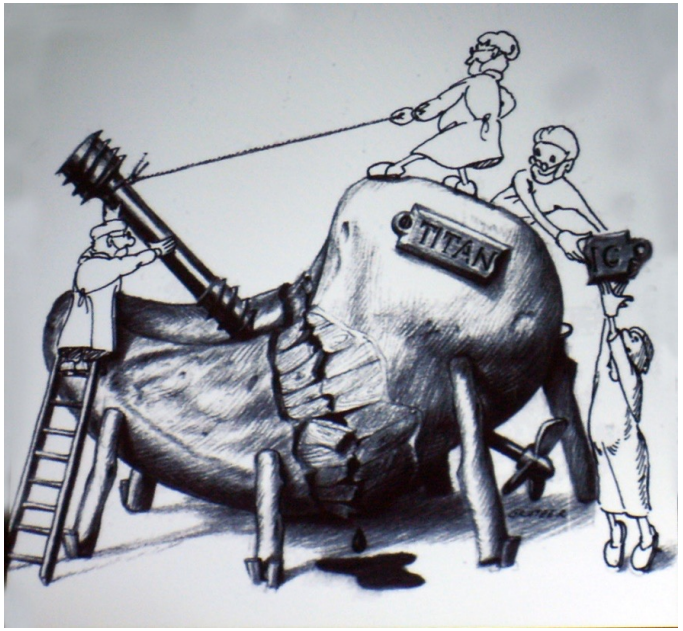
SCAPHOID FRACTURES AND NONUNION: WHEN IT'S TOO LATE…



MATTEO FERRERO

HAND SURGERY – TRAUMA CENTER C.T.O.

TURIN - ITALY

EPIDEMIOLOGY OF SCAPHOID FRACTURES

60% of carpal bone fractures

33% undiagnosed in ER

Men 82% - 10/30 y.a.

Most frequently fractured carpal bone

ABOUT 10% FAIL HEALING DESPITE PROPER IMMOBILIZATION

Ortop Clin 2020

Scaphoid Reconstruction

Cristian S. Borges, MD[a,b,*], Paulo H. Ruschel, MD[a,b], Milton B. Pignataro, MD[a,b]

Orthop Clin N Am 51 (2020) 65–76
https://doi.org/10.1016/j.ocl.2019.08.010

CHARACTERISTICS THAT PREDISPOSE TO NONUNION

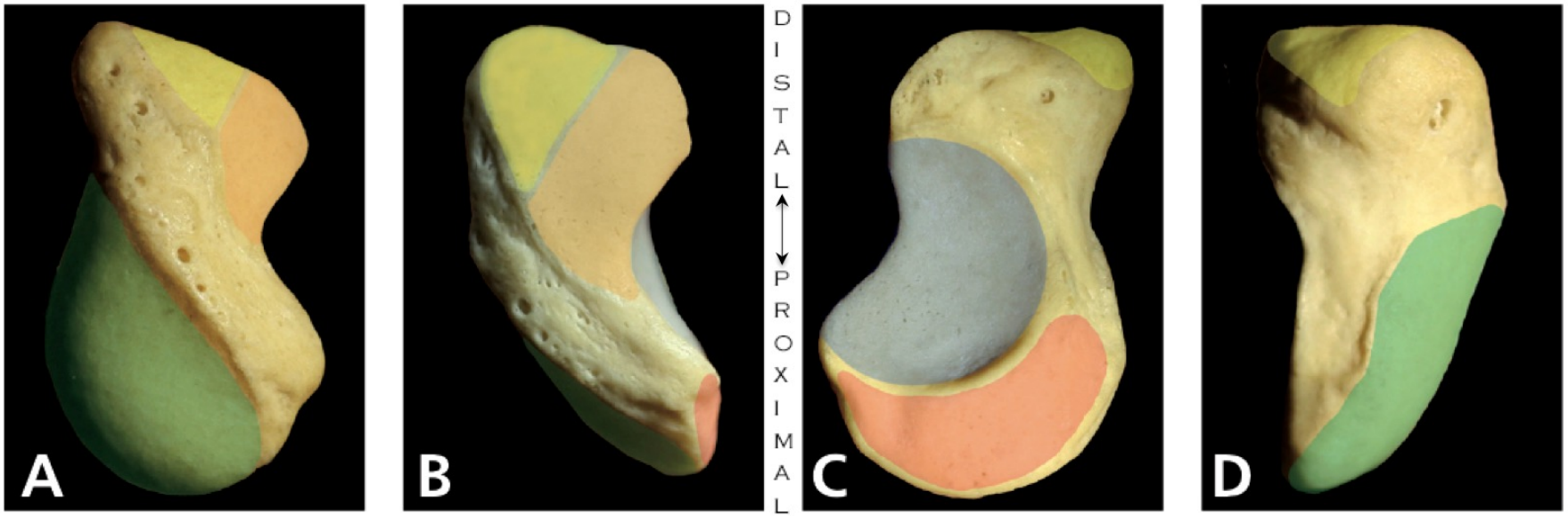
Anatomy

Mainly intraarticular (wrist stability and biomechanical function)

80% is covered by cartilage on articular surface

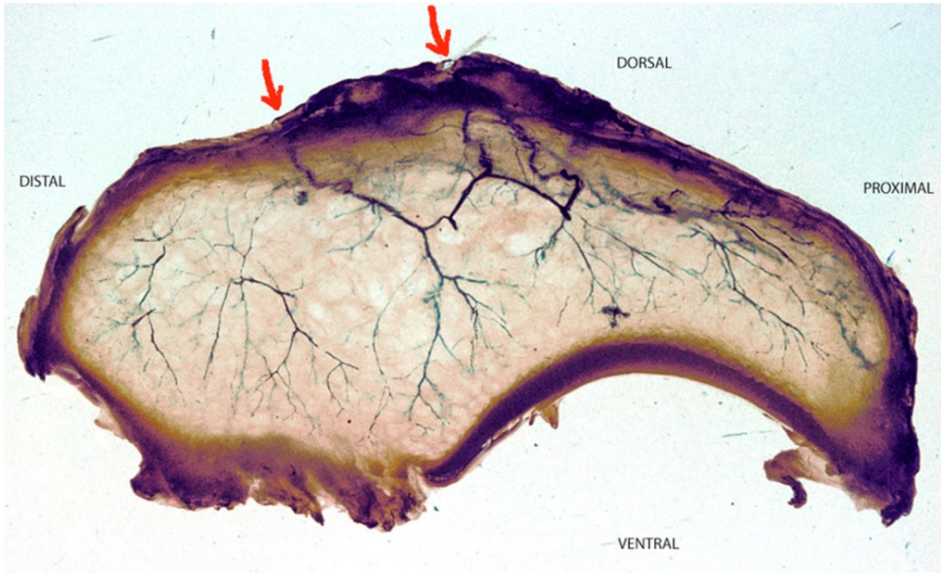
Radius | Trapezium | Triquetrum | Capitate | Lunate

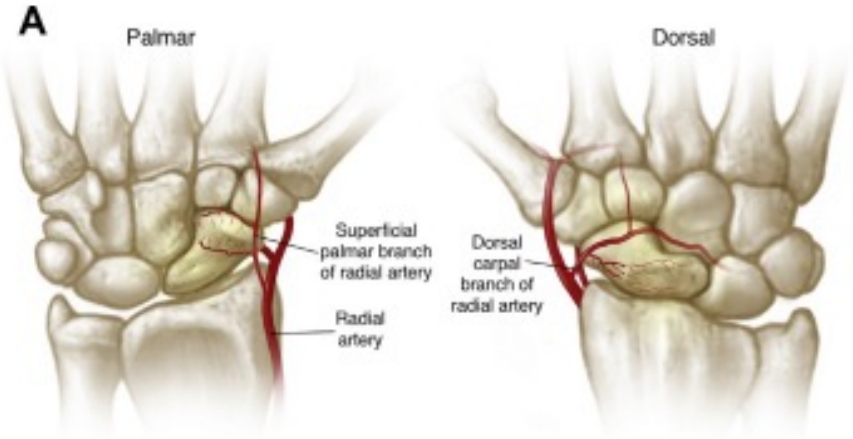
A) Radial B) Dorsal C) Volar D) Ulnar

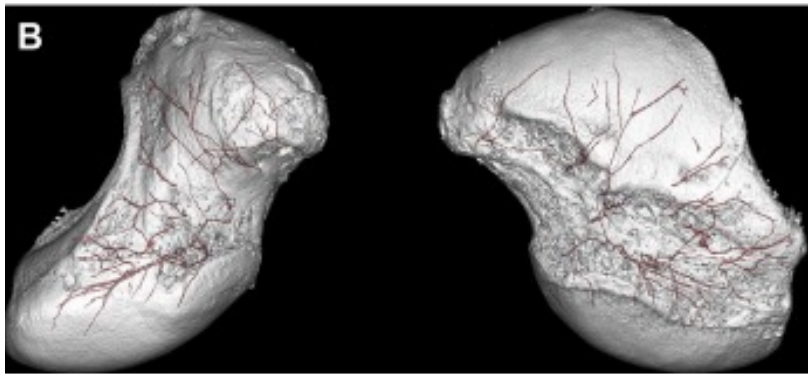


Anatomy

Small surface area for vascular inflow
2 branches of radial artery (dorsal, proximal)
Tubercle (1/3 distale) - Dorsal (1/3 medium, proximal)

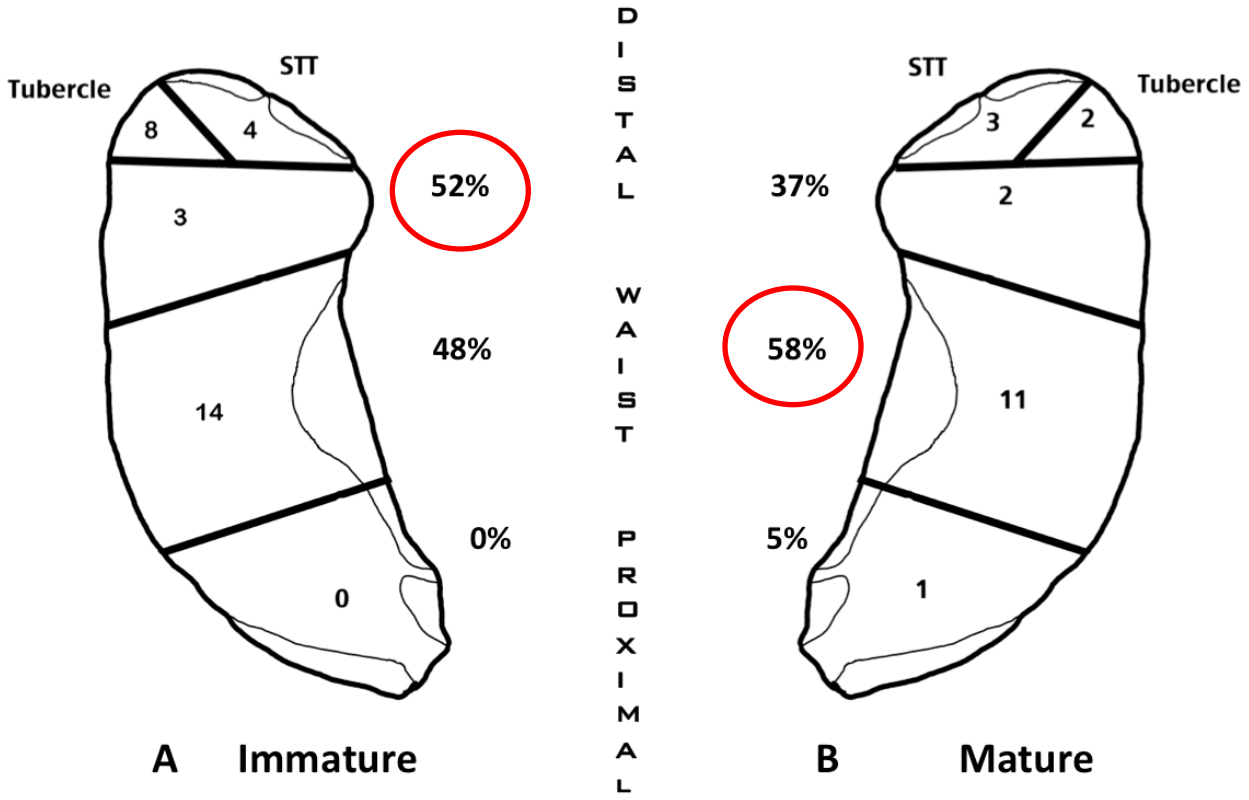






Epidemiology scaphoid fractures

Pattern scaphoid fracture teenagers vs adults
(in children are less common only 3%)
Jorgsholm, Acta Orthopaedica 2016



TO AVOID WASTING TIME...

Xrays

10-15% unrecognized → until 25% of FN

Immobilization by splint or cast → 2 weeks control

ALTHOUGH OFTEN THE FIRST NEGATIVE RX

Second line investigation is debated:

Xrays (again after 2 weeks): 91% SN - 99% SP

CT: 85-95% SN - 86-95% SP

MRI: 97.7 % SN - 99% SP

J Bone Joint Surg Br, 2012 *Kirkeby, J Hand Surg Br, 2013*

→ **Undergo immediate CT (O MRI) if young pt with clinical findings (without time delay of 2-3 weeks…)**

Sabbagh, J Hand Clin, 2019 **MAYO CLINIC**

Clinical Scaphoid Fractures - Imaging TC MRI

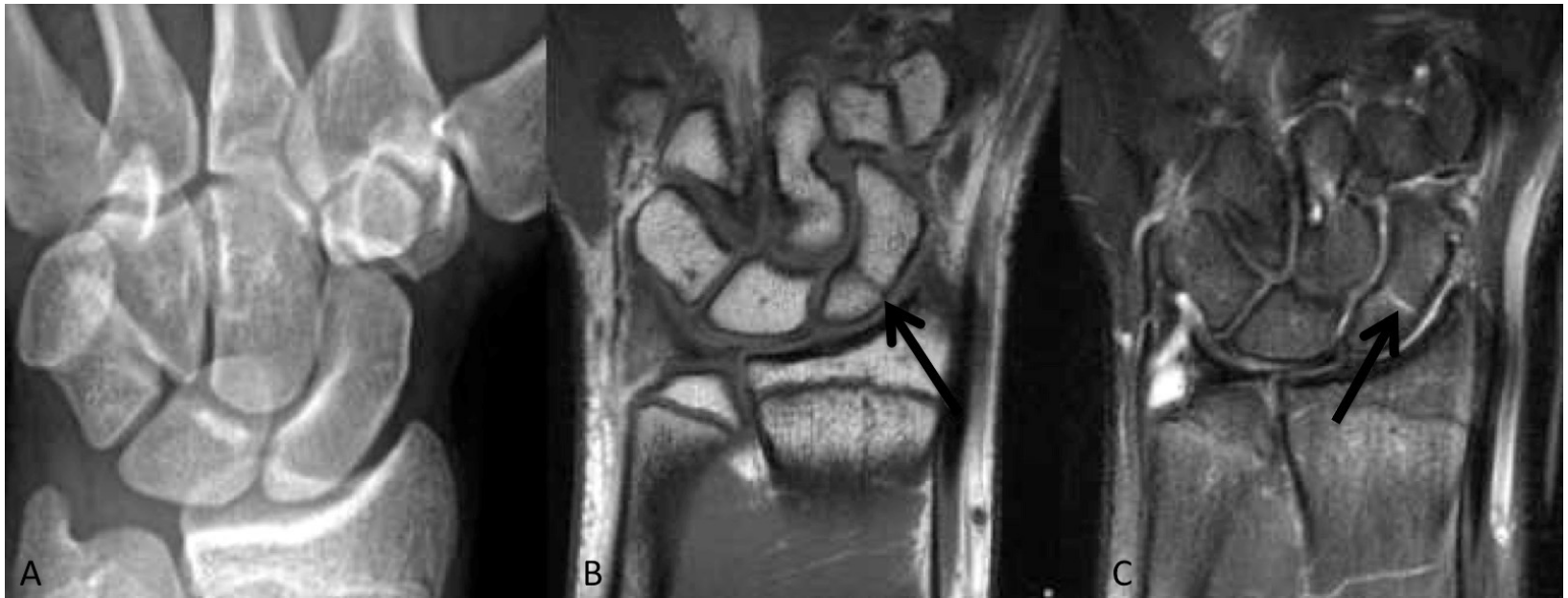
CT > MRI degree of displacement

MRI > CT unricognized or misdiagnosised fractures

MRI Gold standard second line study (coexisting lesions)

✓American College of Radiology. Appropriateness Criteria. Acute Hand and Wrist Trauma. 2013

✓UK NICE guidelines. 2016



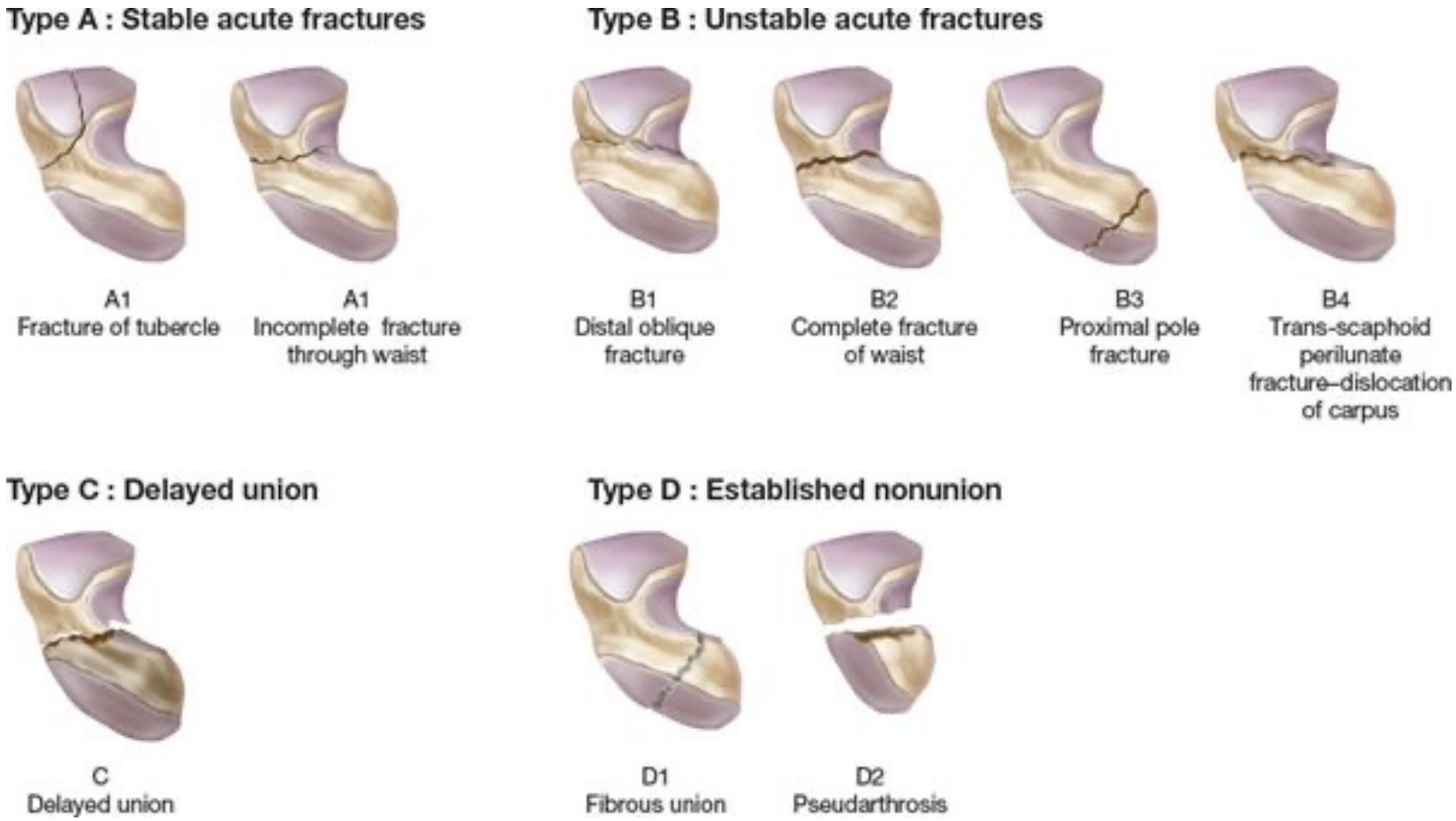
Classification

Anatomy (type)

Stable vs unstable

History (Acute vs delayed - union vs non-union)

Herbert, JBJS B 1984



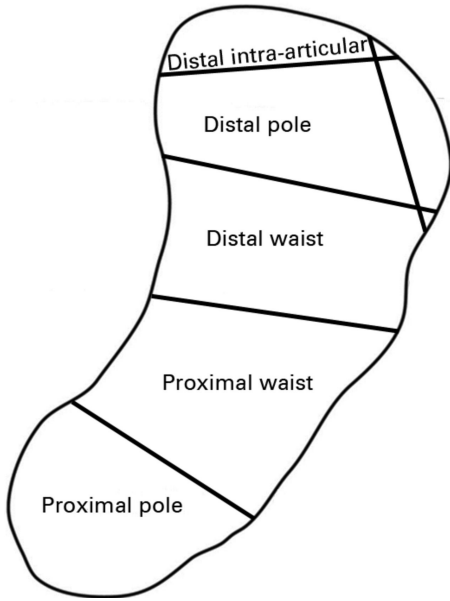
Scaphoid Fractures - Distal pole

Most of these fractures are treated non-operatively in a cast for 4-6 weeks with good short term results. Long-term outcome studies for this specific type of fracture are not available (FESSH, 2017)

Scaphoid Fractures - Proximal pole

The relative risk of non-union in proximal pole scaphoid fractures compared to fractures of the waist of the scaphoid is 7.5, although 2/3 of these fractures will still unite in a cast. There is no evidence to support early fixation of proximal pole fractures at present (FESSH, 2017)

Surgical treatment could be favored. Union rate after surgical treatment is around 66% (Singh, 2011)



CLASSIFICATION nonunion

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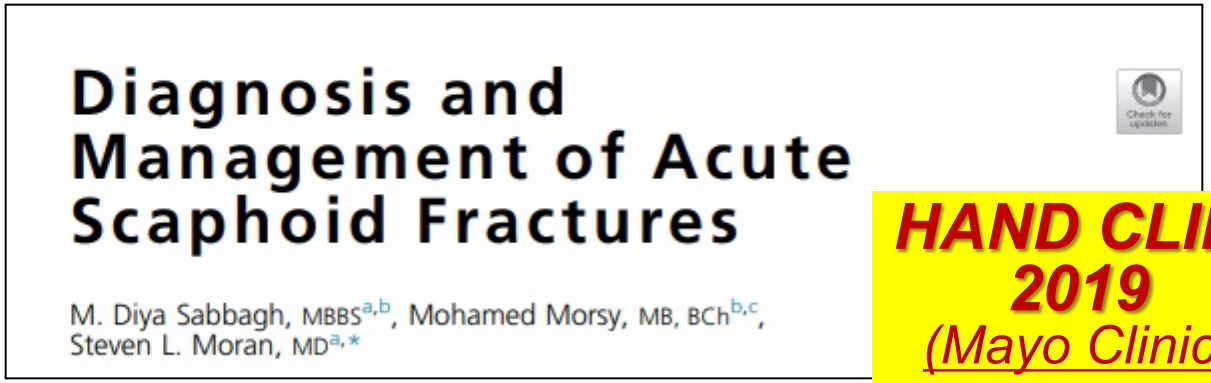
Treatment classification system for Scaphoid nonunions

Grade	Category	Characteristics of Scaphoid Nonunions
I	Delayed presentation	Scaphoid fractures with delayed presentation (4–8 wk)
II	Fibrous nonunion	Intact cartilaginous envelope, minimal fracture line at nonunion interface, no cyst or sclerosis
III	Minimal sclerosis	Bone resorption at nonunion interface <1 mm with minimal sclerosis
IV	Cyst formation and sclerosis	Bone resorption at nonunion interface <5 mm, cyst formation, and maintained scaphoid alignment
V	Cyst formation and sclerosis	Bone resorption at nonunion interface >5 mm and <10 mm, cyst formation, and maintained scaphoid alignment
VI	Pseudoarthrosis	Separate bone fracture fragments with profound bone resorption at nonunion interface. Gross fragment motion and deformity is often present.

Subtypes	Category	Associated Characteristics
a	Proximal pole nonunion	The proximal pole has a tenuous blood supply and a mechanical disadvantage that places it at greater risk of delayed or failed union.
b	Avascular necrosis	Scaphoid nonunion with avascular necrosis confirmed by MRI or intraoperative lack of punctate bleeding. The fracture must heal and revitalize.
c	Ligamentous injury	Injury suggested by static and dynamic imaging of the carpal bones or arthroscopic, direct observation.
d	Deformity	Scaphoid deformity must be corrected. This requires a bicortical structural bone graft and rigid fixation.

Summary

THE ABILITY TO DISTINGUISH UNSTABLE FROM STABLE FRACTURES IS ESSENTIAL, BECAUSE IT DETERMINES WHO NEEDS SURGICAL MANAGEMENT



HERBERT B2 (distal to the apex of dorsal ridge) ARE MORE LIKELY TO PROCEED TO COLLAPSE AND HUMPBACK DEFORMITY

(loss ligamentous stability of distal fragment)

OKA, Moritomo «Current management of scaphoid nounion based on the biomechanical study» ***J Wrist Surg 2017****;7(2): 94-100*

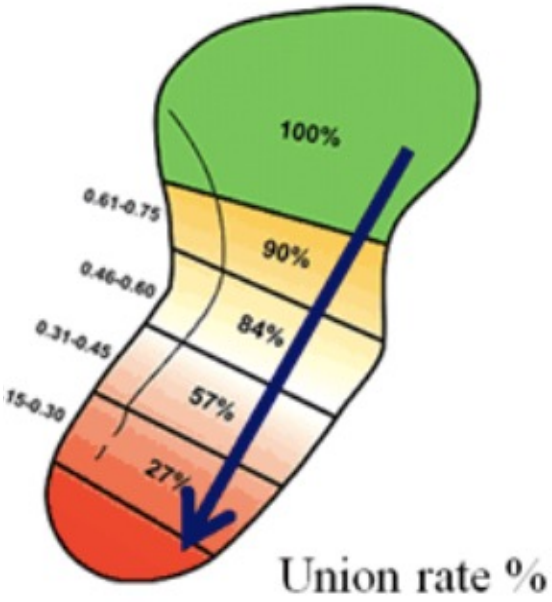
Scaphoid Fractures - Healing process

Union is a process rather than a single event at a specific time in the natural history of healing

Partial union of the scaphoid is common (up to 40%) and with bridging trabeculae across more than 25% of the cross-section of the scaphoid, it progresses to full union without the need for further plaster immobilization.

Nonunion is the absence of radiographic signs of healing at 12 weeks and a clear gap on a CT scan

Nondisplaced fractures of the waist can heal in 8 weeks in 90% of the cases



Scaphoid Fractures - Nonunion

1. Radiographs taken at only three months after fracture cannot differentiate reliably between union and nonunion.

2. Union is a process rather than an event and follow-up for a minimum of six months is required.

3. Some patients are discharged prematurely in the belief that the fracture has united but when they return complaining of pain and with abnormal radiographs the fracture had never united.

Radiographic signs of union of scaphoid fractures. Dias, JBJS B, 1988

Follow up for fracture in treatment:
xRays 6 weeks , 3 and 6 months with CT if there's doubt of non consolidation

WHEN IS NOT TOO LATE?

Actually, it's not just a matter of time... but also the type of fracture/PSA

- Less than 1 year after the traumatic event,
- minimally displaced fragments (<1 mm),
- minimal bone resorption (<2 mm),
- minimal sclerosis, no vascular necrosis NO deformities

PERCUTANEOUS OR BONE GRAFTED SCREW IN ARS

After a few years of the trauma? SNAC presence?

OFTEN LATE DIAGNOSIS

In some cases healing is achieved anyway...

… In other… SNAC WRIST

SCAPHOID

NONUNION

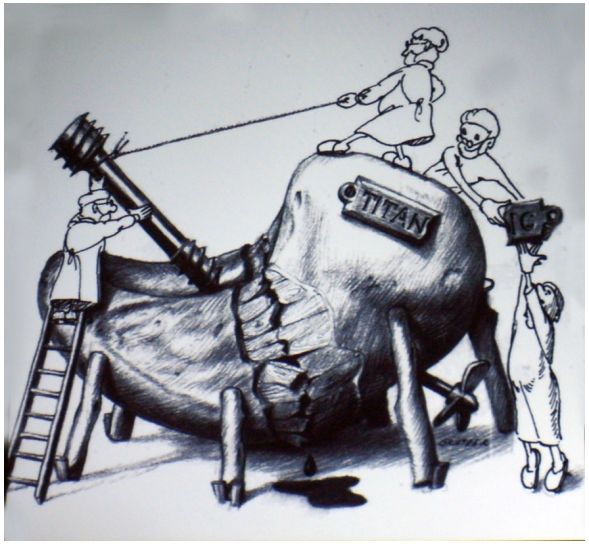
ADVANCED

COLLAPSE

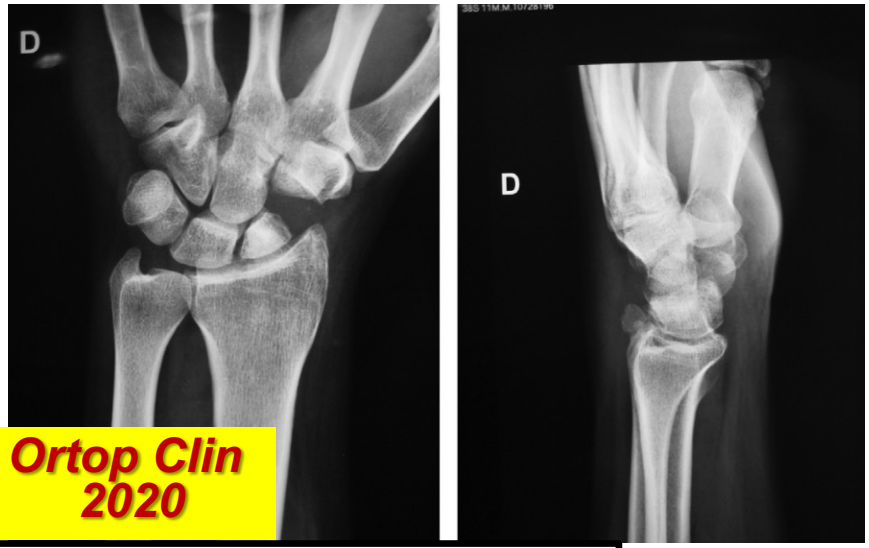
WHEN PSA OF SCAPHOID WITH

AVASCULAR NECROSIS OF THE PROXIMAL POLE

THAT CAN NO LONGER BE SAVED...



BEFORE CLASSICAL PALLIATIVE TECHNIQUES



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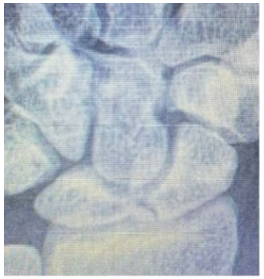
RESECTION OF THE DISTAL POLE OF THE SCAPHOID IS A GOOD OPTION (> 5 YEARS) OR AFTER A FAILED SCAPHOID PROCEDURE IN SELECTED PATIENTS (WITHOUT SNAC)
RISK OF DISI TENDENCY

Or resection of the proximal pole

WITH FRC ANCHOVY
COURTESY DR BORELLI

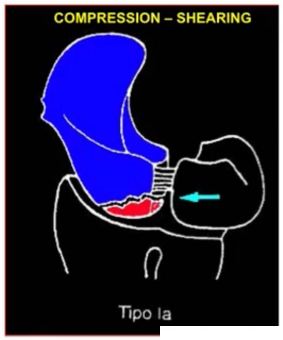


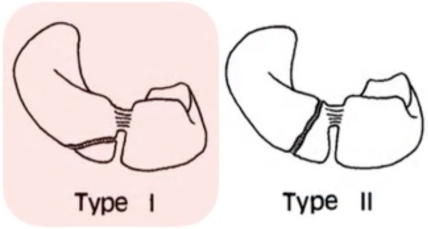
Rev.Ort.Traum.
1998

tratamiento

FRACTURES OF THE PROxiMAL POLE OF THE SCAPHOID. CLASSIFICATION AND TREATMENT

M. García-Elías Cos





Garcia-Elias, 1998

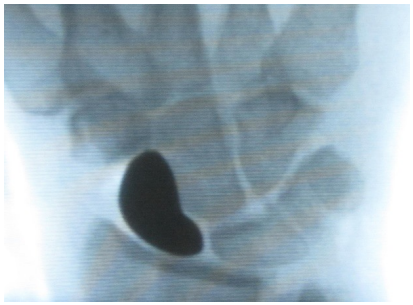
TOTAL PROSTHESIS

HAND (2011) 6:179–184
DOI 10.1007/s11552-010-9315-3

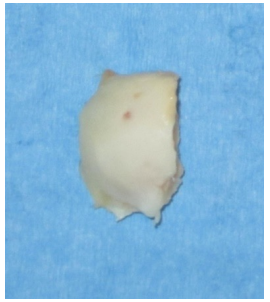
SURGERY ARTICLES

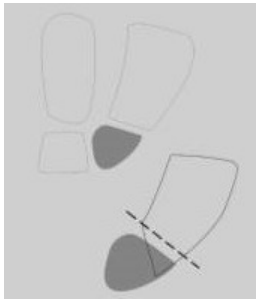
The total scaphoid titanium arthroplasty: A 15-year experience

Ombretta Spingardi · Mario Igor Rossello



PARTIAL PROSTHESIS





TITANIUM OR

PEEK

ADAPTIVE PROXIMAL SCAPHOID IMPLANT

APSI

PROSTHETIC IMPLANT DYNAMIC INTERPOSITION SPACER IN PYROCARBON

CONCEPT OF INTERPOSITION WITHOUT FIXATION

INDICATIONS

- SCAPHOID PROXIMAL POLE FRACTURES (small fragment)
- PSA WITH PROXIMAL POLE AVASCULAR NECROSIS
- SNAC OR SLAC WRIST
- AFTER THE FAILURES OF OTHER SURGICAL TREATMENTS
- RARE CASES OF PREISER'S DISEASE (idiopathic osteonecrosis of the scaphoid... 150 cases worldwide)

Maladie de Preiser traitée par résection partielle du scaphoïde sous arthroscopie et implant en pyrocarbone, résultats préliminaires : à propos d'un cas, et revue de la littérature

Arthroscopic treatment for Preiser's disease by partial resection of the scaphoid and pyrocarbone's implant, preliminary results: A case report and literature review

B. Rousseau *, X. Delpit, T. Bauer, P. Hardy

Service d'orthopédie traumatologie, hôpital Ambroise Paré, groupement hospitalier universitaire Ouest, 9, avenue Charles-de-Gaulle, 92100 Boulogne-Billancourt, France

Reçu le 17 novembre 2010 ; reçu sous la forme révisée 6 avril 2011 ; accepté le 12 avril 2011

OUR EXPERIENCE

Surgery Article

AAHS AMERICAN ASSOCIATION FOR HAND SURGERY

HAND
2022, Vol. 17(5) 899–904

DOI: 10.1177/1558944720974120
journals.sagepub.com/home/HAN

Prosthetic Replacement of the Scaphoid Proximal Pole: Should It Be the Future?

Matteo Ferrero[1], Enrico Carità[2], Francesco Giacalone[1], Julien Teodori[3], Alberto Donadelli[2], Mara Laterza[2], Massimo Corain[4], and Bruno Battiston[1]

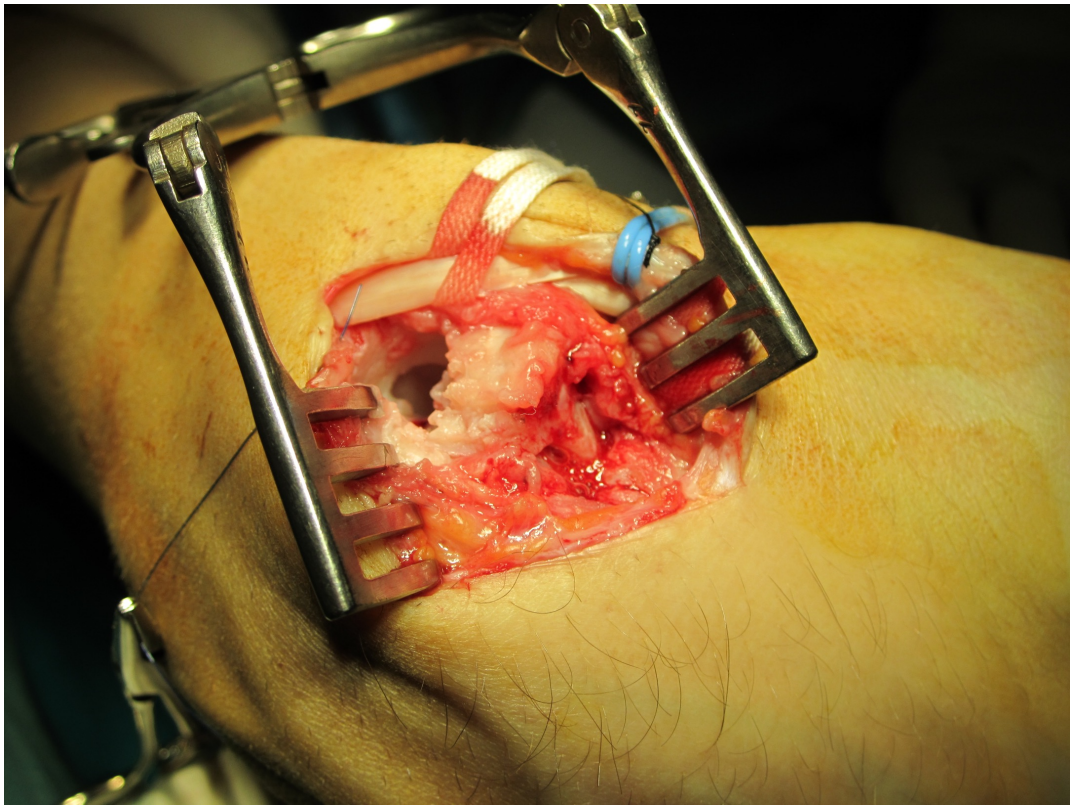
HAND 2022

76 pz (1999-2017)
3 fallimenti
2 artroscopici

ENCOURAGING RESULTS

OVERLAPPING WITH THOSE OF LITERATURE

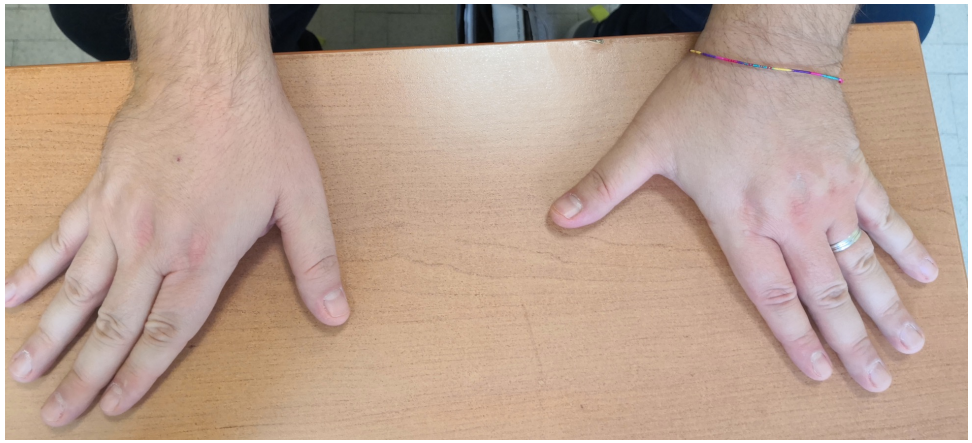
Case 1 B.S. 22 y.o. in 2011 male

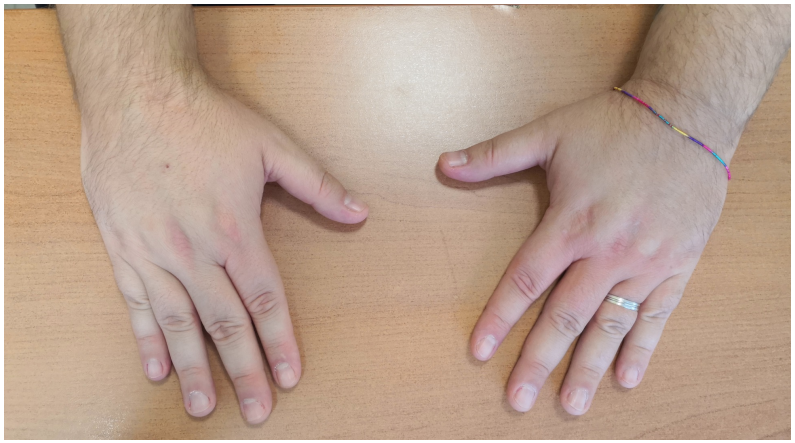


Rx Control

Follow Up at 19.10.23 (12 years after)

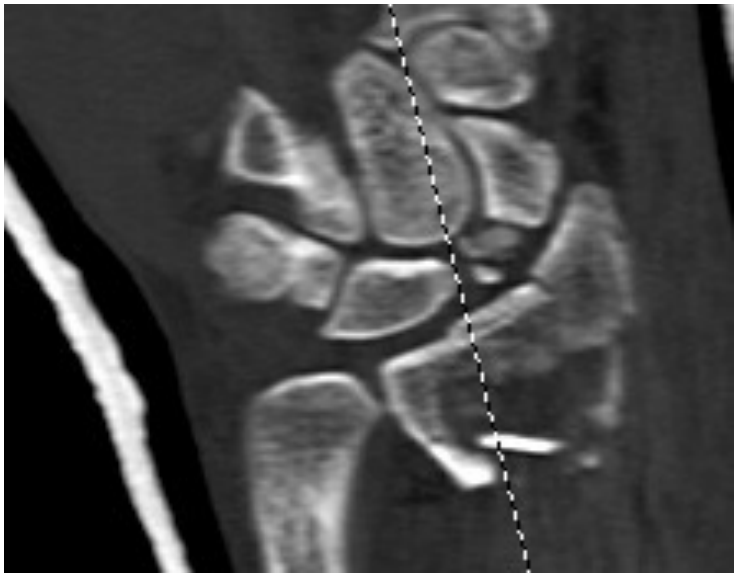
Patient very happy and satisfied!!





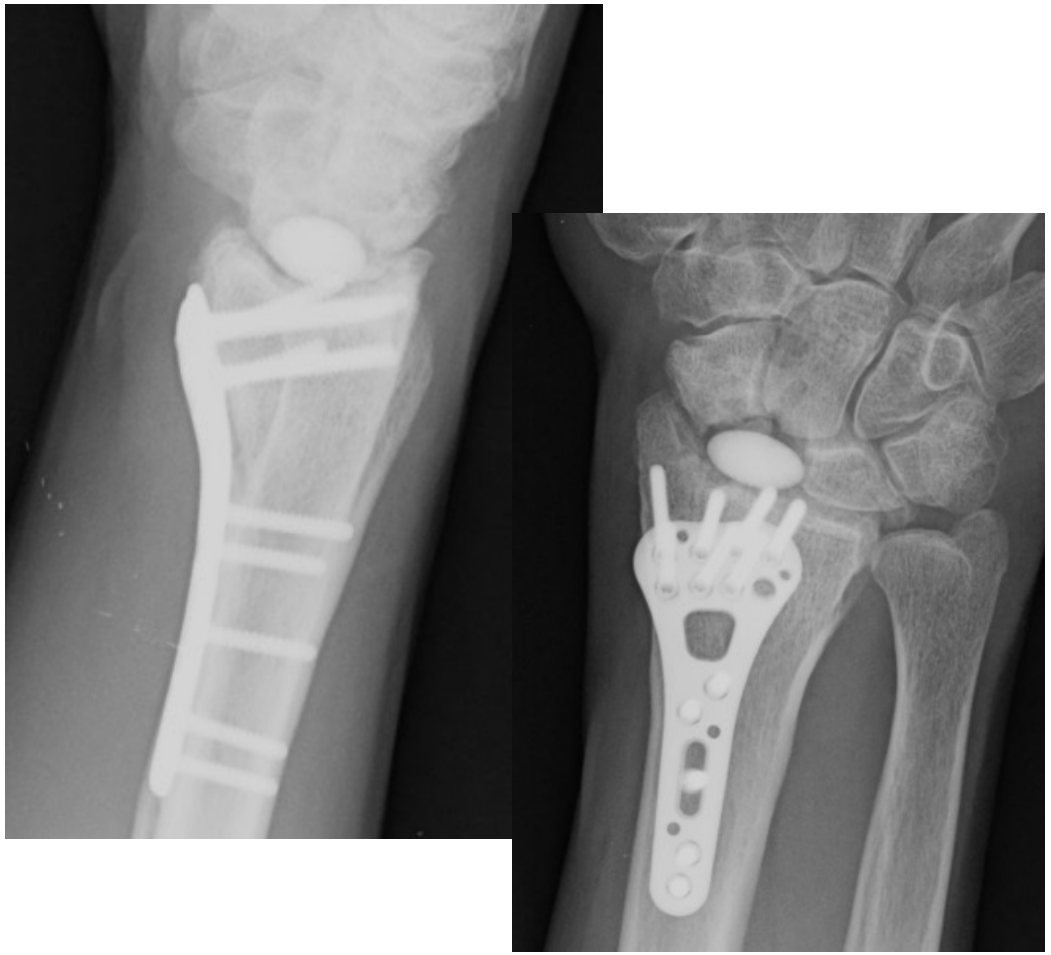
Case 2

B.D. 64 y.o. male



TOO FRACTURED RATHER THAN TOO LATE!!

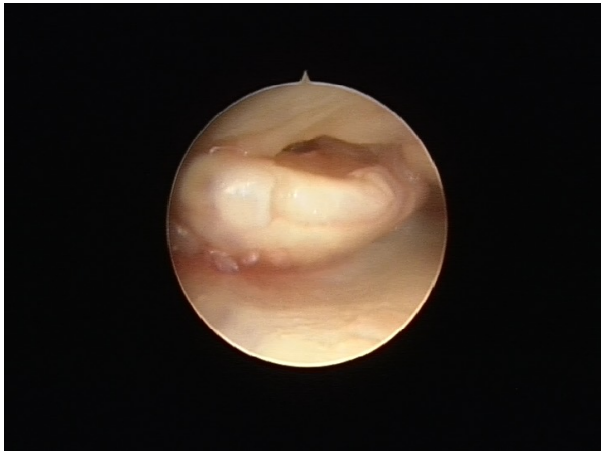
Follow-up at 2 years

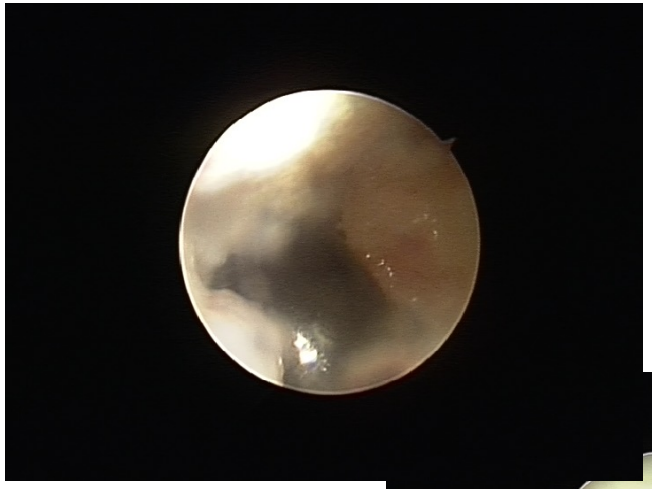


Patient satisfied

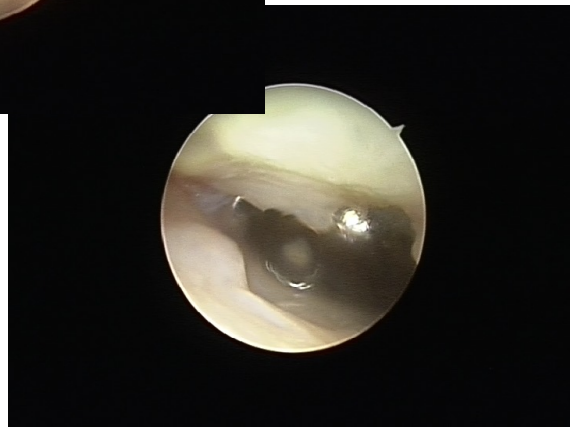
Case 3

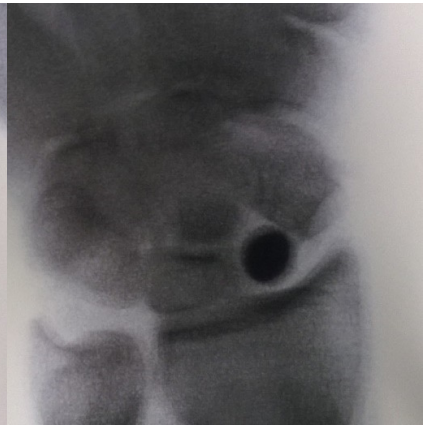
T.D. 40 y.o. male in 2016





ARTHROSCOPIC PROXIMAL POLE RESECTION AND ARTHROSCOPIC IMPLANTATION OF APSI SPACER





FOLLOW UP 19.10.2023 (7 years after)

Patient very satisfied

CONCLUSIONS

•Dynamic spacer that restores the variable geometry of the carpus and maintains the correct alignment of the first carpal raw

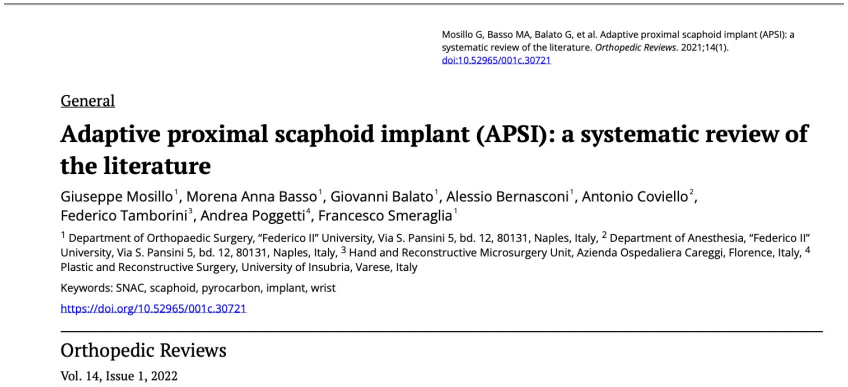
• adaptability of the implant prevents arthritic evolution of the wrist and decreases the risk of dislocation

• Reduced immobilization times

• Rapid functional and strength recovery

CONCLUSIONS

- Minimally invasive procedure
- Possibility of performing it by arthroscopy (Mathoulin)
- Further palliative treatments can be performed
- Also possible in the case of arthritis of the radial surface



Mosillo G, Basso MA, Balato G, et al. Adaptive proximal scaphoid implant (APSI): a systematic review of the literature. *Orthopedic Reviews*. 2021;14(1). doi:10.52965/001c.30721

General

Adaptive proximal scaphoid implant (APSI): a systematic review of the literature

Giuseppe Mosillo[1], Morena Anna Basso[1], Giovanni Balato[1], Alessio Bernasconi[1], Antonio Coviello[2], Federico Tamborini[3], Andrea Poggetti[4], Francesco Smeraglia[1]

[1] Department of Orthopaedic Surgery, "Federico II" University, Via S. Pansini 5, bd. 12, 80131, Naples, Italy, [2] Department of Anesthesia, "Federico II" University, Via S. Pansini 5, bd. 12, 80131, Naples, Italy, [3] Hand and Reconstructive Microsurgery Unit, Azienda Ospedaliera Careggi, Florence, Italy, [4] Plastic and Reconstructive Surgery, University of Insubria, Varese, Italy

Keywords: SNAC, scaphoid, pyrocarbon, implant, wrist

https://doi.org/10.52965/001c.30721

Orthopedic Reviews

Vol. 14, Issue 1, 2022

A GOOD OPTION WHEN... IT'S TOO LATE!!

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Orthopedic Reviews

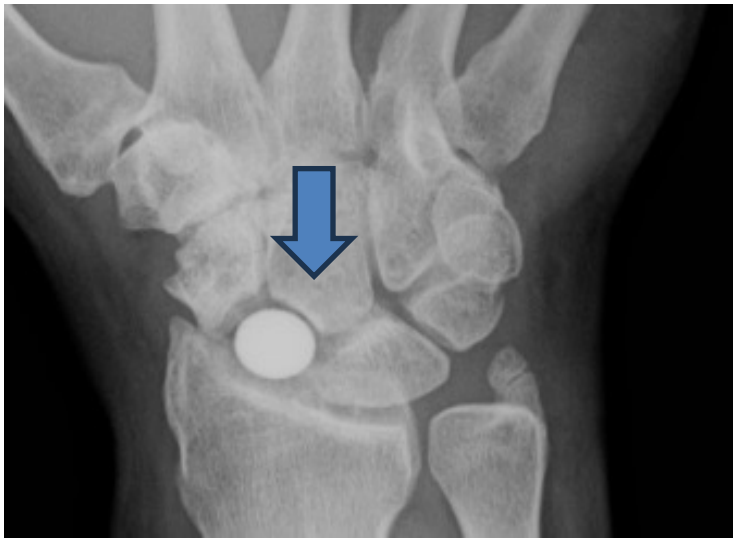
Vol. 14, Issue 1, 2022

mobilization has a rate 5.1% (8/156). In conclusion the APSI implant is a reliable alternative for the treatment of SNAC wrist and SLAC wrist.

DISCUSSION

- Duration? NO WEAR AND TEAR...
- Effects on nearby bones over time?
- manual workers? YES According to the literature...
- in older patients to avoid more invasive interventions?
- In very young patients it is an alternative to resection or reconstruction (femoral condyle?) ... But what to do if radial chondropathy?

→ NEED ARTHROSCOPY!!



"NOTCHING" OF THE CAPITATE

(MATHOULIN 6 OUT OF 15 CASES

BUT … ASYMPTOMATIC)

IT'S IMPORTANT TO UNDERSTAND WHEN IT'S TOO LATE... AVOID AGGRESSIVE THERAPY!!

THANK YOU!!