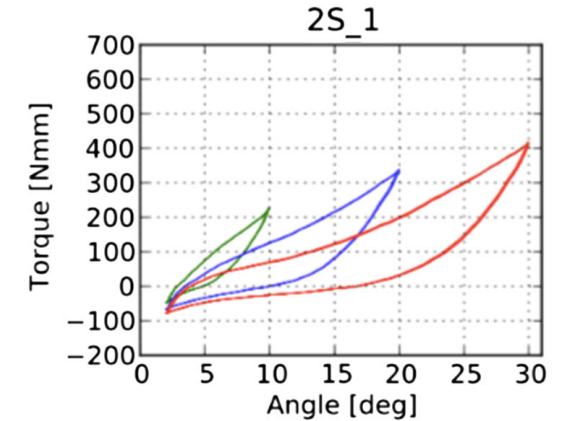
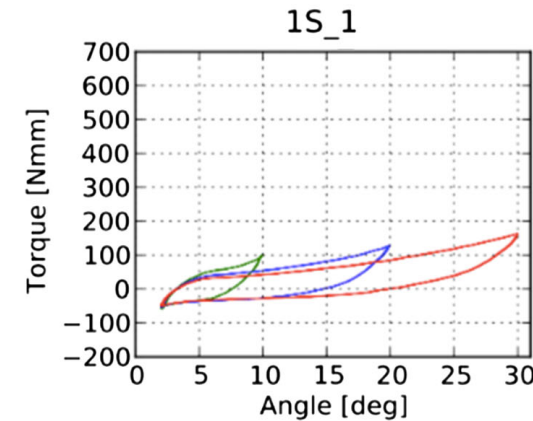




Rotational stability in screw-fixed scaphoid fractures compared to plate-fixed scaphoid fractures

Josef Jurkowitsch¹ · E. Dall'Ara² · S. Quadlbauer^{1,3,4} · Ch. Pezzeri¹ · I. Jung³ · D. Pahr⁵ · M. Leixnering¹

Conclusion Even though indications of using screws or plate systems might be different and plate osteosynthesis may be preferable in treatment of dislocated or comminuted fractures as well as for nonunions, our study showed a better rotational stability by choosing more than just one screw for osteosynthesis. Angular stable plating of scaphoid fractures also provides more rotational stability than single CCS fixation. The authors therefore hypothesise higher union rates in scaphoid fractures using more stable fixation systems.

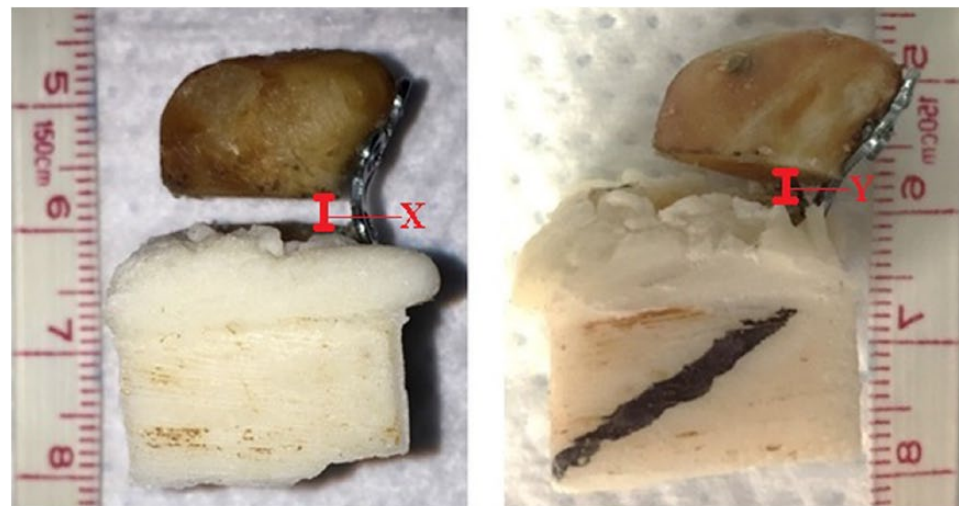




A Comparison of Plate Versus Screw Fixation for Segmental Scaphoid Fractures: A Biomechanical Study

HAND
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DOI: 10.1177/1558944717732065
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In consideration of the plate’s ability to superiorly recover scaphoid gaps after a load to failure, the authors advocate for plate fixation of “complicated” scaphoid fractures and nonunions, especially those with large segmental defects, disuse osteoporosis, delayed presentation, or failed screw fixation.



First Experiences With a New Adjustable Plate for Osteosynthesis of Scaphoid Nonunions

Martin Leixnering, MD, Christoph Pezzei, MD, Patrick Weninger, MD, Michael Mayer, MD, Robert Bogner, MD, Stefan Lederer, MD, Josef Schauer, MD, and Markus Figl, MD

Conclusions: Scaphoid plate osteosynthesis should be regarded as a salvage procedure, and the indication for the procedure should be established accordingly. It is a simple procedure in terms of technique. The plate can be adjusted very well to the anatomic shape of the scaphoid, and one can achieve a high degree of stability, particularly rotational stability.

TECHNIQUE

Volar Plate Fixation of Recalcitrant Scaphoid Nonunions With Volar Carpal Artery Vascularized Bone Graft

Seth D. Dodds, MD, Joseph T. Patterson, BS, and Andrea Halim, MD

CONCLUSIONS

Recalcitrant scaphoid nonunions can be treated with a single volar incision through which vascularized bone graft and volar buttress plating can be performed. Advantages of this scaphoid plate fixation over the headless compression screw remain untested.

Angular Stable Miniplate Fixation of Chronic Unstable Scaphoid Nonunion

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Pascal F. W. Hannemann, MD, PhD¹

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Conclusion Volar angular stable miniplate fixation with autologous cancellous bone grafting is a successful technique for the treatment of chronic unstable scaphoid nonunion, even in patients with long-lasting nonunion and in patients who underwent previous surgery for a scaphoid fracture. Rotational interfragmentary stability might be an important determining factor for the successful treatment of unstable scaphoid nonunion.

Current concepts for the treatment of acute scaphoid fractures

A. Arsalan-Werner, M. Sauerbier & I. M. Mehling

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Eur J Trauma Emerg Surg
DOI 10.1007/s00068-015-0587-8



[...] When screw osteosynthesis is not possible (for example, in wedge and multifragmentary fractures or fractures with large pre-existing intraosseous cysts of the scaphoid, a special locking plate can be used instead (Medartis AG, Basel, Switzerland).

The plate adjusts very well to the anatomy of the scaphoid. This new technology is an option for particularly difficult cases as a backup procedure. However, hardware removal after scaphoid fracture fixation is often necessary due to mechanical disturbances caused by hardware prominence [40]. Bone grafting is rarely necessary in acute fractures [...].

Lessons learned from volar plate fixation of scaphoid fracture nonunions

Seth D. Dodds, John B. Williams, Max Seiter and Clark Chen

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DOI: 10.1177/1753193417743636
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Abstract

Treating scaphoid nonunions presents difficulties particularly when there is bone loss, significant humpback deformity or avascular necrosis. We describe a new type of fixation with a volar scaphoid plate that adds to the methods of internal fixation that are available for the treatment of recalcitrant scaphoid nonunions. We will also discuss 'lessons learned' from a cases series. The case series includes 20 consecutive patients treated with volar buttress plating and a pedicled vascularized bone graft from the ipsilateral volar distal radius. There was clinical and radiographic evidence of union in 18 of 20 patients, 13 of which were verified by computed tomographic scan. The range of motion was improved in all patients post-operatively. Four patients with radiographic union experienced intermittent clicking with maximal wrist flexion, believed to be due to the impingement of the plate on the volar aspect of the radioscapoid articulation and underwent removal at approximately 1 year after the index procedure. **Volar scaphoid plating is a useful alternative to headless scaphoid screw fixation in the treatment of unstable scaphoid waist fractures and nonunions.**

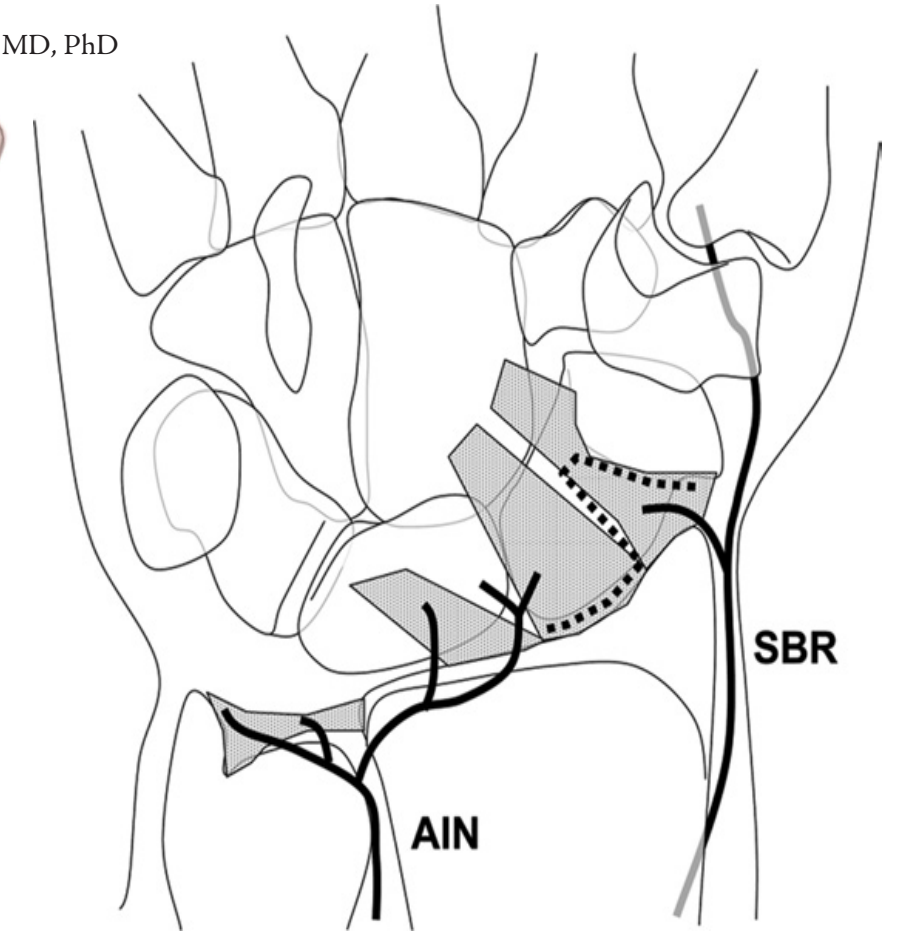
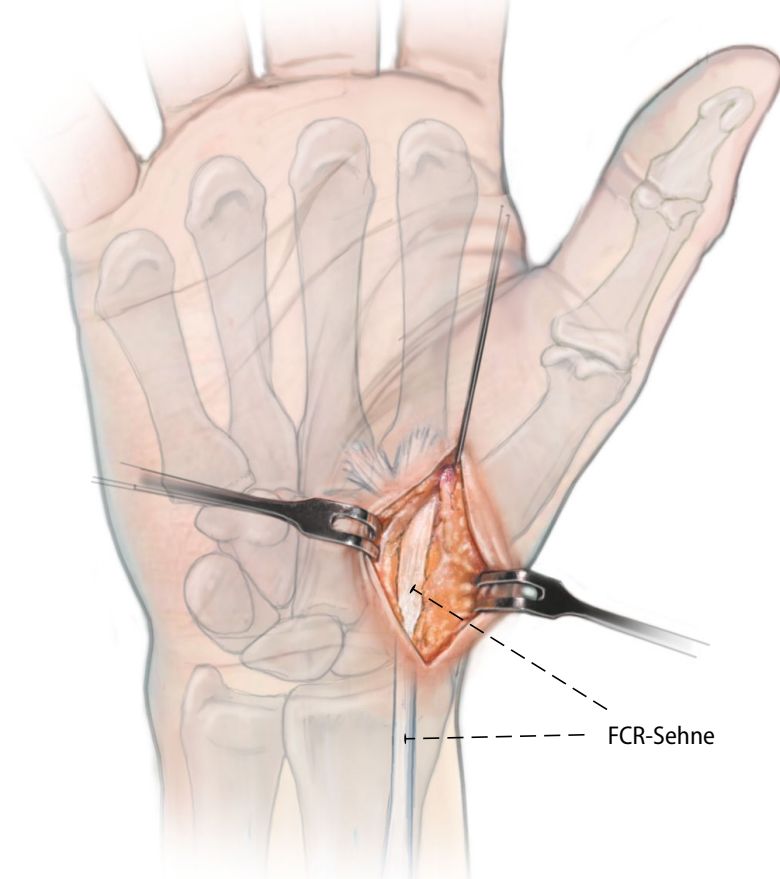
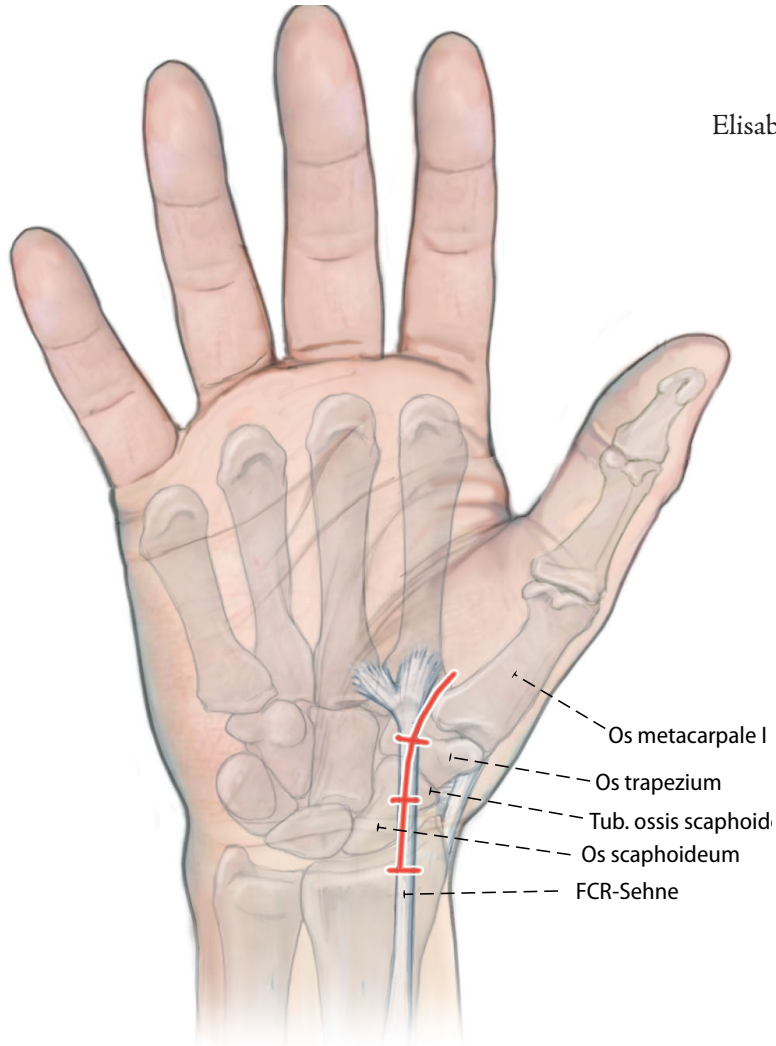


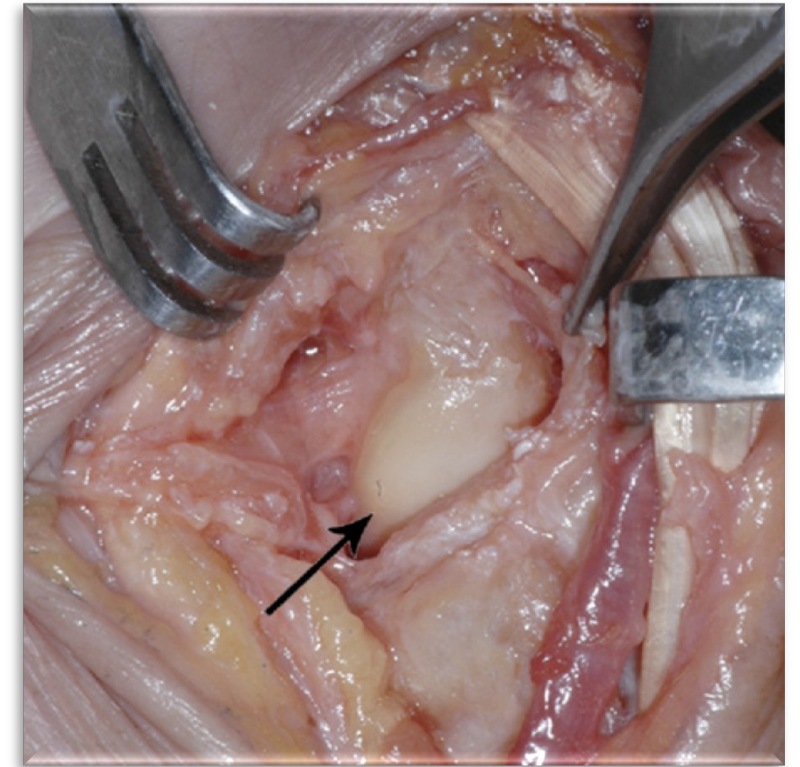
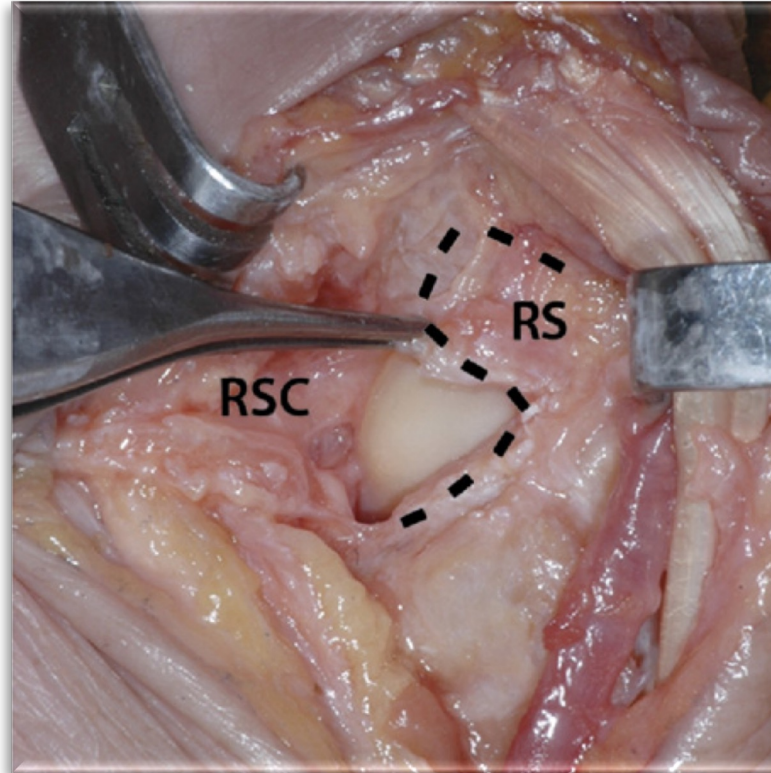
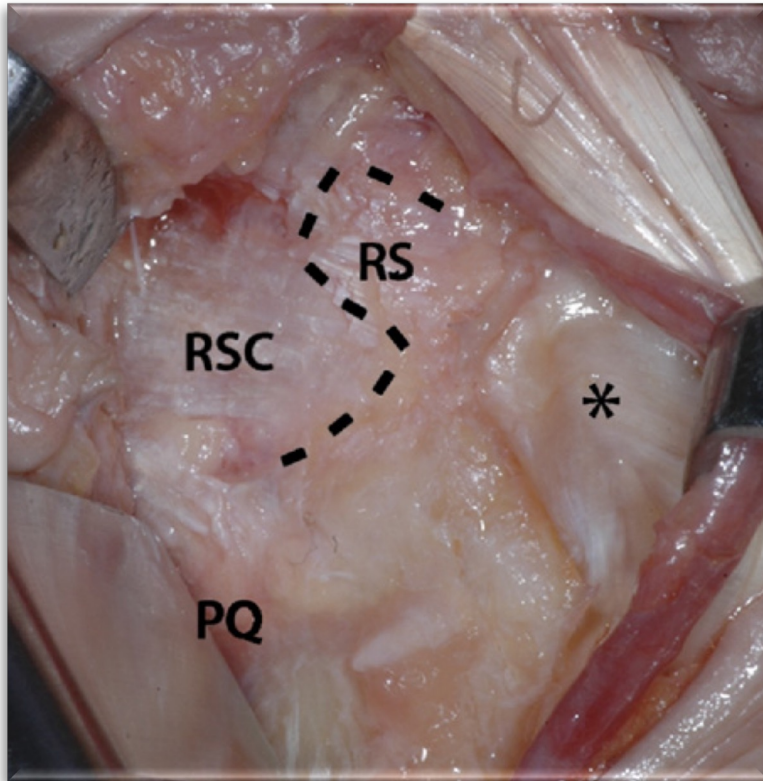
CASO CLINICO N. 1



Nerve-Sparing Dorsal and Volar Approaches to the Radiocarpal Joint

Elisabet Hagert, MD, PhD, Àngel Ferreres, MD, PhD, Marc Garcia-Elias, MD, PhD

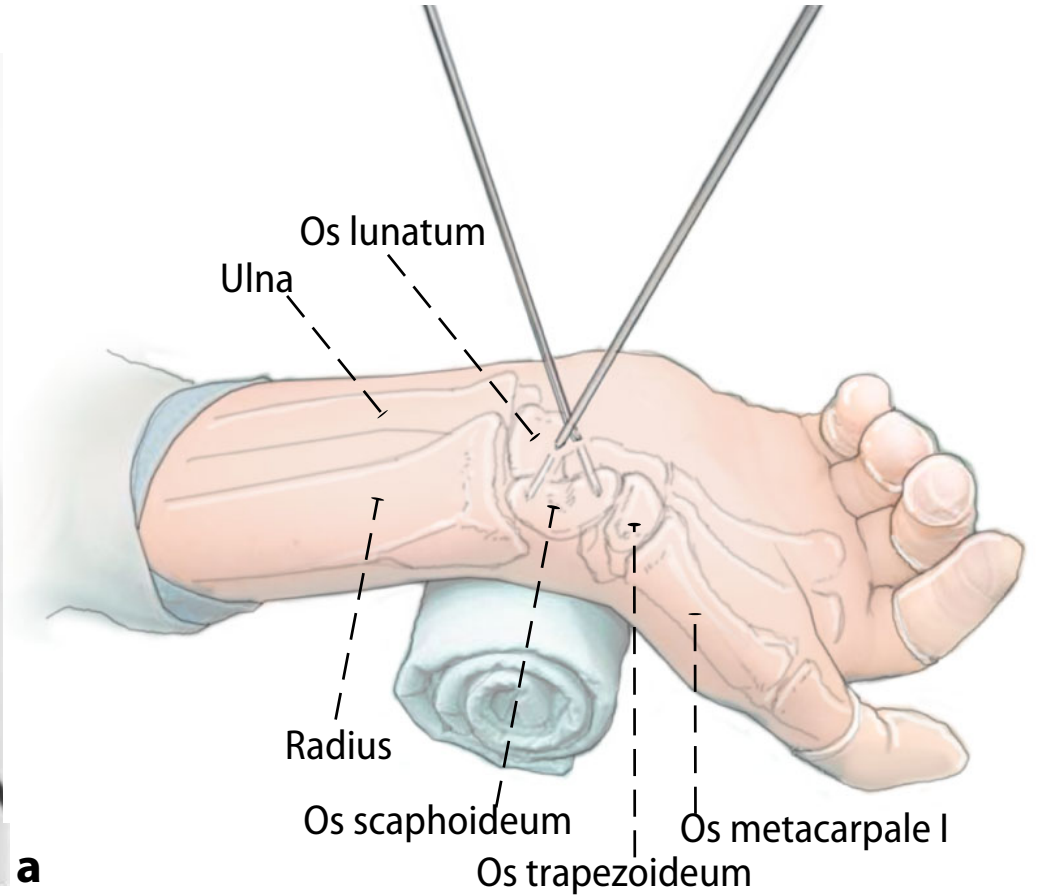


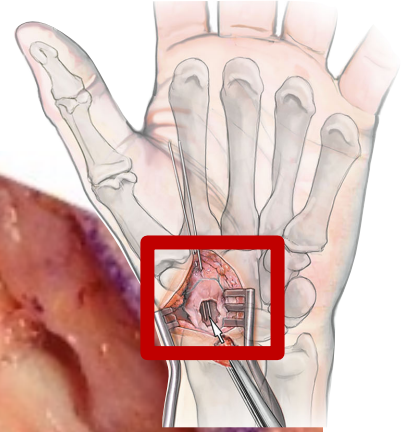
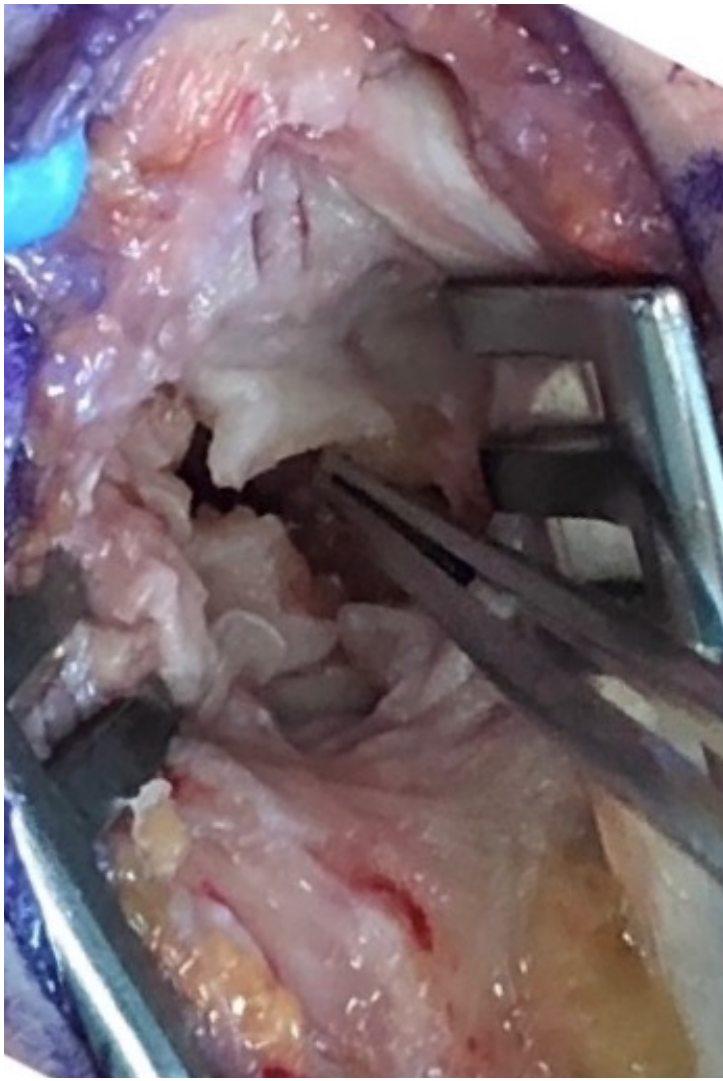
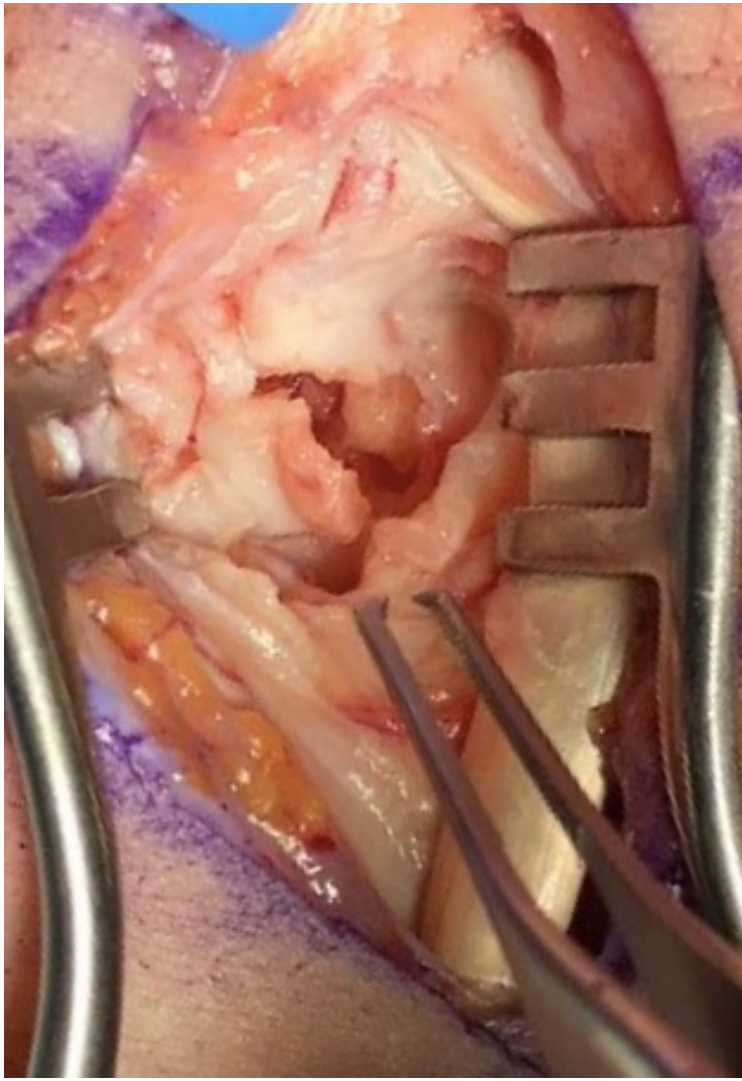


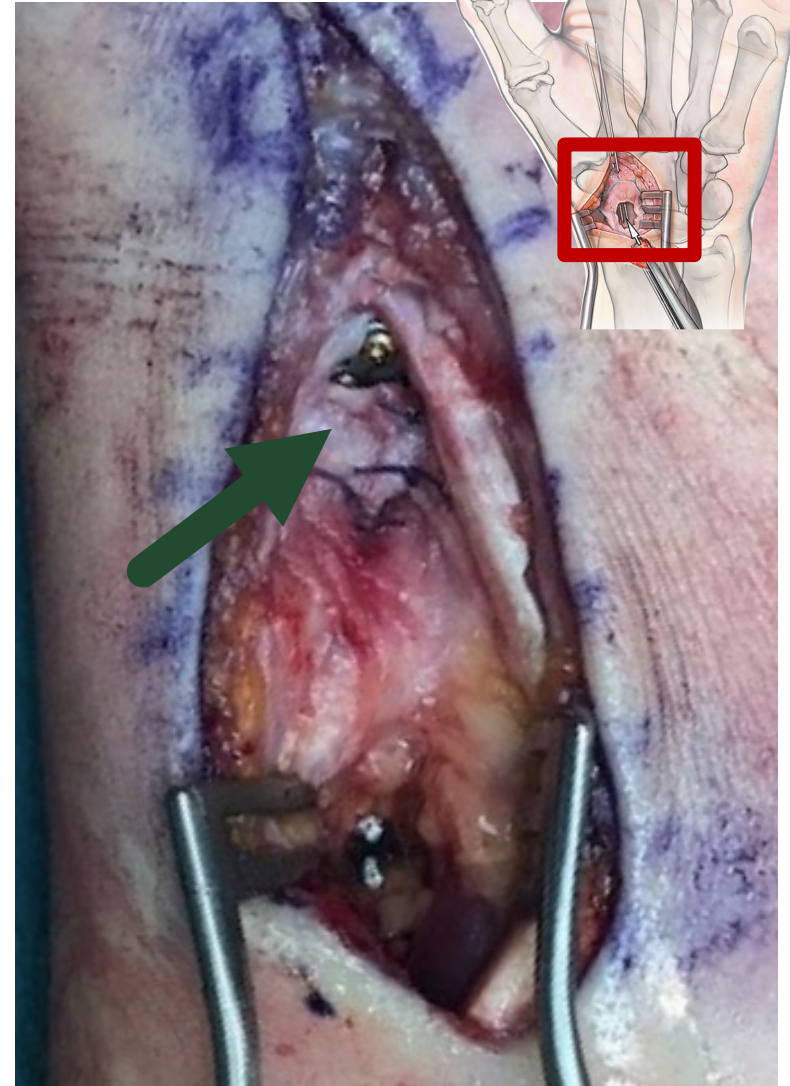
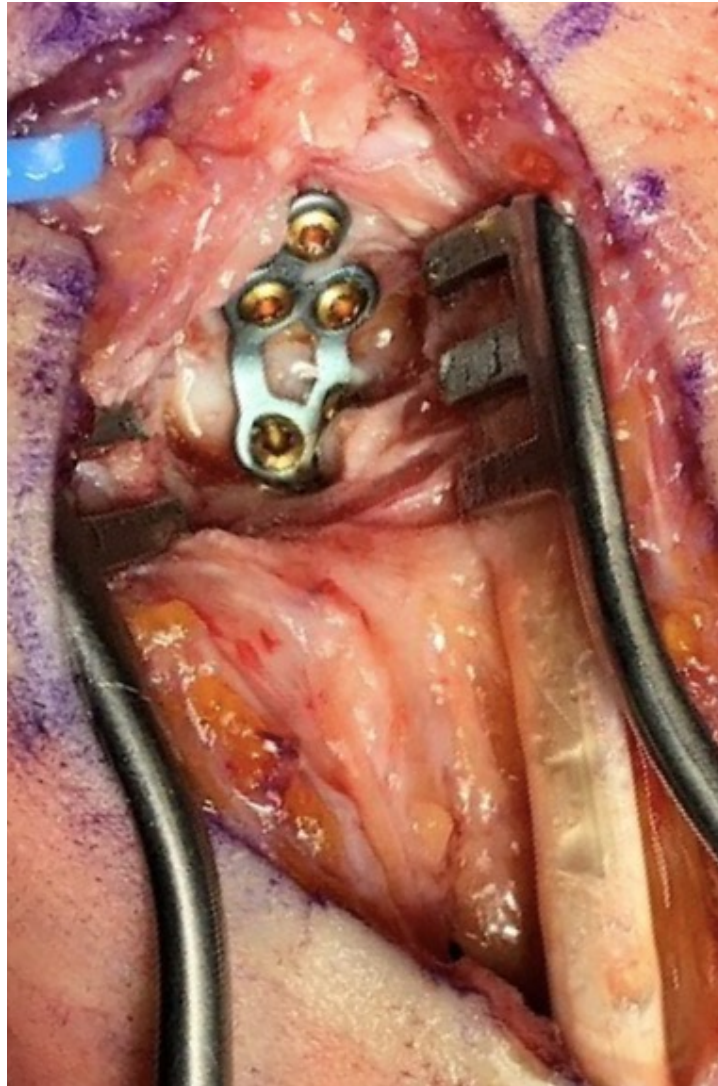
L'incisione pianificata è disegnata come una linea tratteggiata. Il legamento RSC è diviso dal bordo distale del radio ed elevato in direzione distale.

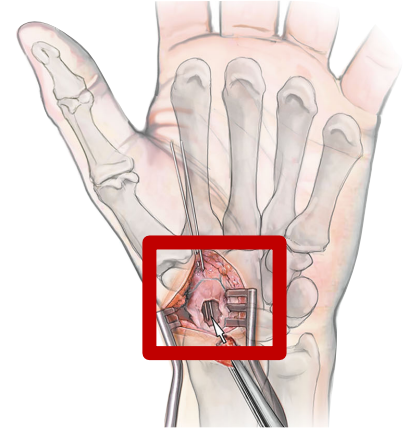
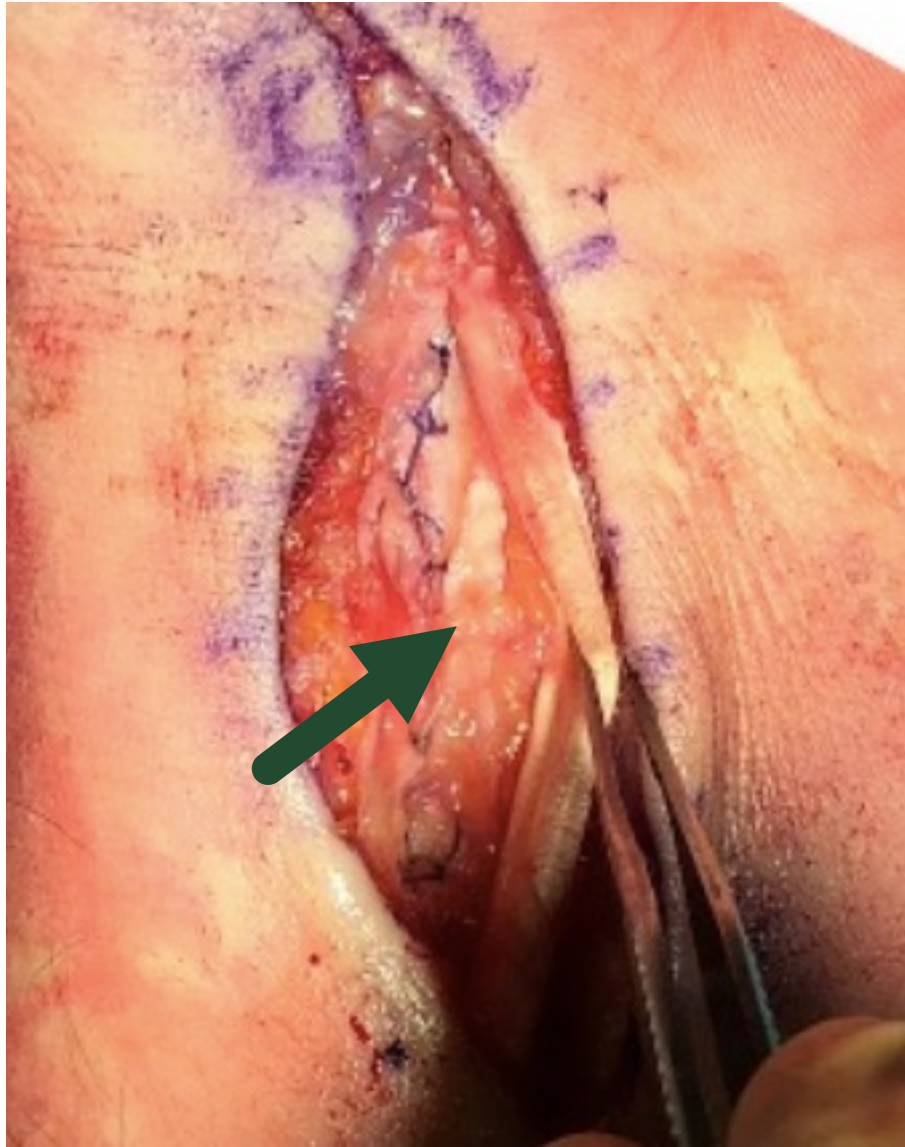
L'inserzione distale del legamento radioscafoideo (RS) sullo scafoide viene incisa per consentire l'elevazione del legamento in direzione prossimale, fornendo un'ampia esposizione allo scafoide del volare.

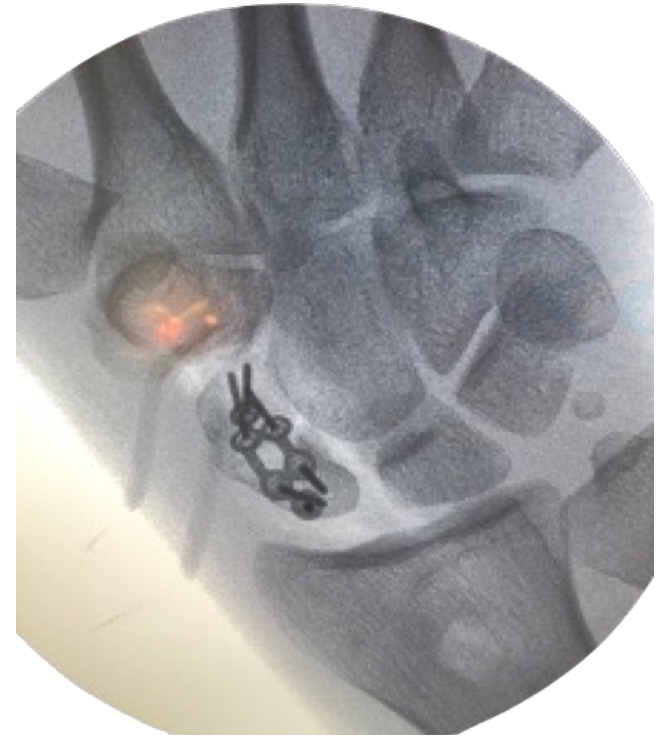
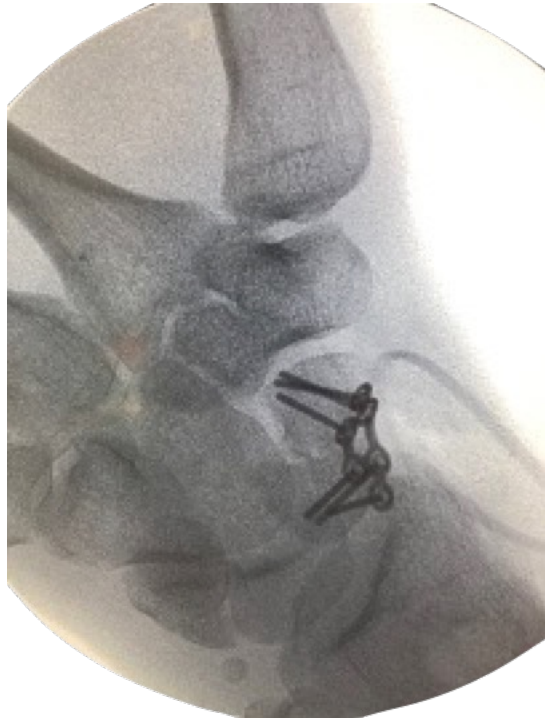
Manovra di Linscheid per ottenere una correzione della DISI











**MASSIMA
FLESSIONE**



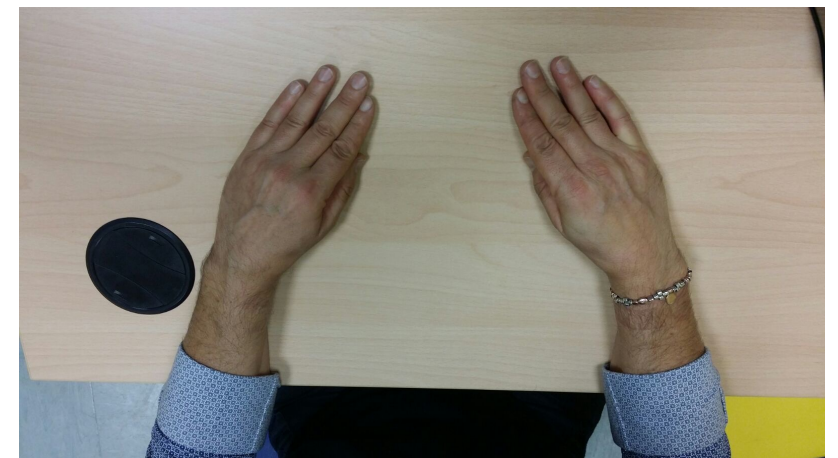
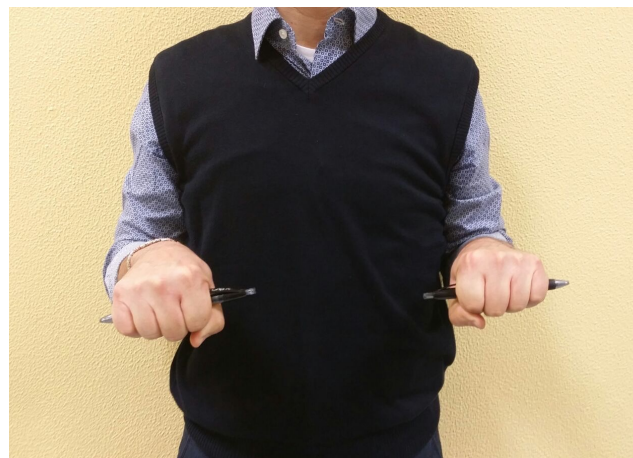
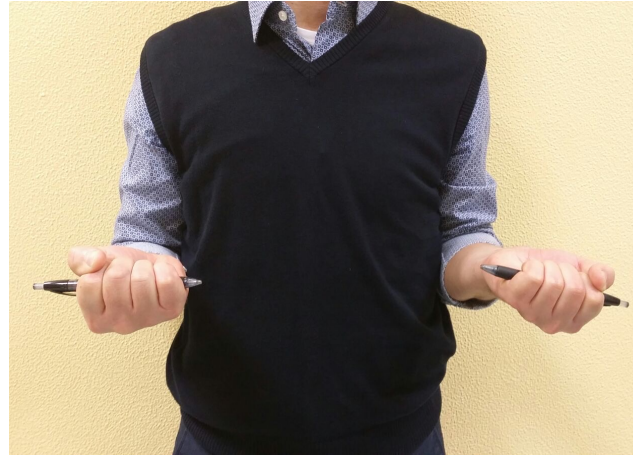
**MASSIMA
ESTENSIONE**



**CORREZIONE
HUMPBACK**



CONTROLLO CLINICO A 3 MESI DALL'INTERVENTO CHIRURGICO



CONTROLLO RX A 3 MESI DALL'INTERVENTO CHIRURGICO





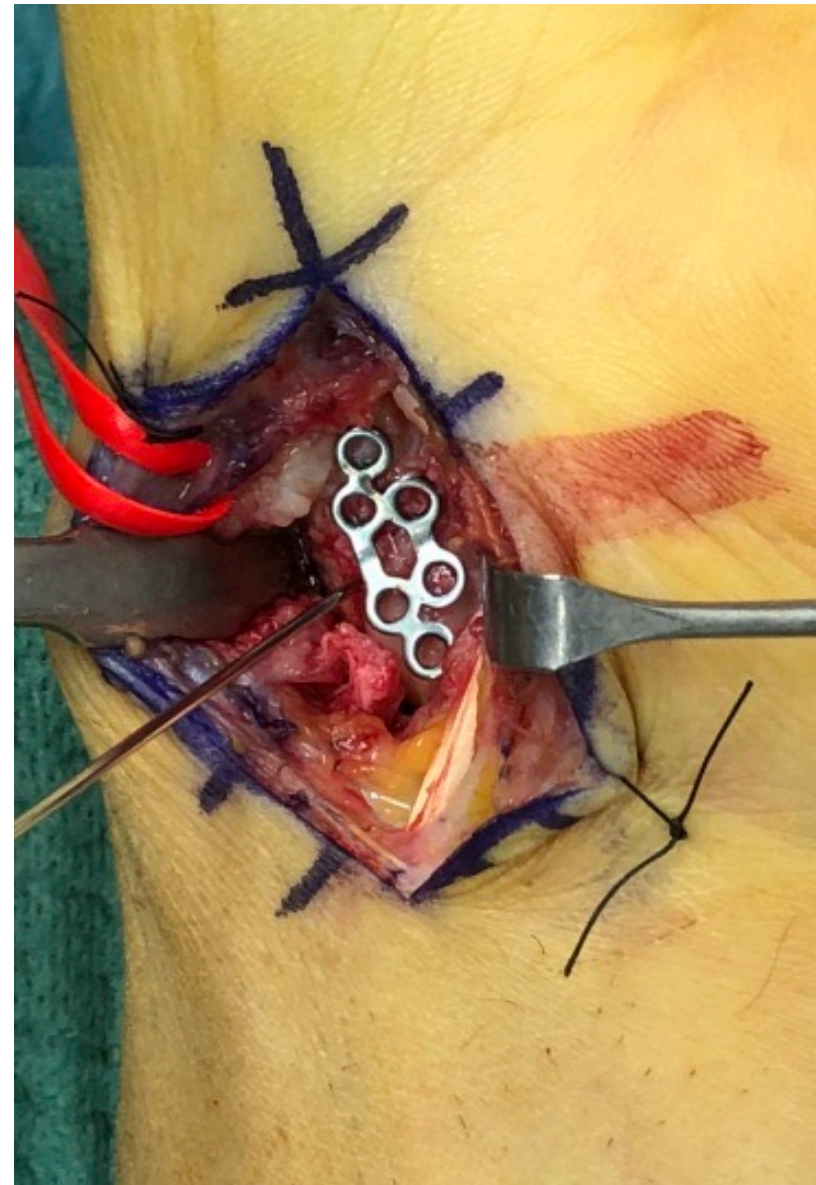
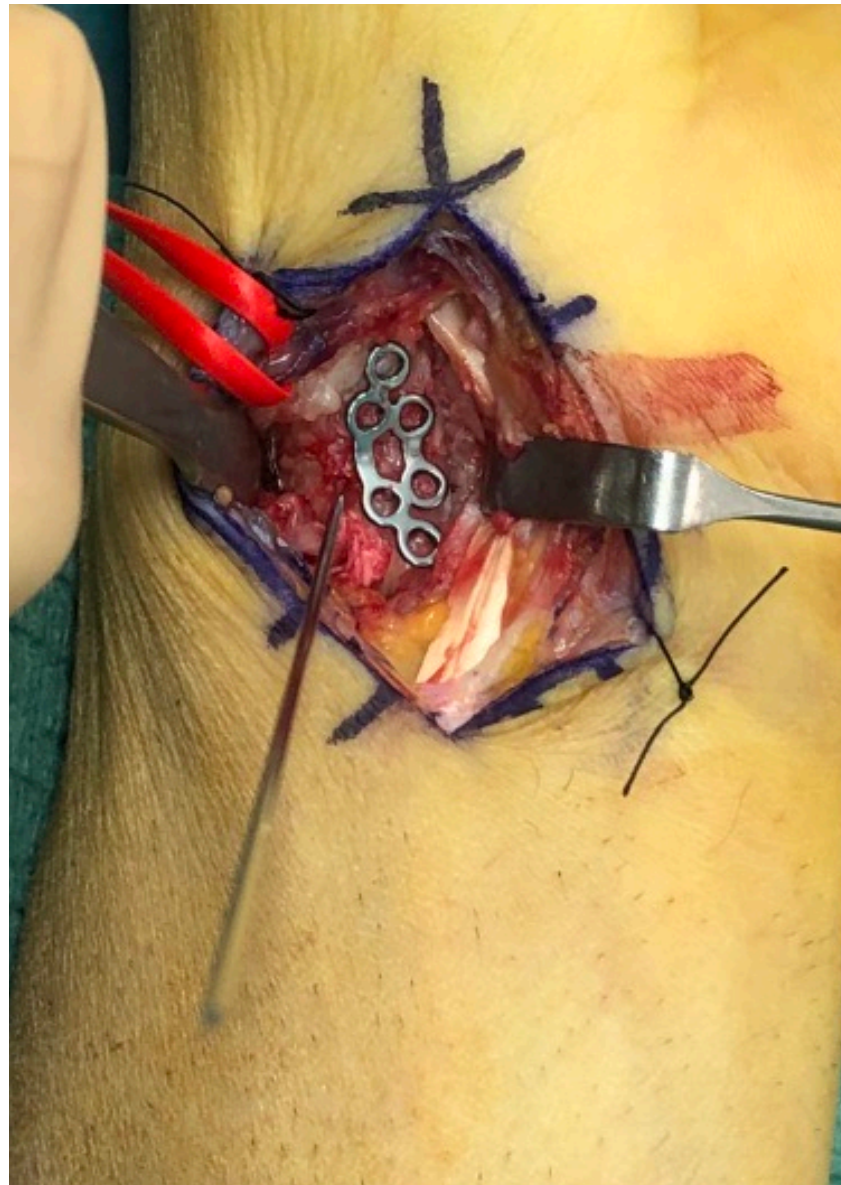
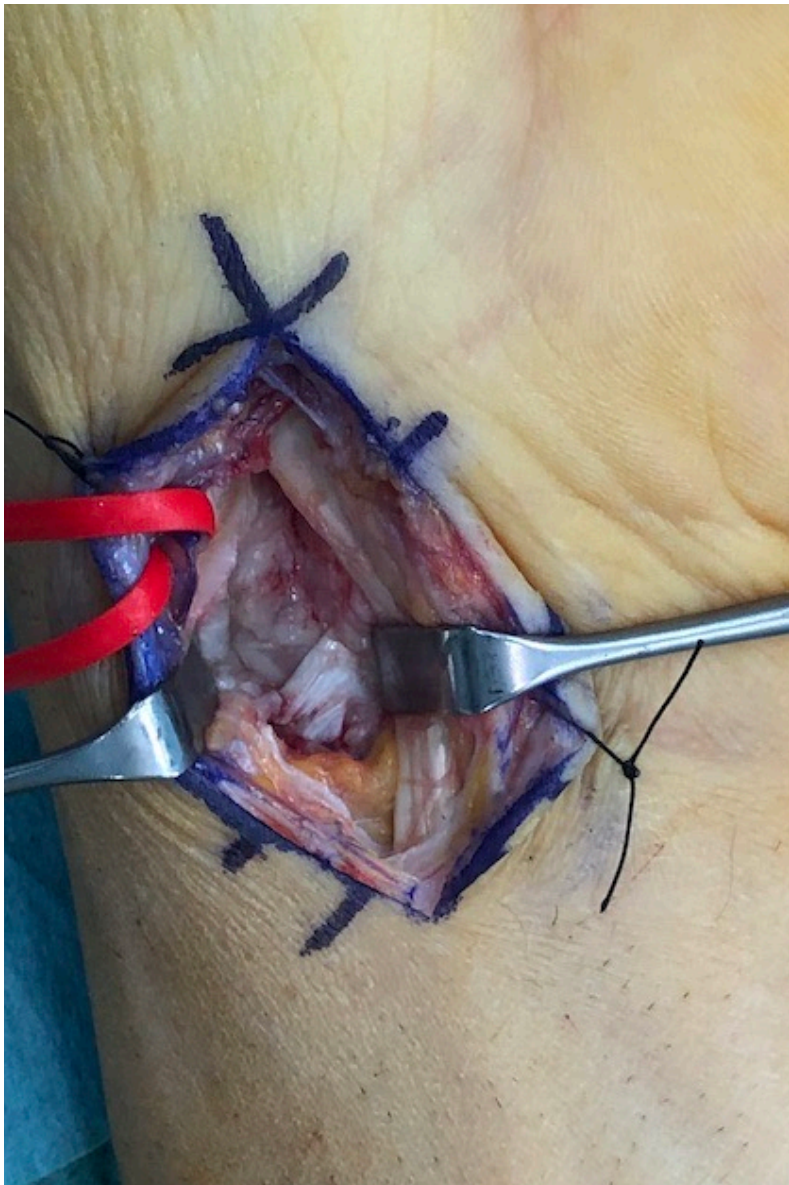
CASO CLINICO N. 2

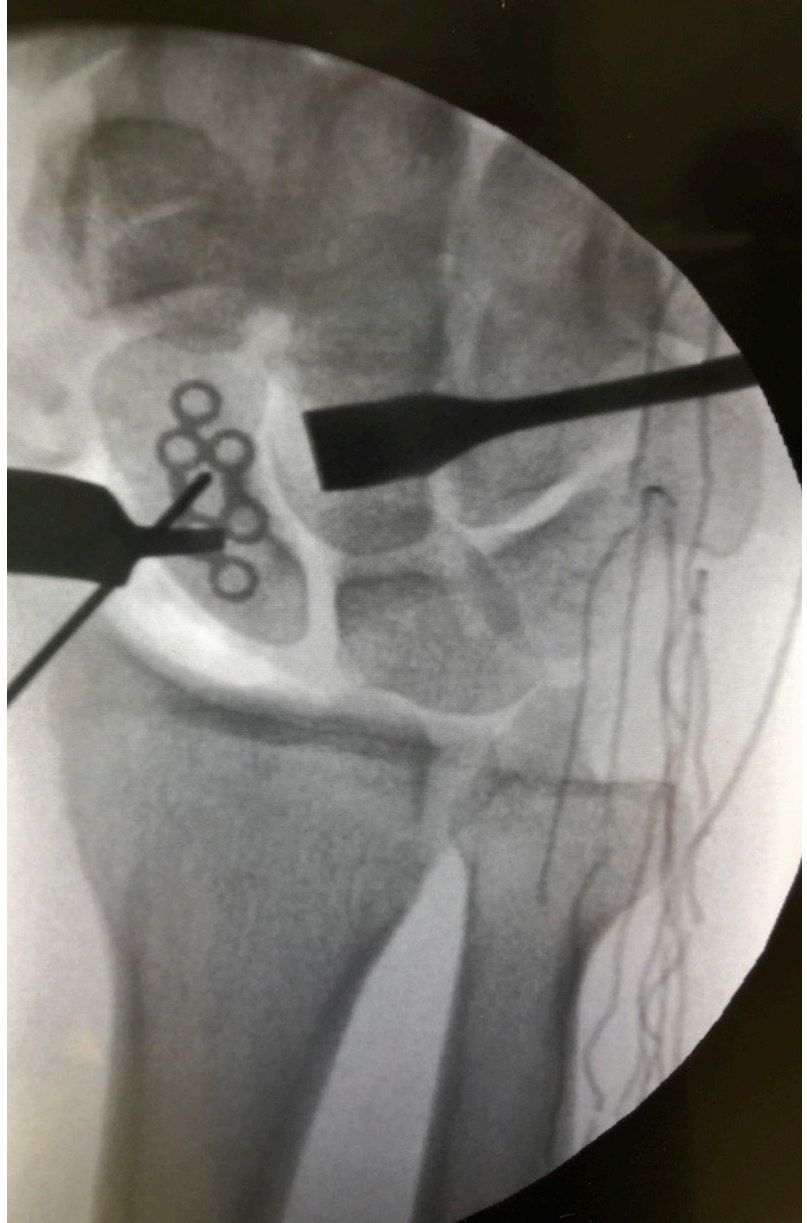
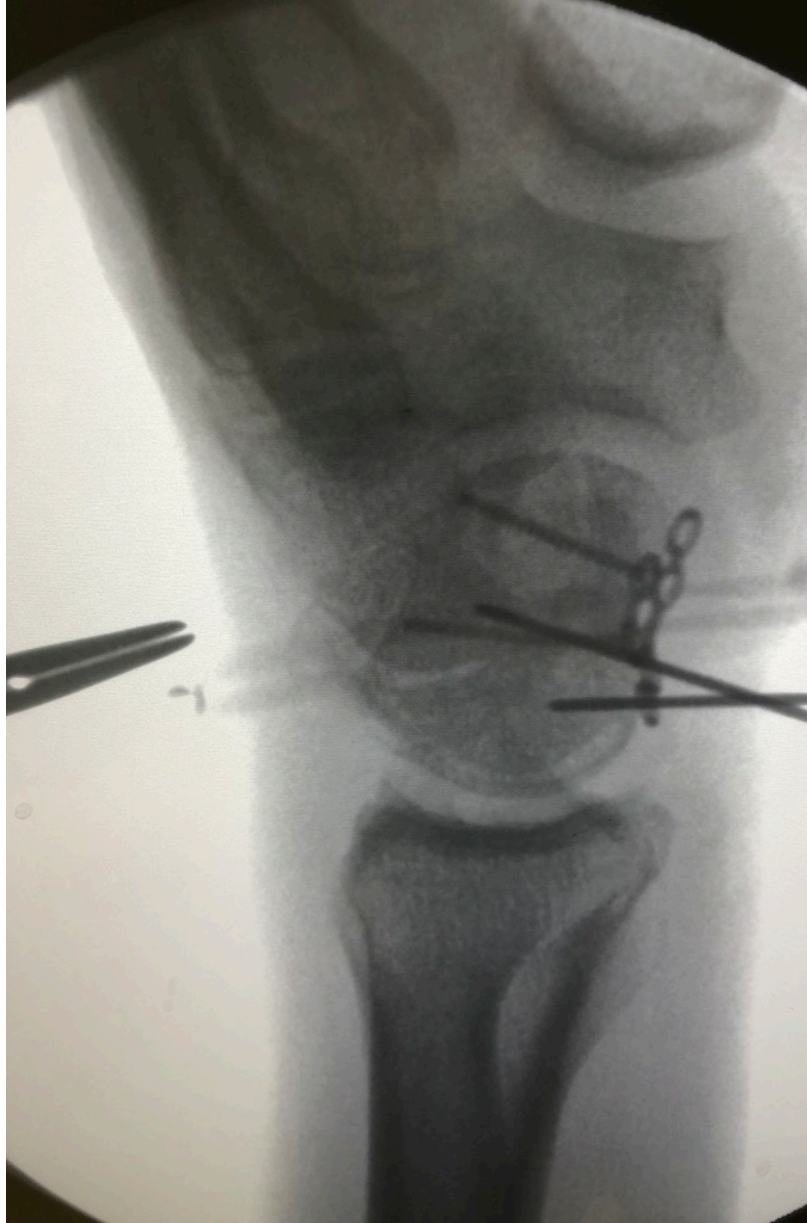
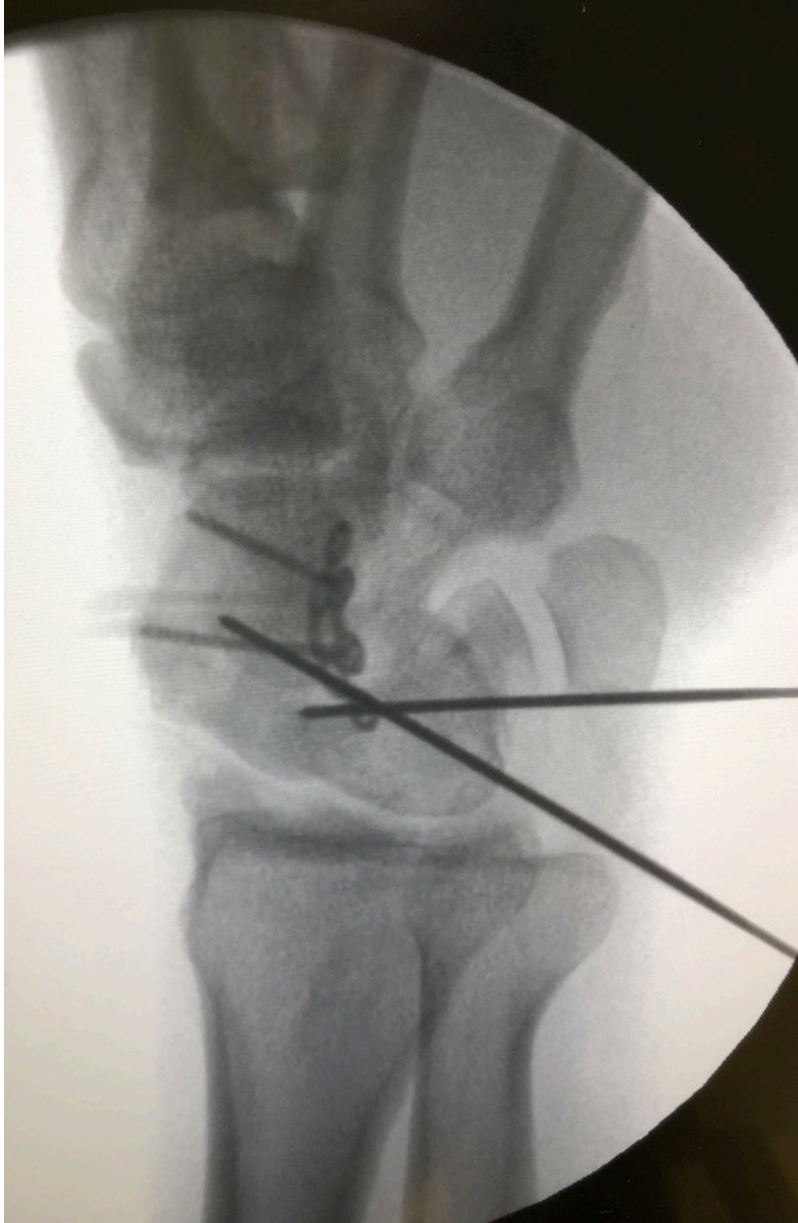
Coronal Fractures of the Scaphoid: A Review

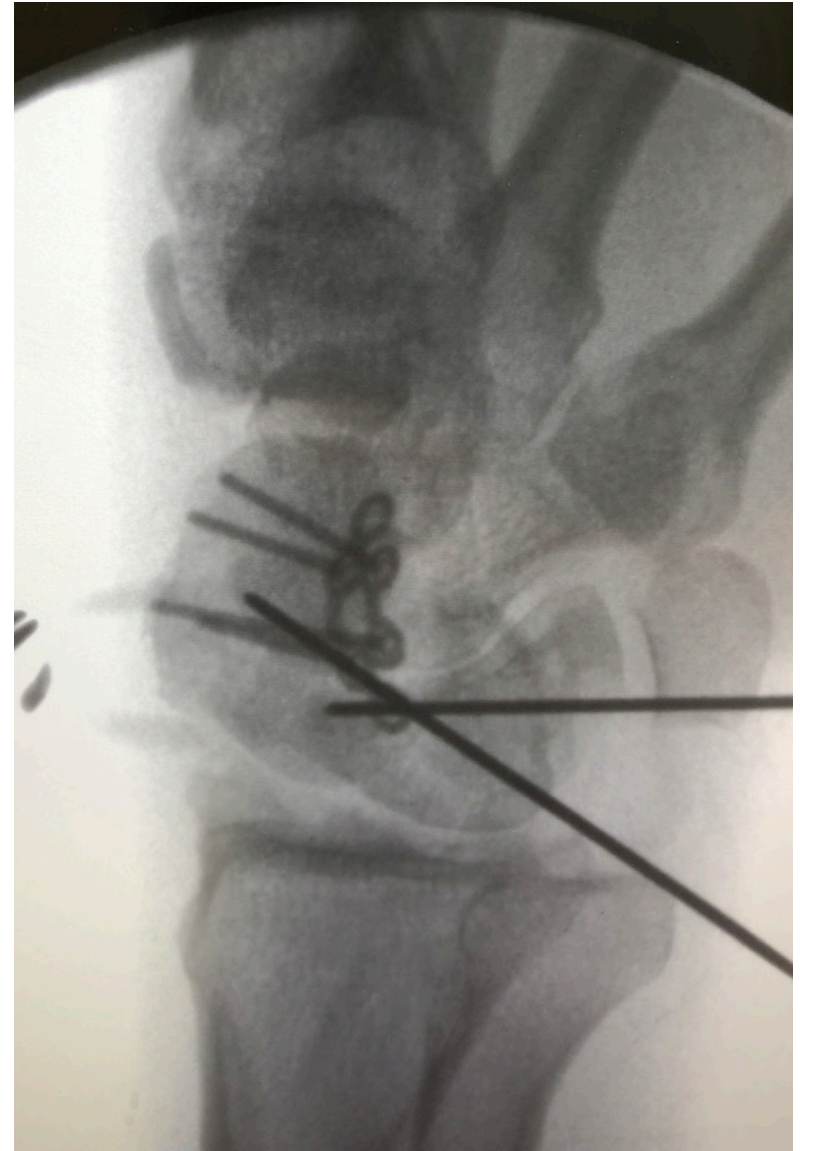
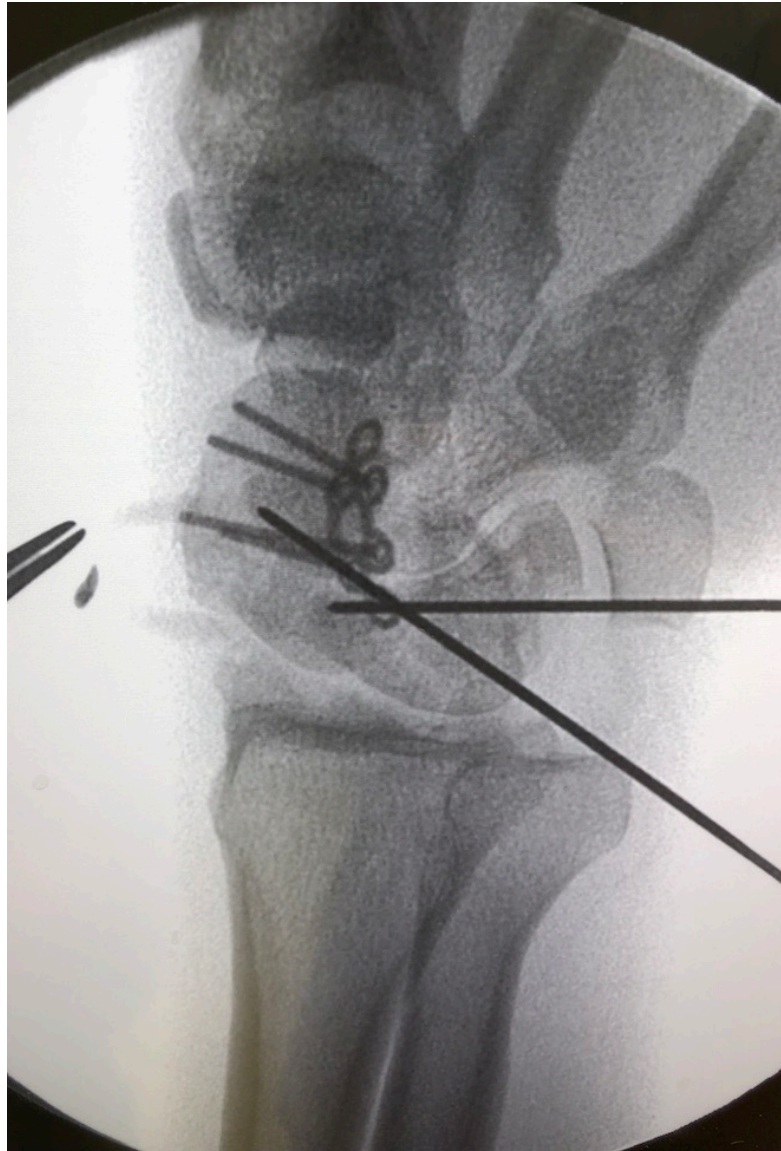
David J. Slutsky, MD¹ Guillaume Herzberg, MD, PhD² Alexander Y. Shin, MD³
Geert A. Buijze, MD, PhD⁴ David C. Ring, MD, PhD⁵ Chaitanya S. Mudgal, MD⁶ Yuen-Fai Leung, MD⁷
Christian Dumontier, MD⁸











MASSIMA FLESSIONE



MASSIMA ESTENSIONE



CONTROLLO CLINICO A 3 MESI DALL'INTERVENTO CHIRURGICO

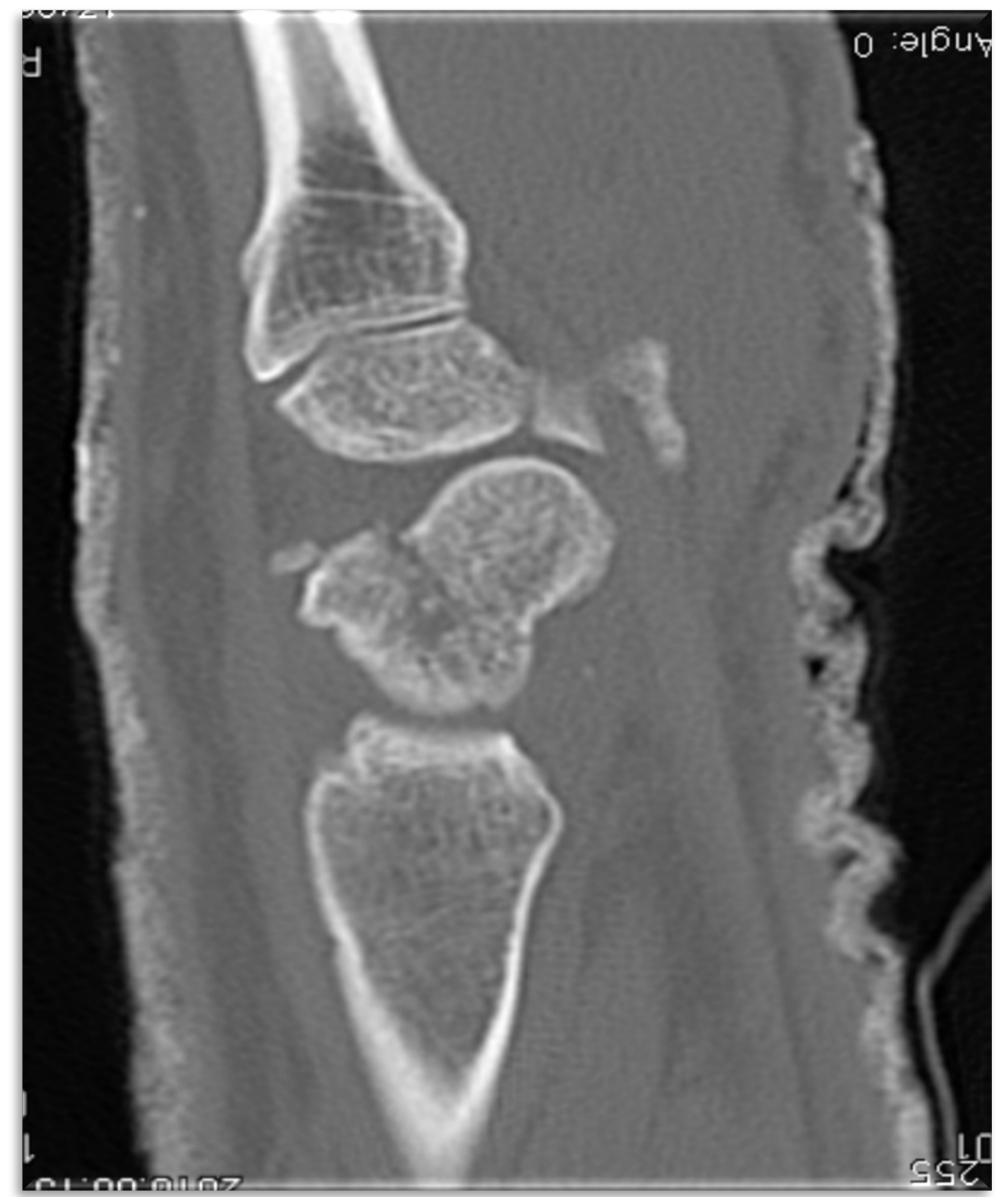
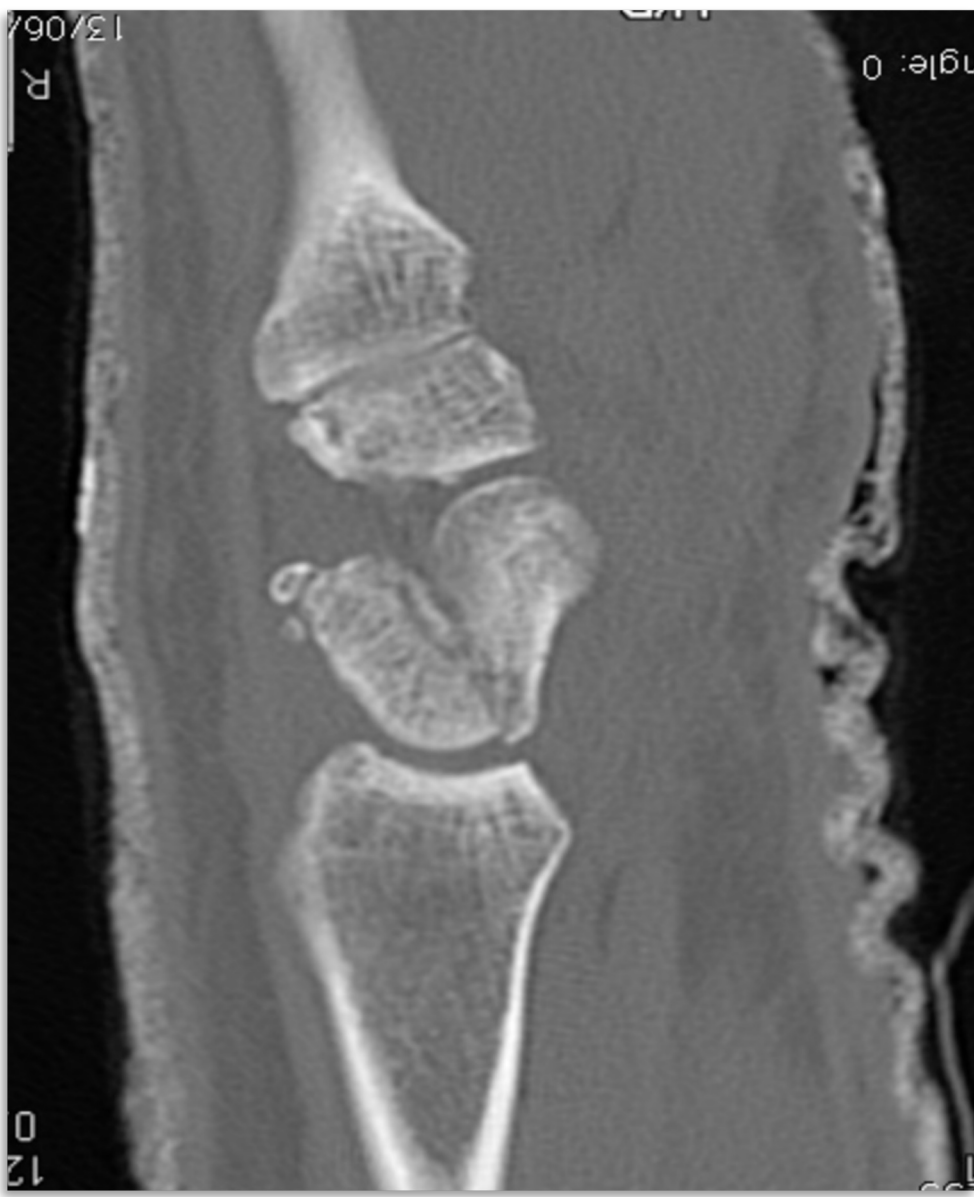


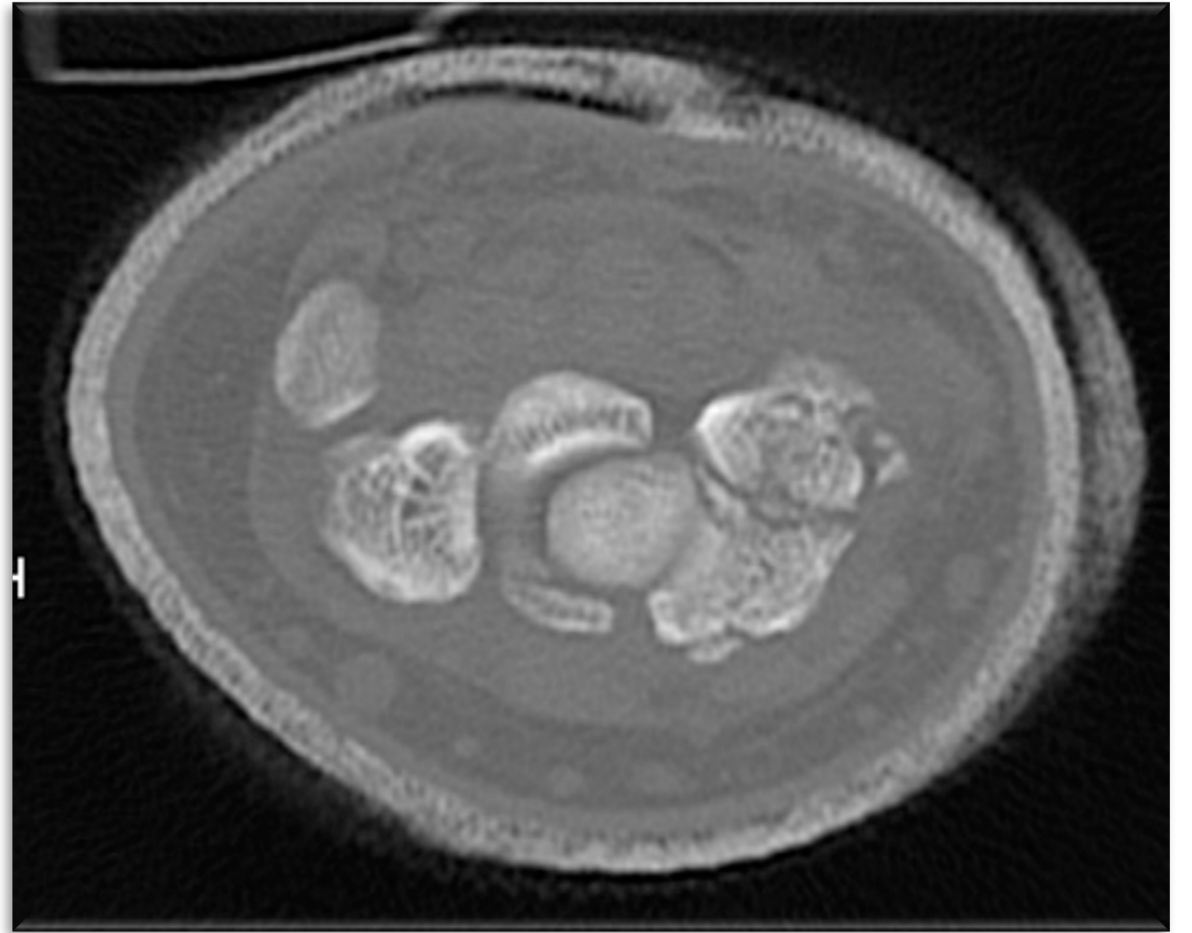
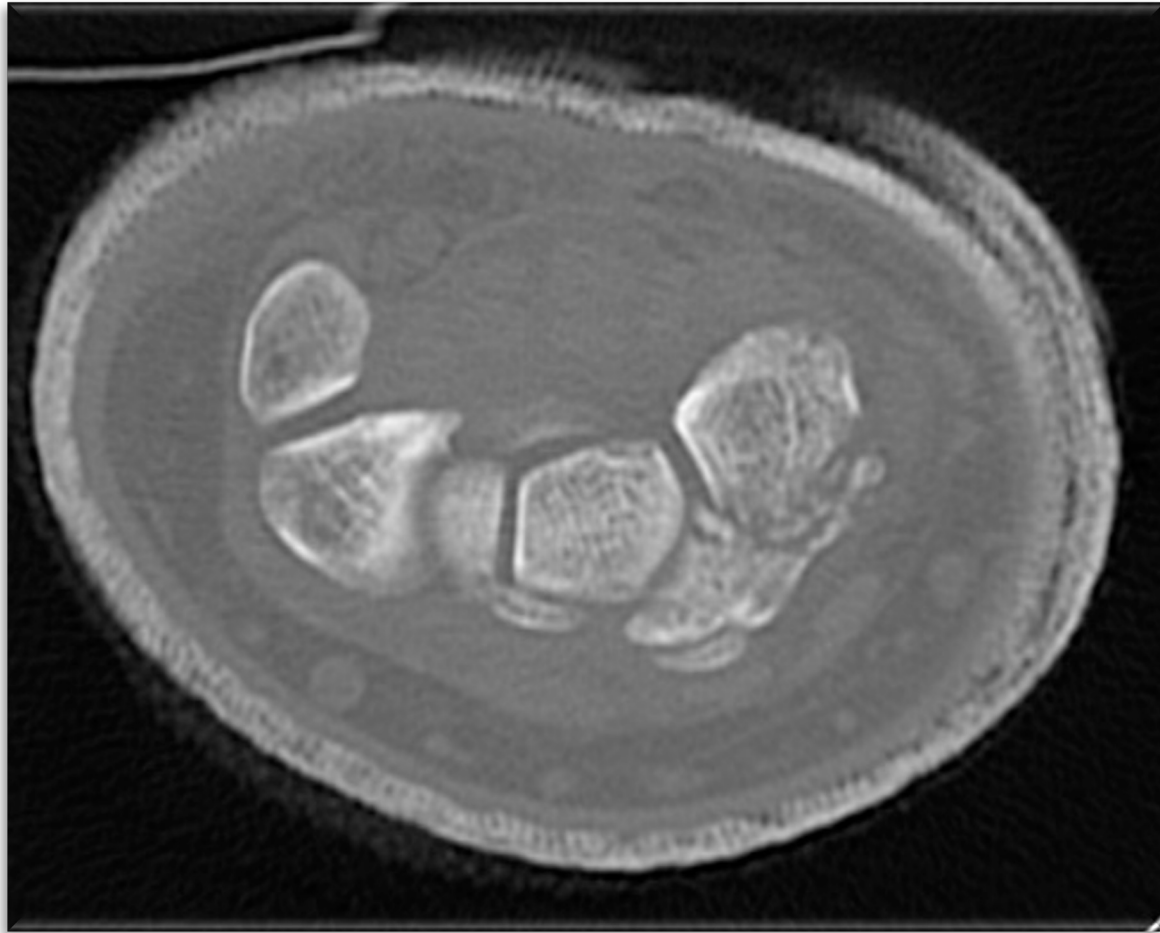
CONTROLLO RX A 3 MESI DALL'INTERVENTO CHIRURGICO





CASO CLINICO N. 3









CONTROLLO CLINICO A 3 MESI DALL'INTERVENTO CHIRURGICO

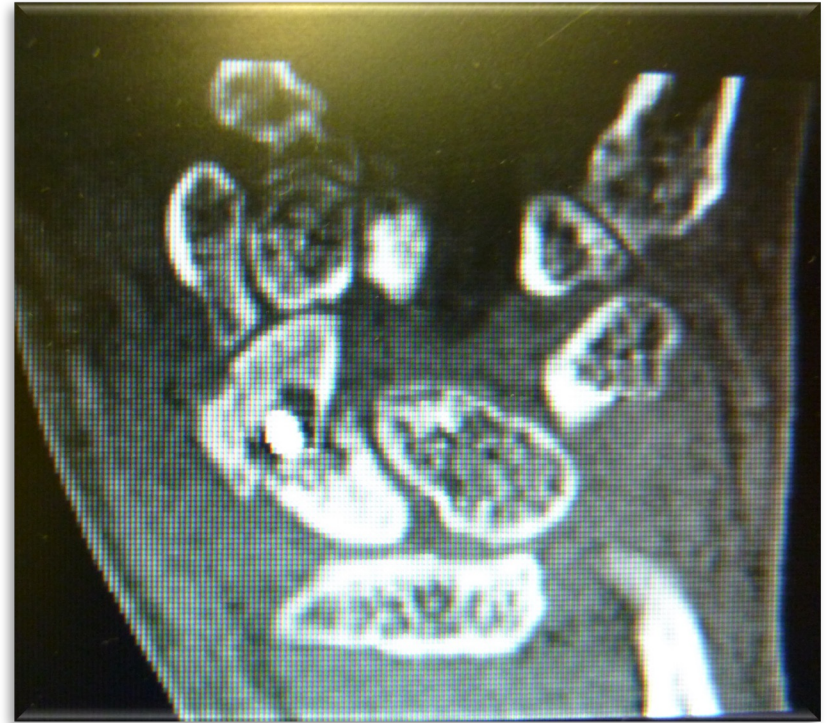
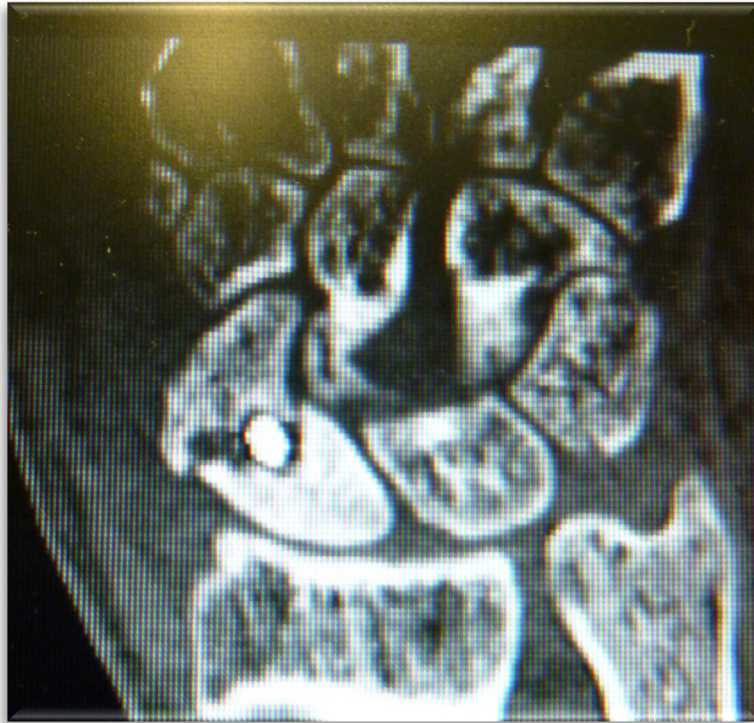


CONTROLLO RX A 14 MESI DALL'INTERVENTO CHIRURGICO



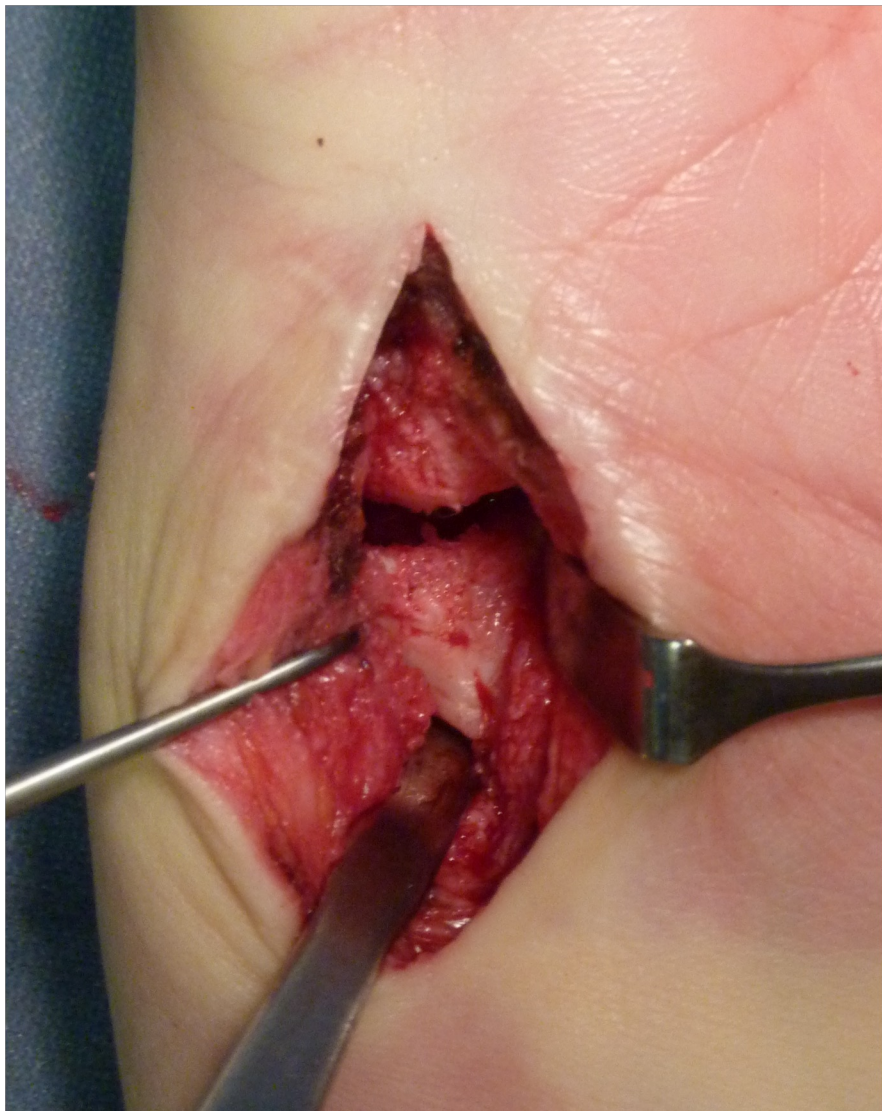


CASO CLINICO N. 4

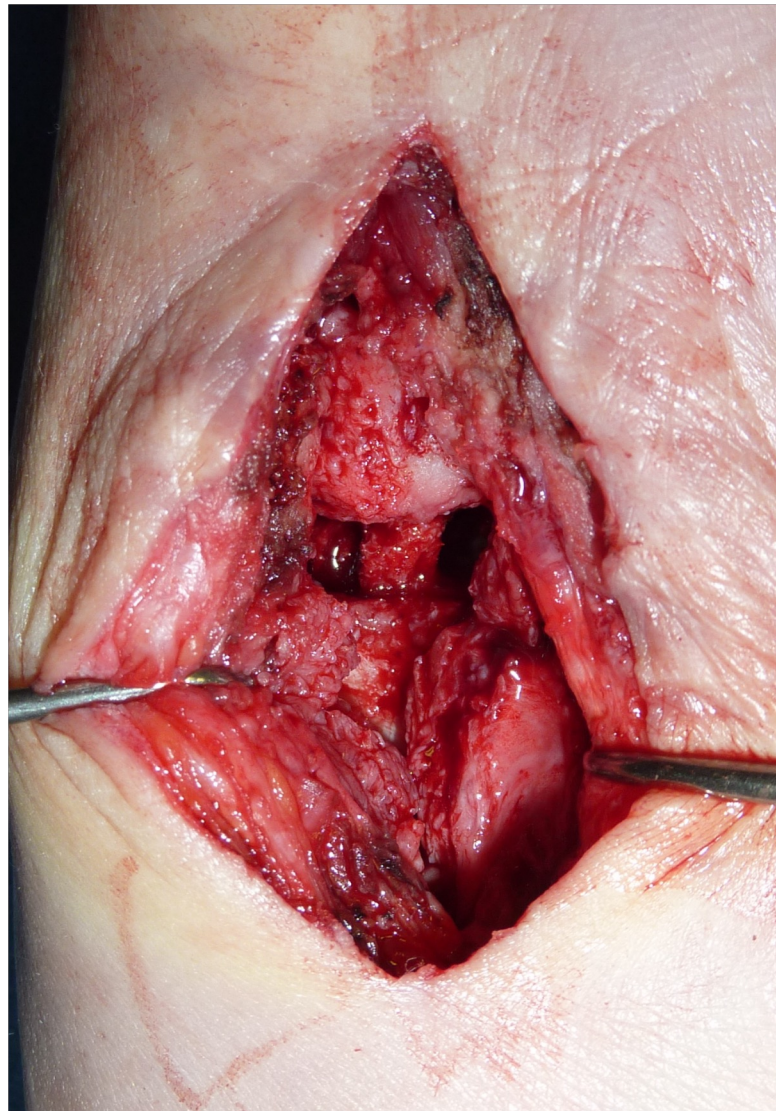


Caso clinico Dr. Leti Acciaro

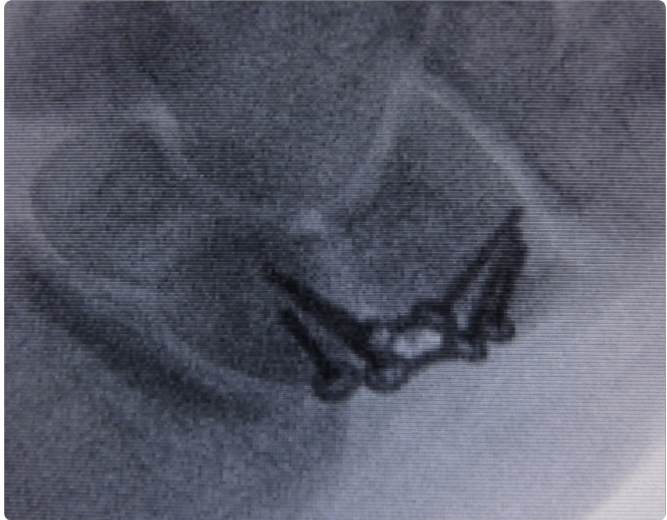
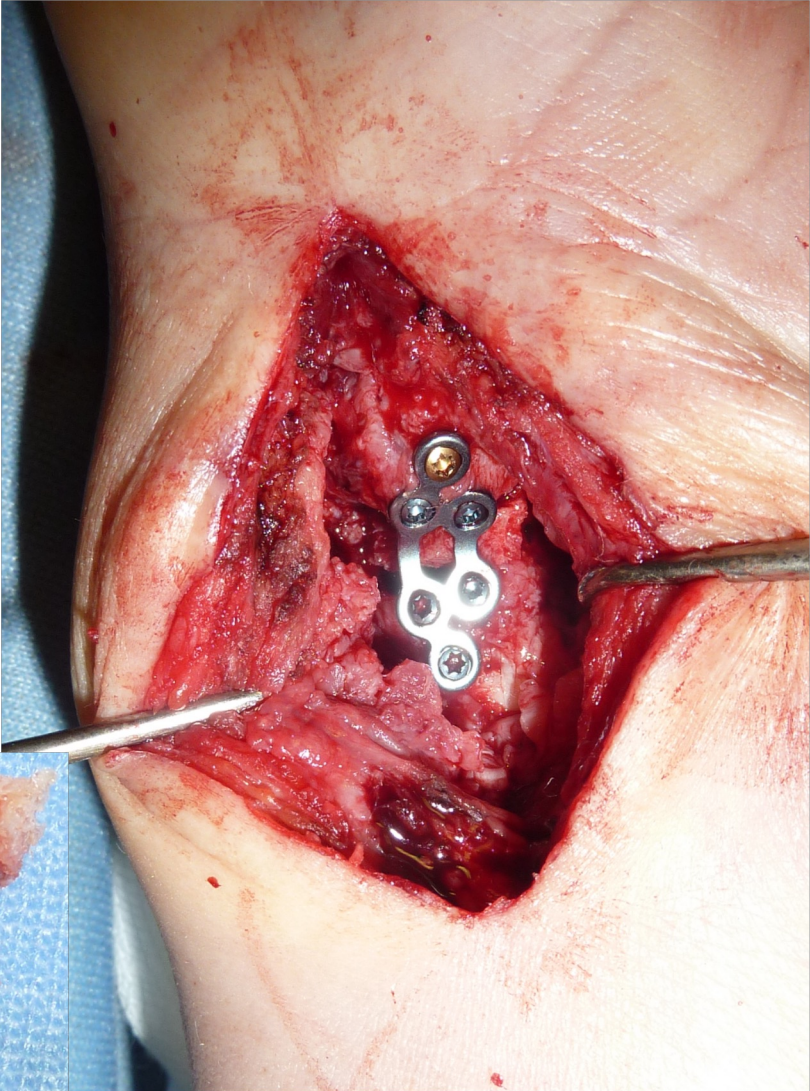
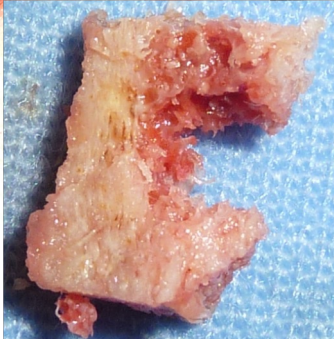
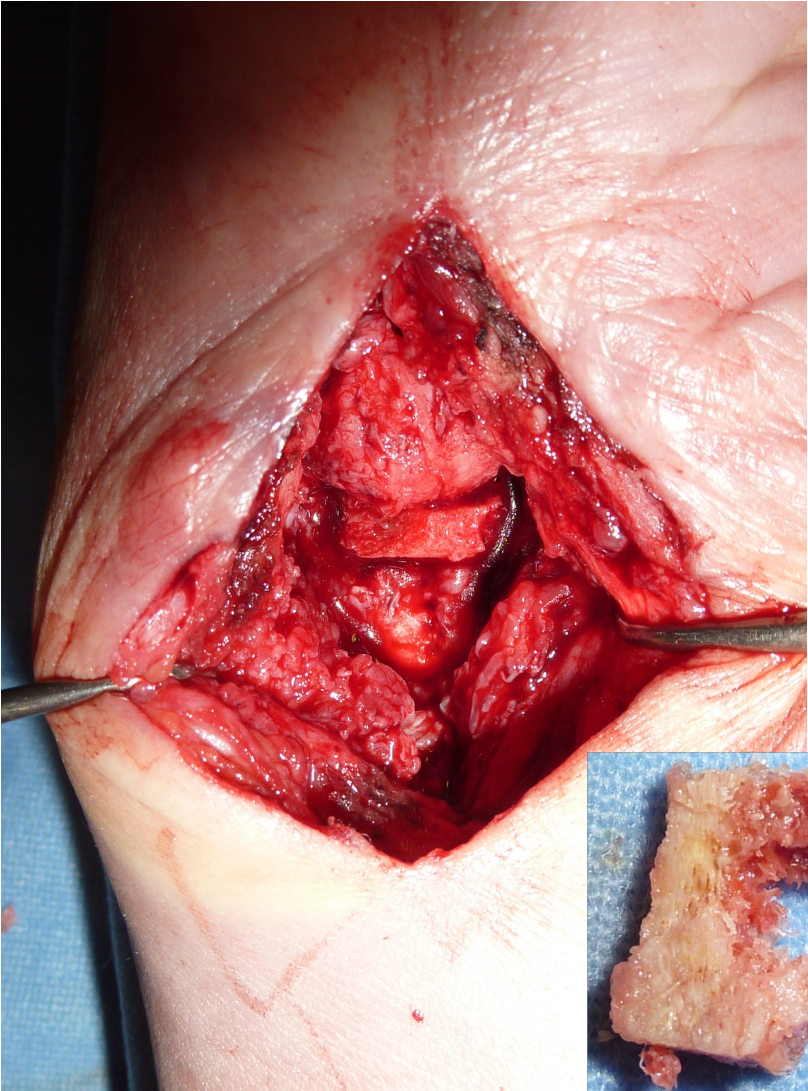
CRUENTAZIONE



LONGITUDINAL PEG GRAFT



INNESTO CORTICOSPONGIOSO



CONTROLLO RX A 1 MESE DALL'INTERVENTO CHIRURGICO



CONTROLLO RX A 2 MESI DALL'INTERVENTO CHIRURGICO



RISULTATI

- 14 fratture fresche
- 5 ritardo di consolidazione
- 6 PSA
- Tutti pazienti maschi
- Età compresa tra 18-50 anni
- Follow up medio 18 mesi (min 9 mesi max 36)
- La consolidazione è stata ottenuta in 12 casi
- Un paziente (forte fumatore) a 6 mesi presenta una rima di frattura ancora visibile e scarsi segni di formazione di trabecolatura ossea, senza fallimenti dell'hardware
- Il tempo medio di consolidazione è stato di due mesi
- L'articolarietà è risultata compresa tra 35° e 65° di flessione e tra 40° e 75° di estensione. L'arco di flesso-estensione è risultato in media di 108,7° (75-130) pari all'73% del polso controlaterale

	FORZA			FORZA CONTROLATERALE		
	PRESA	TIP PINCH	KEY PINCH	PRESA	TIP PINCH	KEY PINCH
B.S.	47	9,5	10	45	8,25	10
C.F	28	4,5	8,5	20	2,75	7
G.G	34	5	10	42	6	10,5
BA.S	32	16	13	48	16	16
VALORE MEDIO	35,25	8,75	10,375	38,75	8,25	10,875

- **Grip test** medio 35,25 (min 28-max 47), pari al 90,96% del controlaterale
- **Tip pinch** medio 8,75 (min 4,5-max 16) pari al 106% del controlaterale
- **Key pinch** medio 10, 37 (min 8,5-max 13), pari al 95,4% del controlaterale

CONCLUSIONI

La fissazione con placca di scafoide può essere considerata un'opzione di salvataggio per le seguenti lesioni:

- Fratture instabili, come Herbert tipo B. Una placca volare può prevenire collasso e accorciamento e resistere alla torsione, rendendola adatta per le fratture comminute (Herbert B5) e scomposte (Herbert B2 e B4).
- PSA di scafoide che abbiano fallito prima la fissazione chirurgica
- PSA con perdita di sostanza ossea > 1 cm
- PSA complicate da necrosi avascolare del polo prossimale



Grazie