ARTHRODESE MEDIO-CARPIENNE PAR CUPULE X-PODE

INDICATIONS, TECHNIQUE, RESULTATS

A. Durand, C. CAMPS, B. Lallemand, A. Falcone,
T. Jaeger, C. DUYSENS, M. MERLE
Institut Européen de la Main
Nancy - France
Luxembourg

L'ARTHROSE DE POIGNET

- Linscheid - 1972 : instabilité du carpe

Linscheid RL, Dobyns JH, Beabout JW, Bryan RS. Traumatic instability of the wrist. Diagnosis, classification, and pathomechanics. J Bone Joint Surg Am. 1972 Dec;54(8):1612–1632.

- Watson & Ballet - 1984 : SLAC wrist

Watson HK, Ballet FL (1984) The SLAC wrist: scapholunate advanced collapse pattern of degenerative arthritis. J Hand Surg Am 9(3):358–365

- Vender & Watson - 1987 : SNAC wrist

Vender MI,WatsonHK,Wiener BD, BlackDM(1987) Degenerative change in symptomatic scaphoid nonunion. J Hand Surg Am 12 (4):514–519

- Mack - 1987 : SNAC wrist

Mack GR, Bosse MJ, Gelberman RH, Yu E. The natural history of scaphoid nonunion. J Bone Joint Surg Am. 1984;66:504–9.

- Romano - 2003 : SCAC wrist

Romano S. Arthrose non-traumatique du poignet : la chondrocalcinose. Chir Main 2003, 22, 285-292.

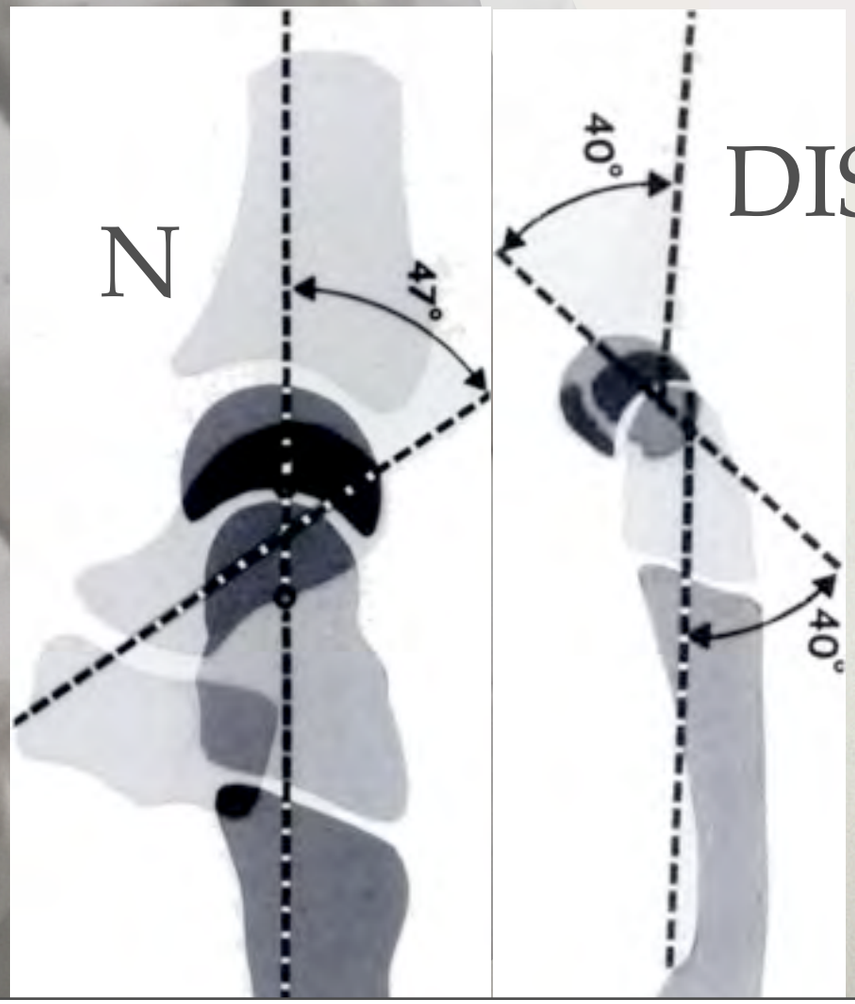
Traumatic Instability of the Wrist

Diagnosis, Classification, and Pathomechanics*

BY RONALD L. LINSCHEID, M.D.†, JAMES H. DOBYNS, M.D.†, JOHN W. BEABOUT, M.D.†, AND RICHARD S. BRYAN, M.D.†, ROCHESTER, MINNESOTA

From the Mayo Clinic and Mayo Foundation, Rochester

Post-traumatic instability of the carpus and the zigzag or sink deformity of the intercarpal joint in rheumatoid arthritis have interested two of us (R. L. L. and J. H. D.) for several years [10, 18]. Recently, when we encountered several cases of post-traumatic instability of the intercarpal joints, we were stimulated to review our experience with this condition, especially with rotatory subluxation of the intercarpal joint and the associated changes in position of the scaphoid with respect to the radius and the other carpal bones.



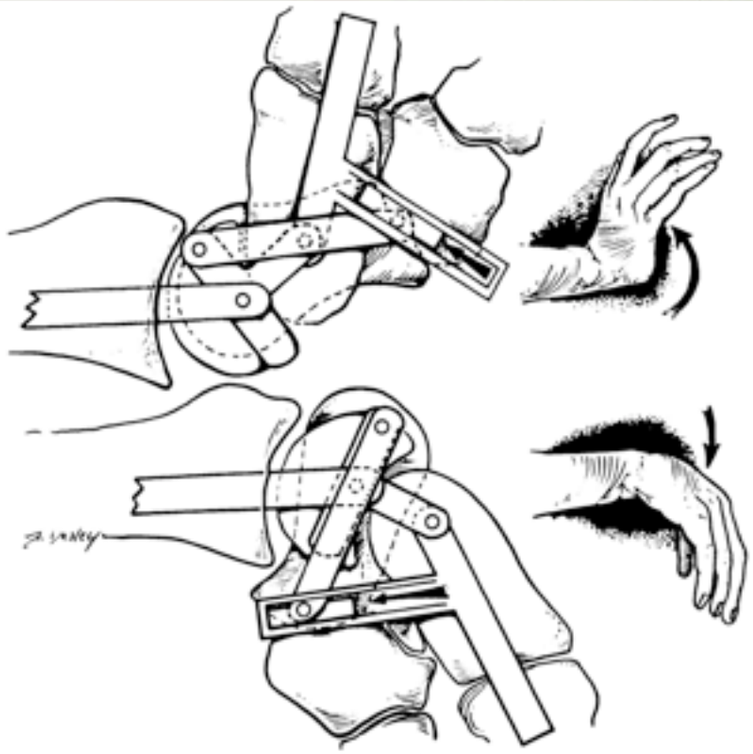
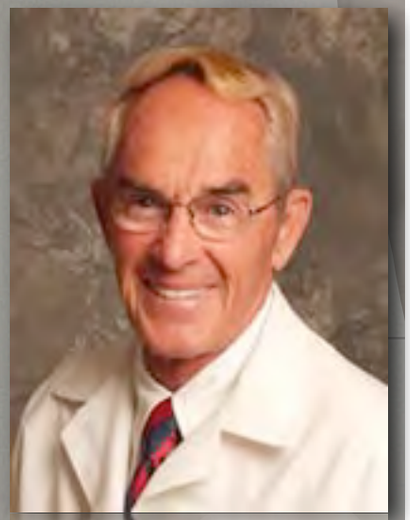


FIG. 15

Slider-crank mechanical model for motion of the intercarpal joint in the sagittal plane. The three-bar linkage shown represents the linkage composed of the radius, lunate, and capitometacarpal links. This linkage is stabilized by the crank (the scaphoid) the straight component that extends between the two t-shaped components which represent the lunate and capitometacarpal links. The linkages of the crank (scaphoid) are a dorsal "revolute" linkage proximally (on the lunate) and a palmar "prismatic" linkage distally (on the capitometacarpal link). The revolute linkage represents the scapholunate ligament; the prismatic linkage, the scaphotrapezoidal-trapezial joint. In dorsiflexion the scaphoid crank induces dorsal rotation of the lunate link by a compressive force directed proximodorsally along the line of the longitudinal axis of the scaphoid. In palmar flexion an oppositely directed tensile force pulls the lunate into palmar flexion. Note that the crank arm will bisect the line joining the centers of rotation of the capitate and the lunate when the wrist is in neutral position.



The SLAC wrist: Scapholunate advanced collapse pattern of degenerative arthritis

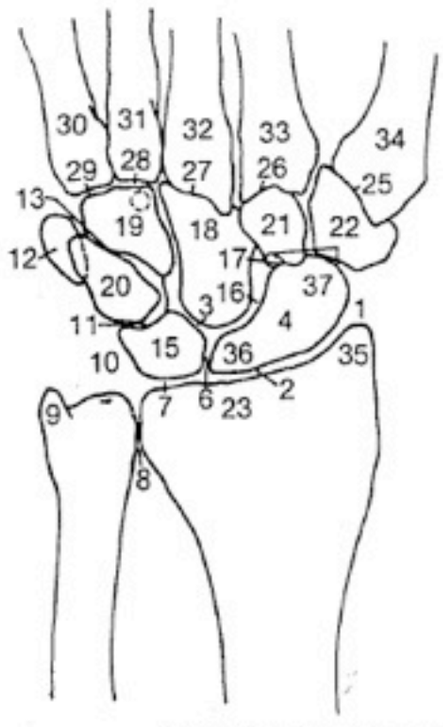
Four thousand wrist x-ray films were reviewed to establish the pattern of sequential changes in degenerative arthritis of the wrist. After eliminating all other arthritides, we studied 210 cases of degenerative arthritis. The most common pattern (57%) was arthritis between the scaphoid, lunate, and radius; 27% of cases occurred between the scaphoid, trapezium, and trapezoid; a combination of these two patterns occurred in 15%. Twenty operations were performed on 19 patients with the scapholunate advanced collapse pattern. Eighteen of 19 patients had less pain postoperatively and none required pain medication. Flexion-extension and radial-ulnar deviation motions showed considerable improvement after the operation. (J HAND SURG 9A:358-65, 1984.)

H. Kirk Watson, M.D., *and* Frederick L. Ballet, M.D., *Hartford and New Haven, Conn.*

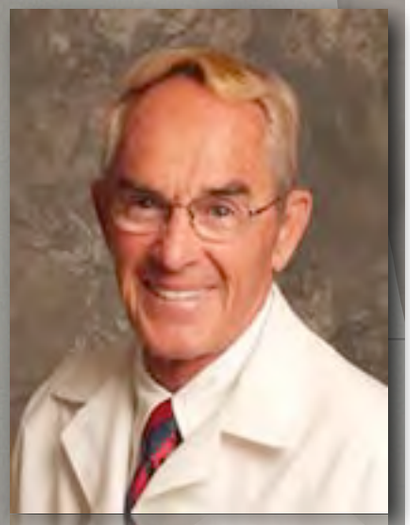
Degenerative arthritis of the wrist occurs in specific patterns. Not only are there repetitive patterns, but the sequence and progression within these patterns is repetitive and consistent. More than 4000 wrist x-ray films were analyzed and all findings of non-inflammatory degenerative changes were computerized for area of initial change, progression of degeneration, degree of joint narrowing, evaluation of sclerosis, and related patterns of change between different carpal joints. All cases of inflammatory arthritis were excluded.

The most common form of human wrist arthritis is termed the "SLAC" (scapholunate advanced collapse) pattern. This repetitive sequence of degenerative change is based on and caused by articular alignment problems between the scaphoid, the lunate, and the radius.

Painful and debilitating SLAC wrist can be reconstructed.[1, 2] This reconstruction consists of limited arthrodesis of the wrist combined with a silicone rubber (Silastic; Dow Corning Corporation, Midland, Mich.) implant.



- ⅓ joint space narrowing
- ⅓◄►⅔ space narrowing
- complete space narrowing
- sclerosis



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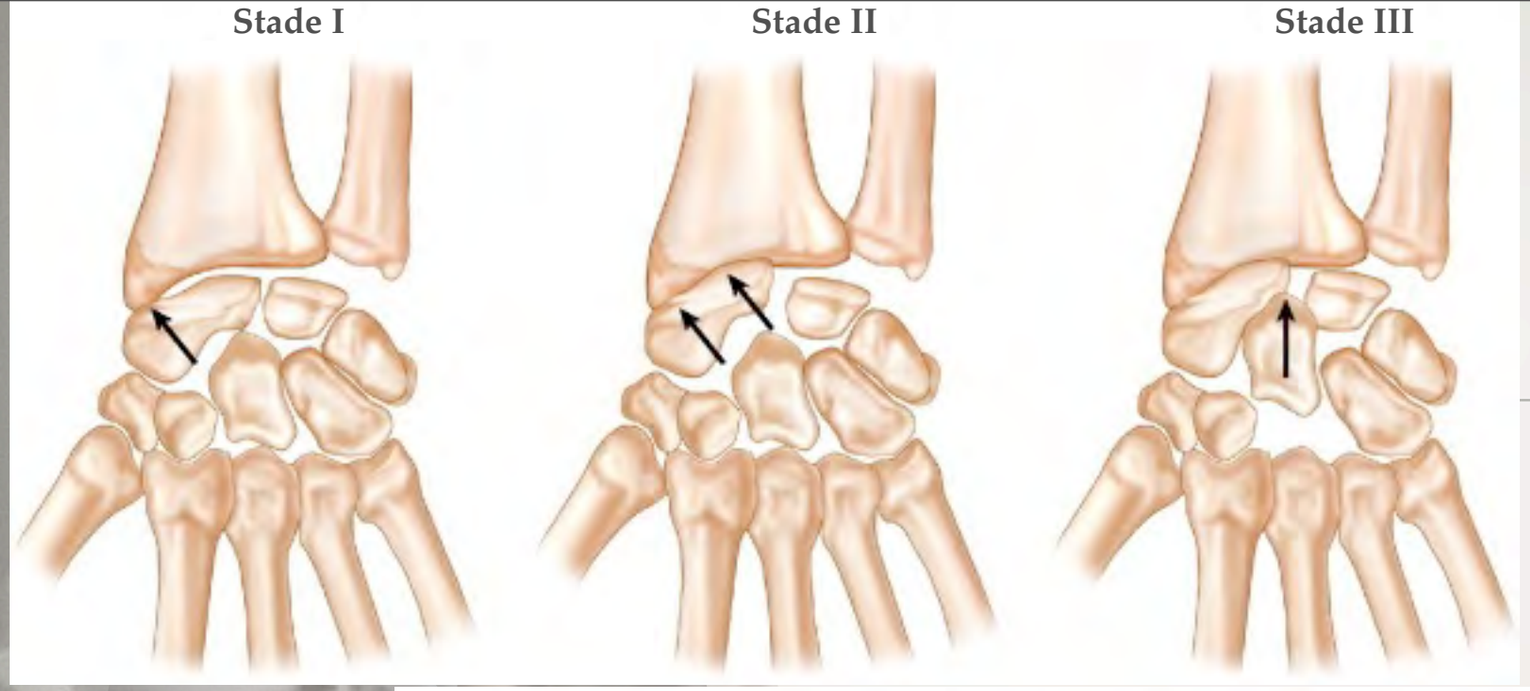
ONE THOUSAND INTERCARPAL ARTHRODESES

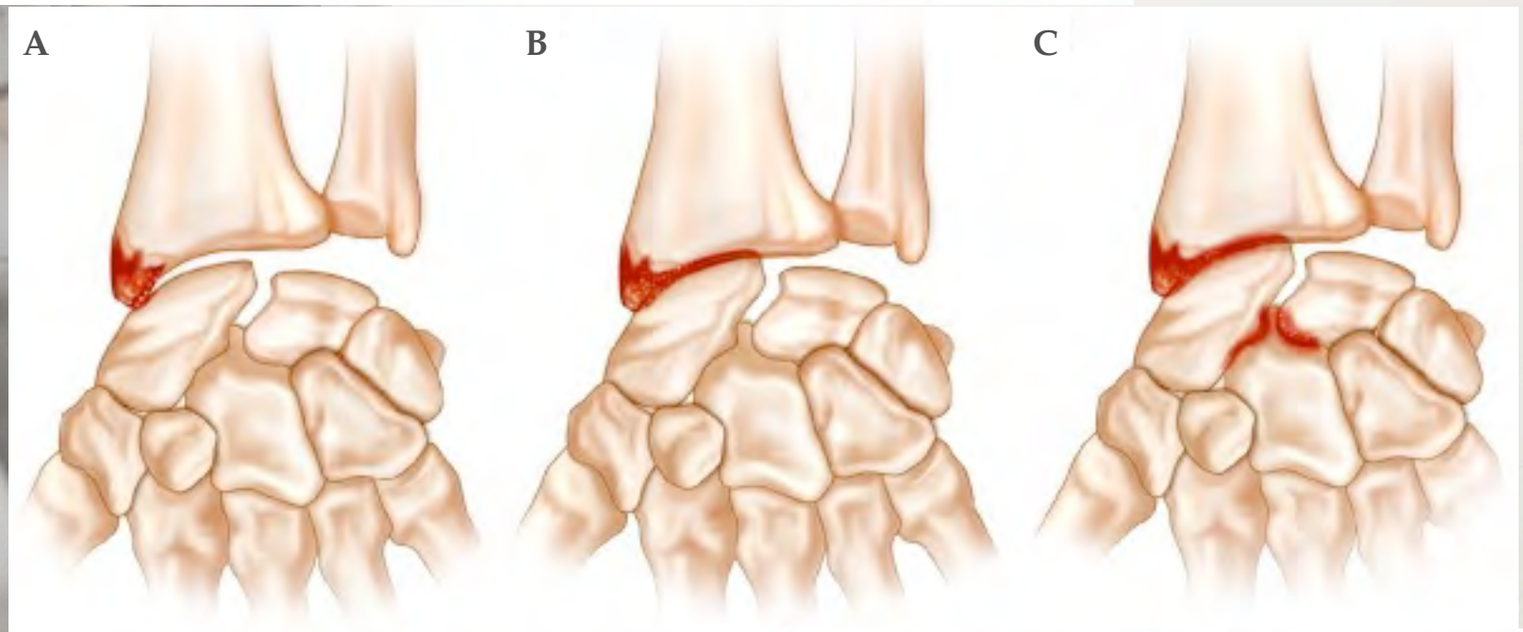
H. K. WATSON, J. WEINZWEIG, P. M. GUIDERA, J. ZEPPIERI and D. ASHMEAD

From the Connecticut Combined Hand Service, Hartford and New Haven, Connecticut and Worcester, Massachusetts, USA

Limited wrist arthrodesis is a useful method for treating specific carpal disorders that maximizes residual wrist motion and strength while eliminating pain. Selective fusion of specific carpal units can be used in degenerative arthritis, rotary subluxation of the scaphoid, midcarpal instability, scaphoid nonunion, Kienböck's disease, and congenital synchondrosis or partial fusion of specific carpal joints. This report presents our experience with more than 1000 limited wrist arthrodeses, and provides a review of the indications and technical considerations for specific intercarpal fusions, and subsequent results. To date this is the largest series of intercarpal arthrodeses and the study has demonstrated that these techniques are reliable and effective in dealing with a wide range of wrist disorders.

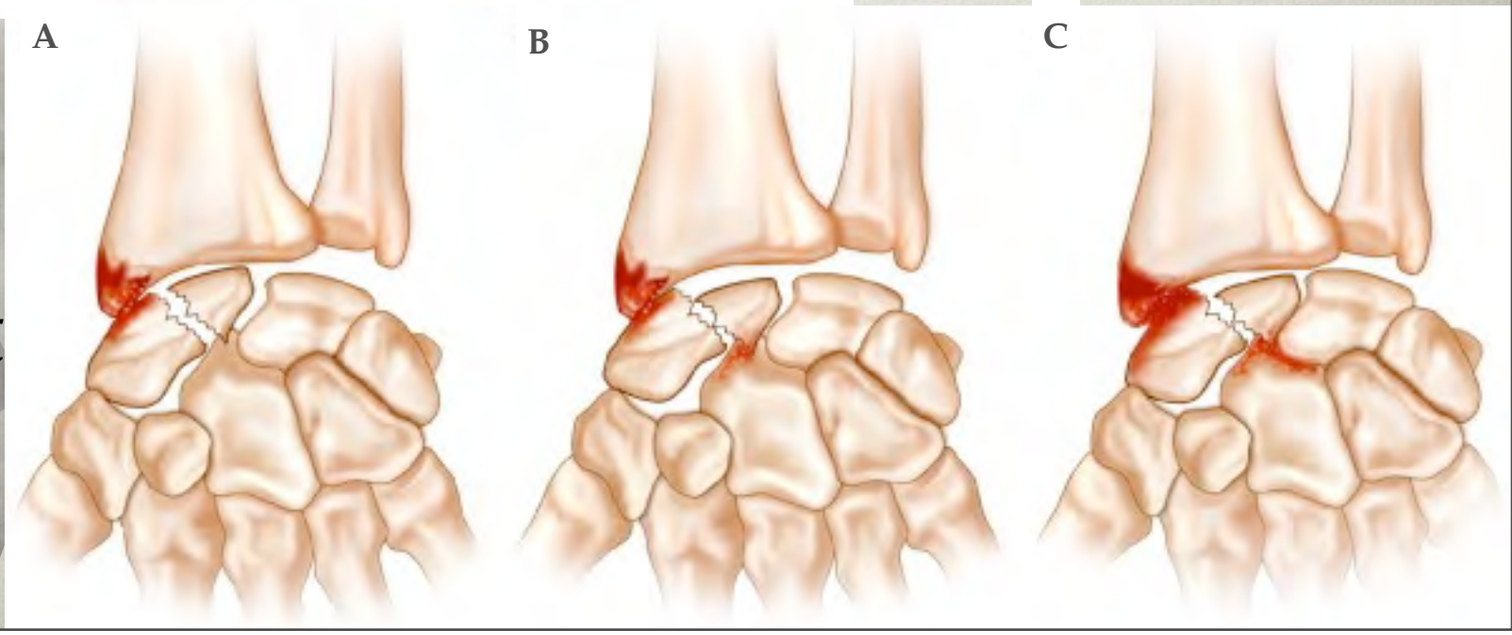
Journal of Hand Surgery (British and European Volume, 1999) 24B: 3: 307–315

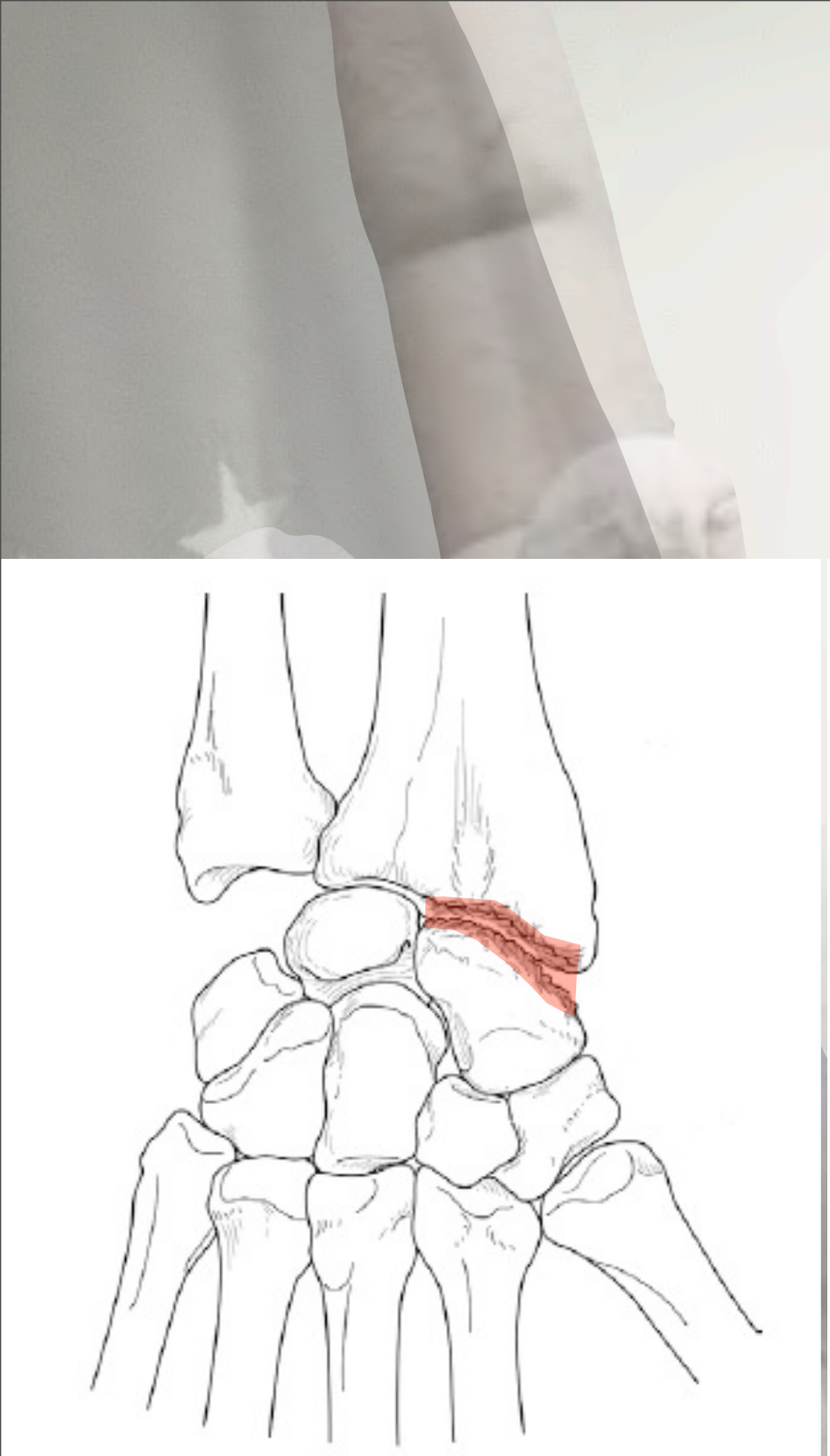


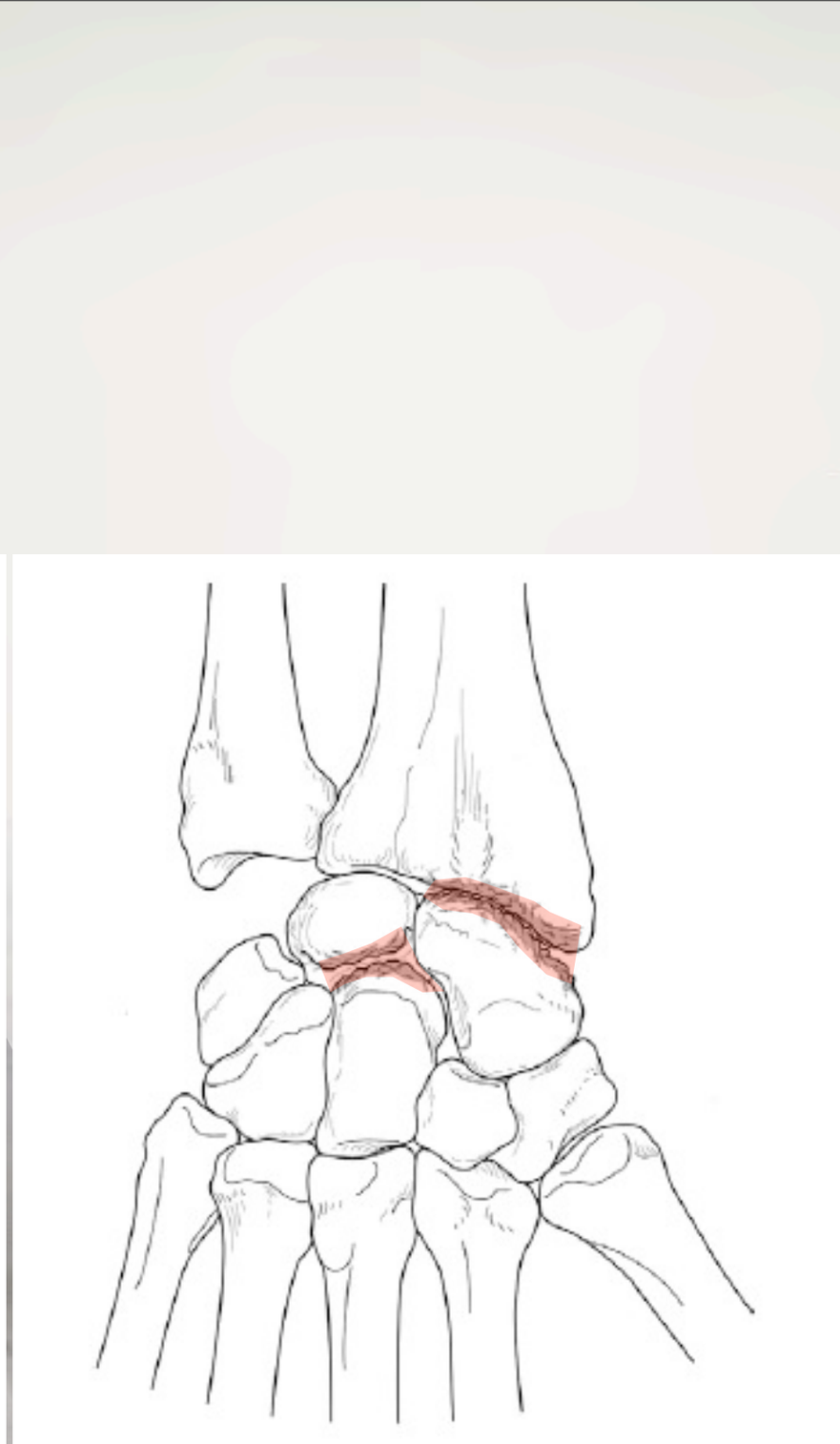


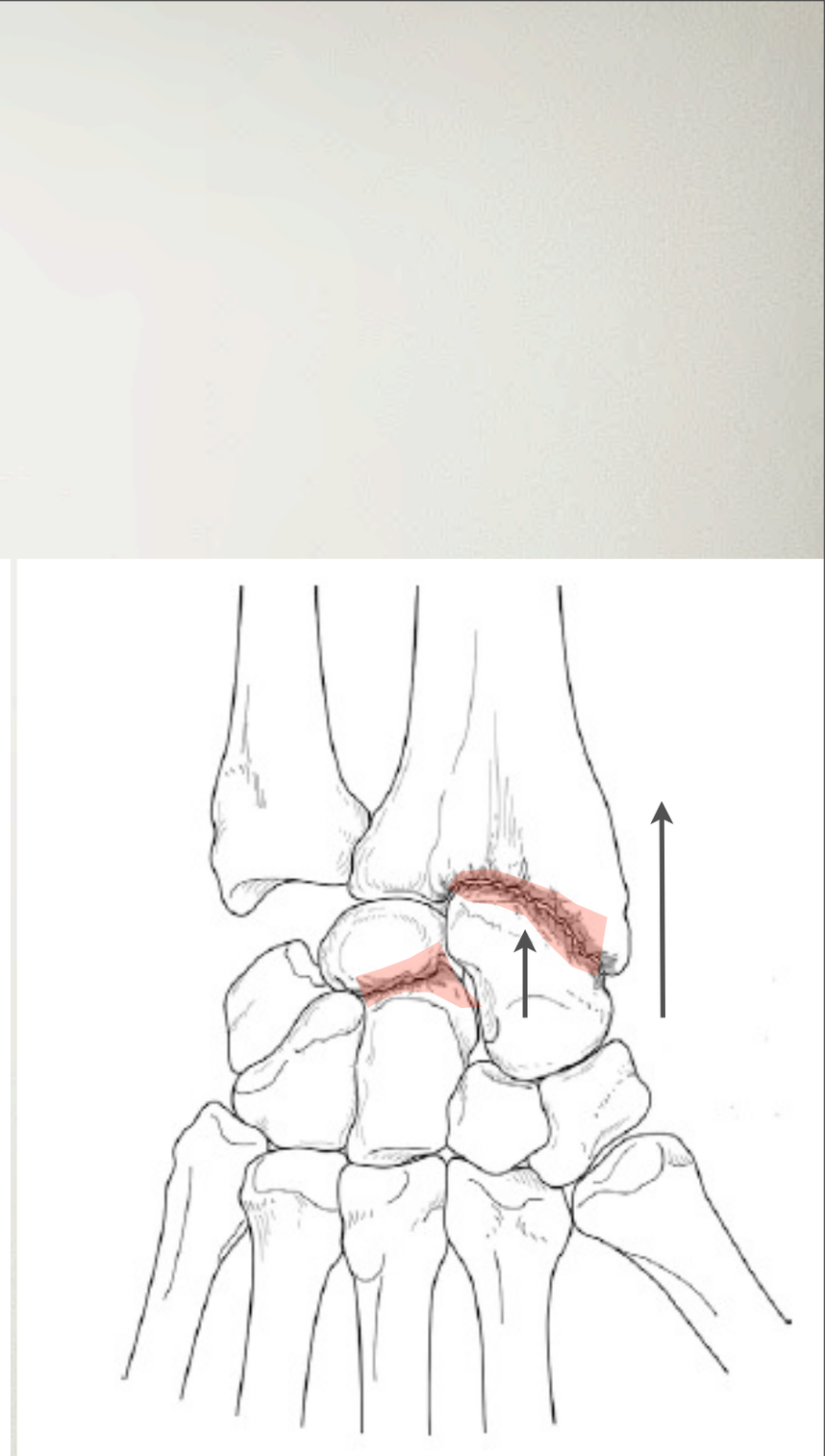
SLAC wrist

SNAC wrist









SCAC 1

SCAC 2

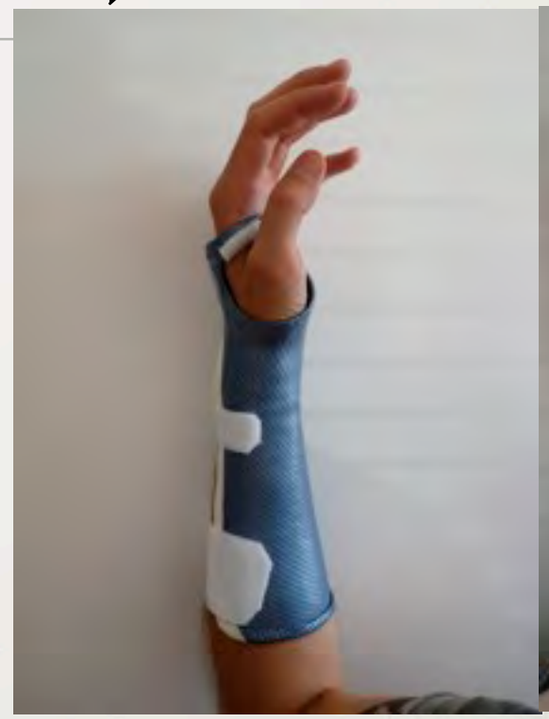
SCAC 3

Romano S. Arthrose non-traumatique du poignet : la chondrocalcinose. Chir Main 2003, 22, 285-292.

L'arthrose de poignet

- Evolution par poussées
- Retentissement fonctionnel
- Stabilité pendant longtemps
- Déstabilisation +/- rapide
- Douleurs / Raideur / Perte de force

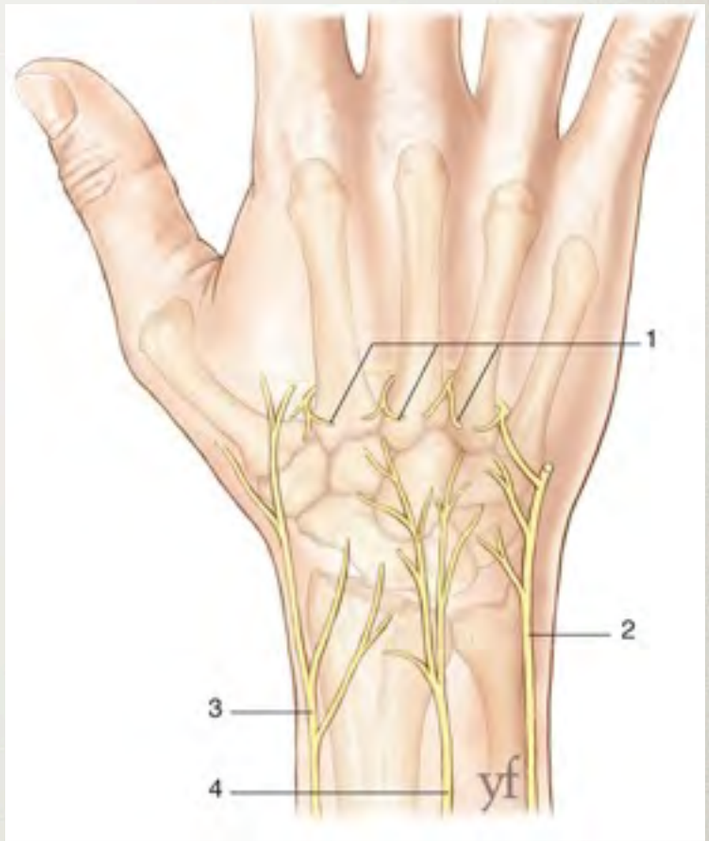
OPTIONS THERAPEUTIQUES



- Abstention
- Orthèse / attelles
- Traitements médicamenteux
- Infiltrations
- Chirurgie

Options chirurgicales

- Dénervation du poignet
- Résection de la 1ère rangée
- Arthrodèses partielles
- Arthrodèse globale
- Interposition
- Implants (silastic, pyrocarbone, ...)
- Prothèses

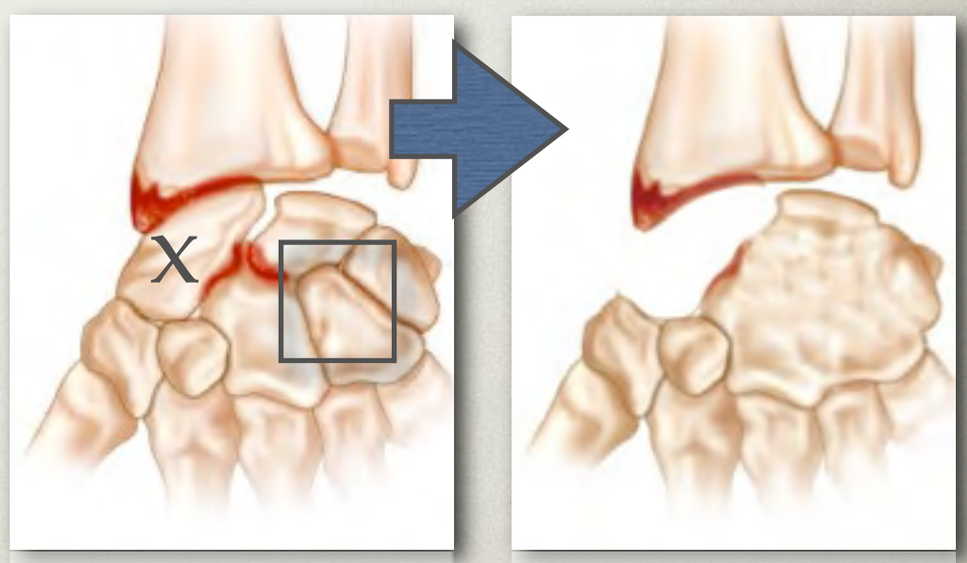


Options chirurgicales

- Dénervation du poignet
- Résection de la 1ère rangée
- Arthrodèses partielles
- Arthrodèse globale
- Interposition
- Implants (silastic, pyrocarbone, ...)
- Prothèses

ARTHRODESES PARTIELLES

- Scaphoïdectomie partielle / complète
- Fusion médio-carpienne
- +/- étendue
- C.L., C.H.L., C.H.L.T.



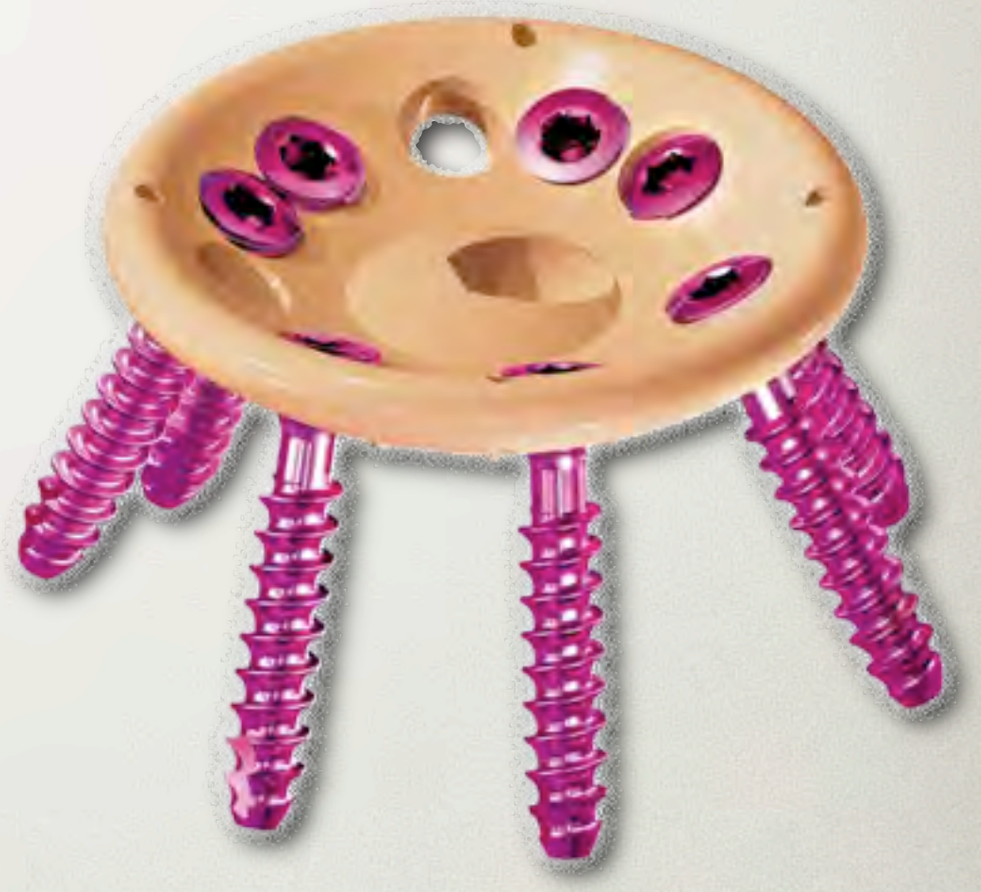
Principe de la fusion de la colonne centrale (Watson - 1984)

LE P.E.E.K.

- P.E.E.K. (poly-ether-ether-ketone)
- Polymère commercialisé en 1978
- Thermoplastique semi-cristallin thermostable
- Renforcement de structures en fibre de carbone, revêtement de pièces mécaniques non-lubrifiées, prothèses et implants chirurgicaux

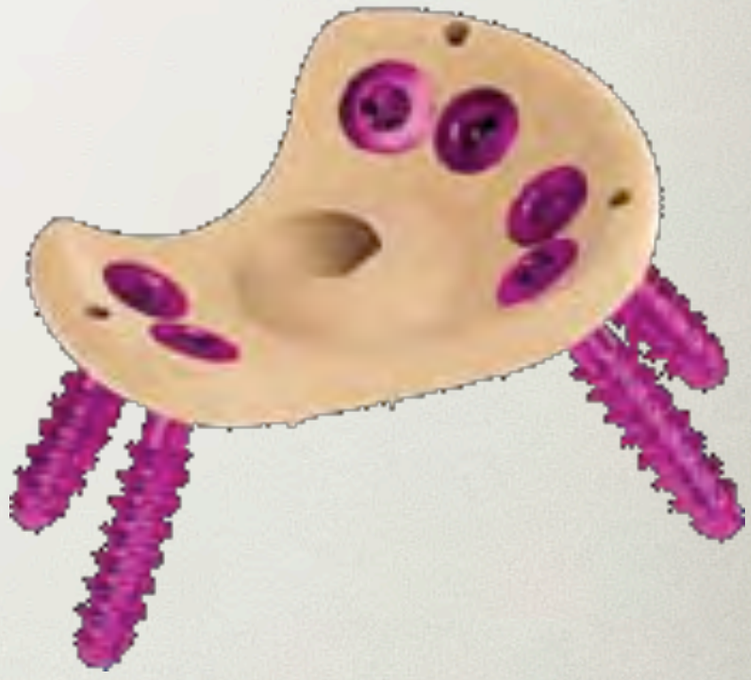
LA CUPULE X-PODE

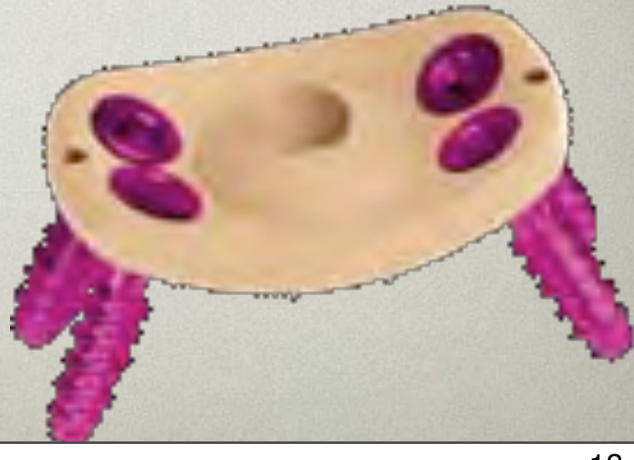
- Cupule circulaire
- Perforée
- P.E.E.K.
- Perforée
- 18 et 22 mm ∅ (9 et 10 trous)



LA CUPULE X-PODE

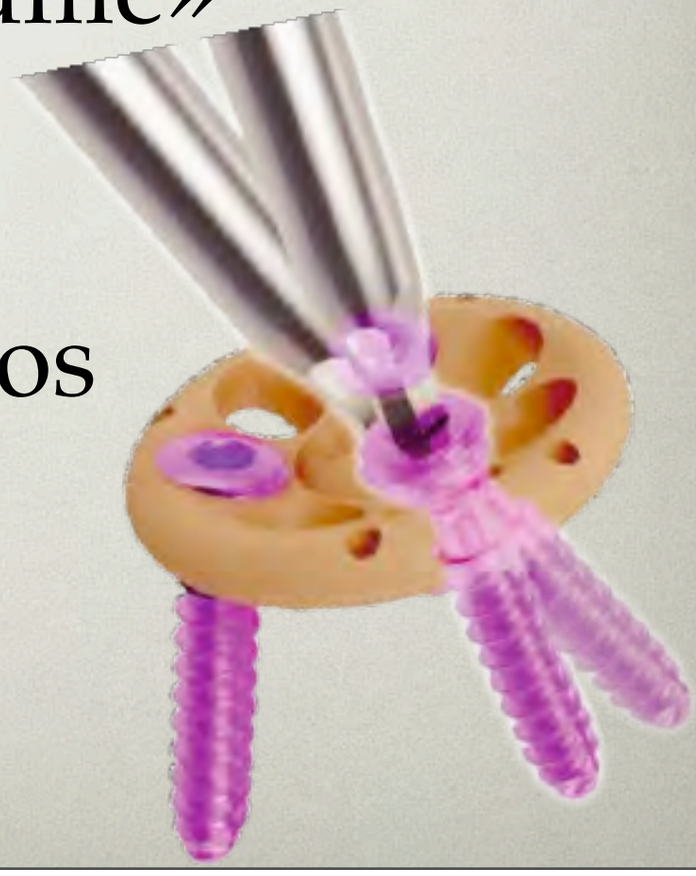
- Cupule tronquée
- Arthrodèse 2 os ou 3 os
- P.E.E.K.
- Perforée
- 18 et 22 mm ∅ (4 et 6 trous) pour les 3 os
- 18 mm ∅ (4 trous) pour les 2 os

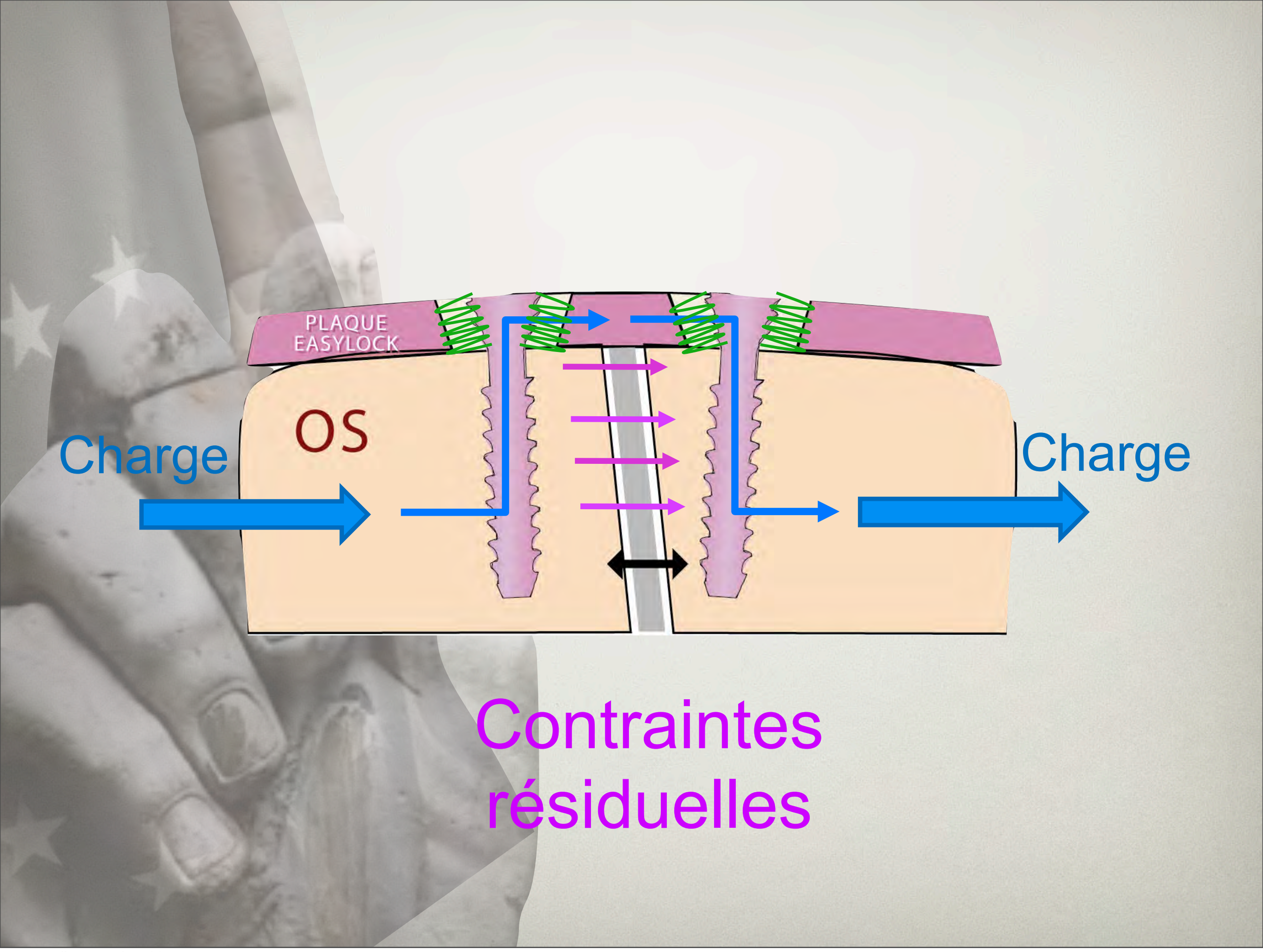




LA CUPULE X-PODE

- Ostéosynthèse «semi-rigide»
- Avantages du système «verrouillé»
- Vissage poly-axial (+/- 10°)
- Module de Young proche de l'os




PLAQUE
EASYLOCK
OS
Charge
Charge
Contraintes
résiduelles

ETUDE BIO-MECANIQUE

Full length article

The Journal of Hand Surgery
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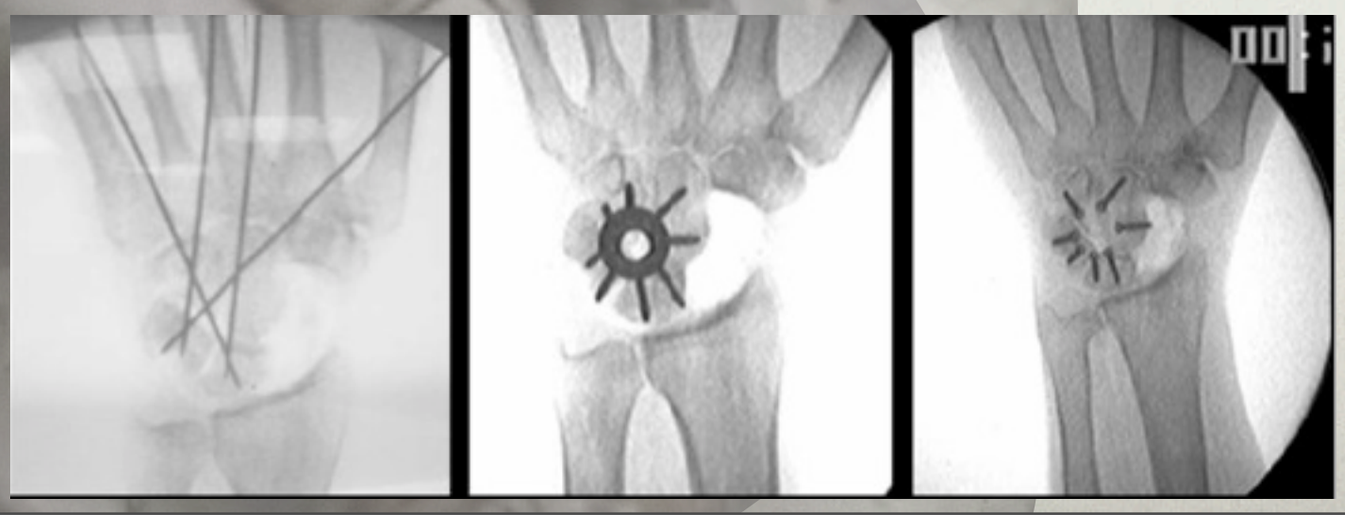
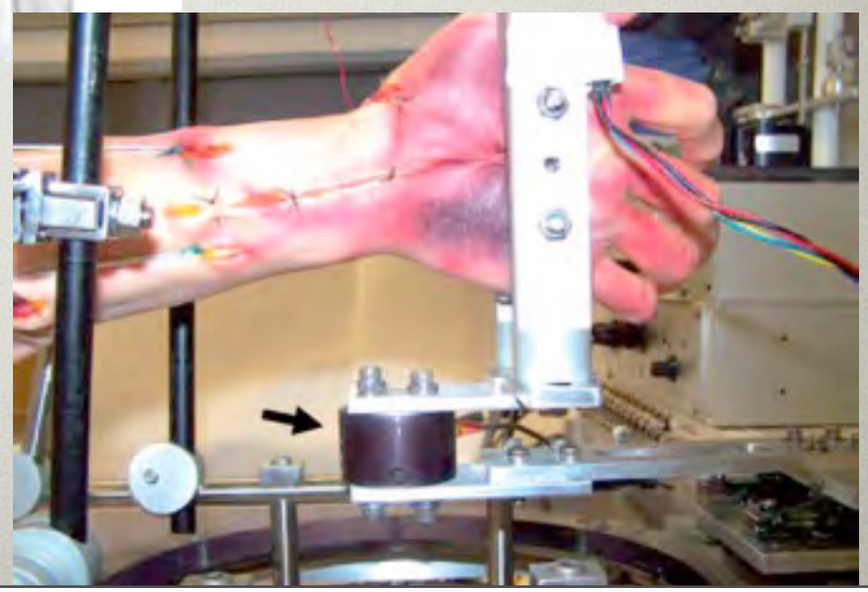
Biomechanical comparison of three fixation techniques used for four-corner arthrodesis

J. Kraisarin, D. G. Dennison, L. J. Berglund, K. N. An and A. Y. Shin
Biomechanics Laboratory, Division of Orthopedic Research, Mayo Clinic College of Medicine, Rochester, USA





ETUDE BIO-MECANIQUE

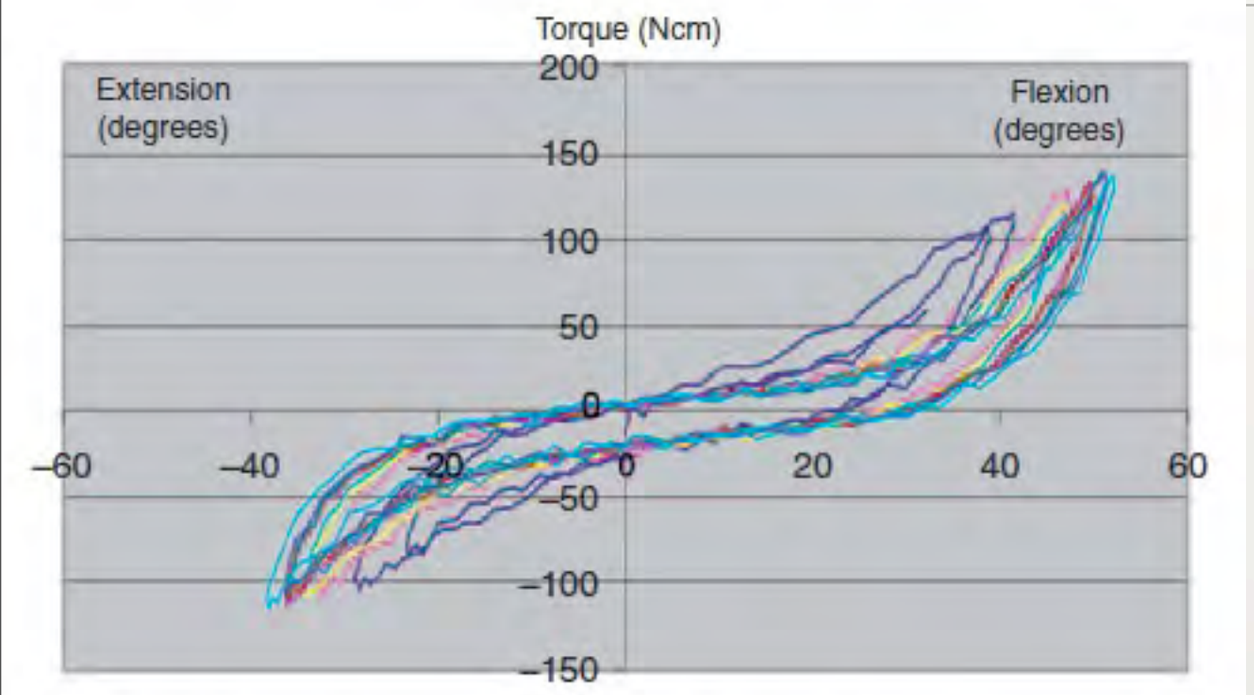


Figure 4. Torque–rotation curve of one specimen with a DCP demonstrates fatigability. The end points of flexion–extension gradually increase with relatively constant torque.

From A. Shin & al.

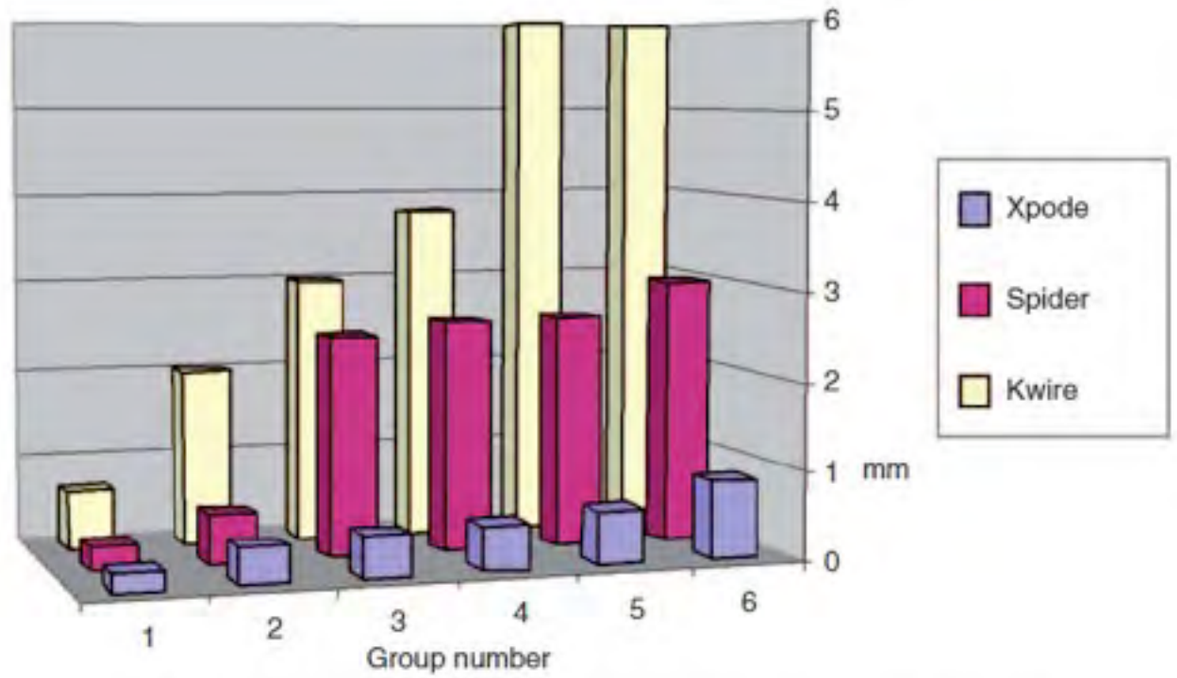
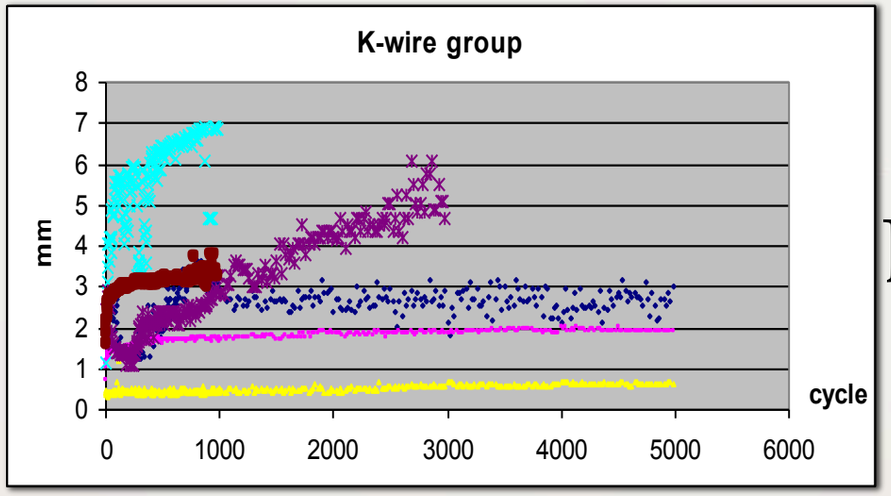


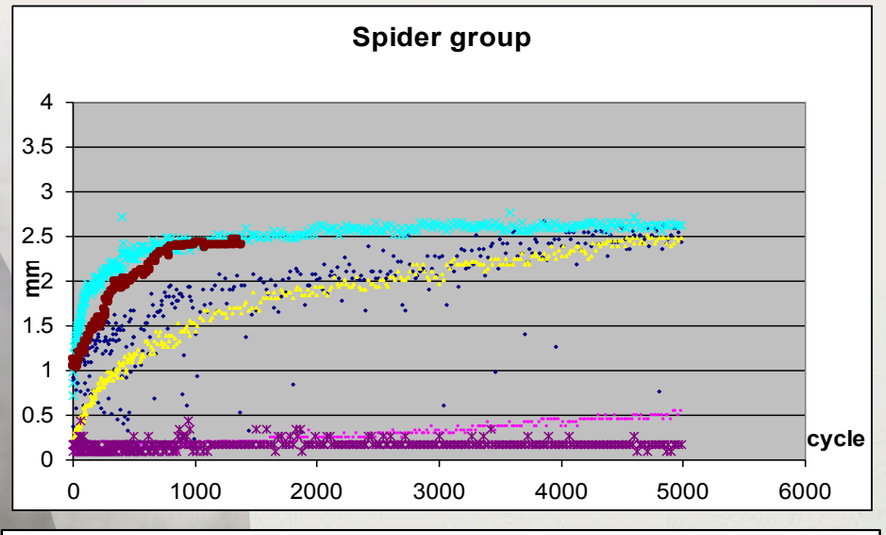
Figure 5. Displacement (mm) between the lunate and capitate for the three fixation techniques.

≥ 3000 cycles, mesure de l'écart luno-capitatum +/-jusqu'à rupture

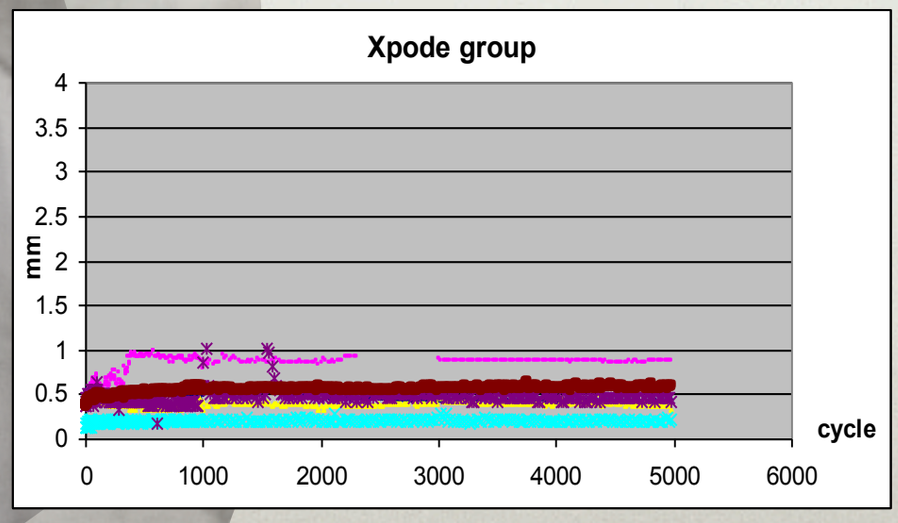
From A. Shin & al.



Broches : 5/6 échecs



Spider : 4/6 échecs



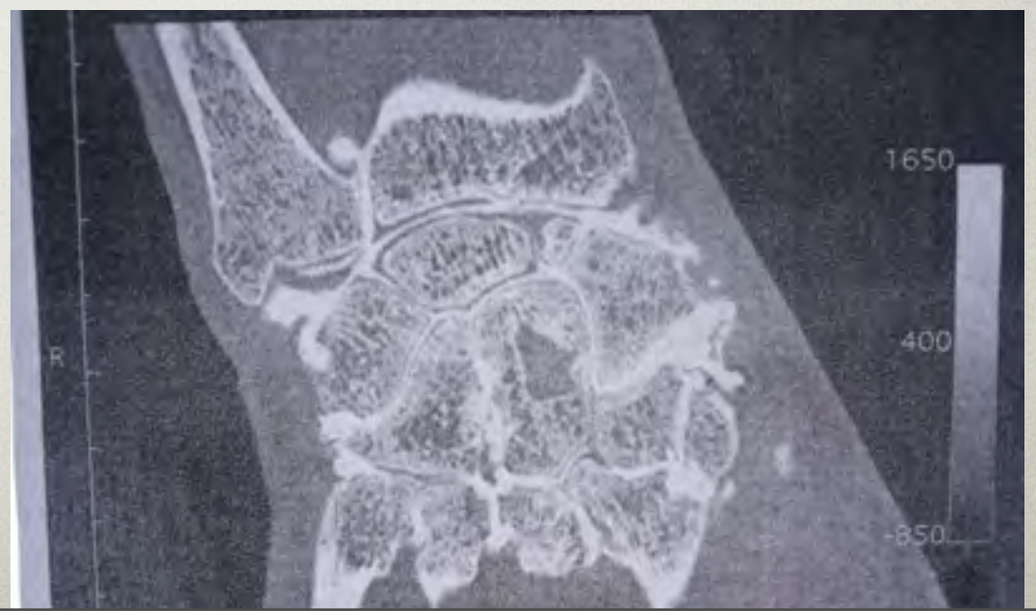
XPode : 0/6 échecs

ETUDE BIO-MECANIQUE

While the LDCP was the most stable of the three techniques tested, this does not predict clinical success. Surgeons must remain aware of the existing literature and principles governing four-corner arthrodesis operations. The success of four-corner arthrodesis operations remains predicated upon careful preparation of the subchondral bone, correction of the wrist deformity and insertion of stable fixation. Locking screws do provide increased stability to the four-corner arthrodesis and this stability may ideally lead to improved union rates or decreased duration of immobilization. Perhaps most importantly though, the dorsal hardware must not be prominent or lead to impingement and requires careful inspection during insertion. We anticipate that our data and our model will be useful as we continue to investigate the outcome of surgical techniques for four-corner arthrodesis.

INDICATIONS

- SLAC Wrist stade 2-3
- SNAC Wrist stade 2-3
- Arthrose médiocarpienne (SCAC, Preiser, post-traumatique)



TECHNIQUE CHIRURGICALE

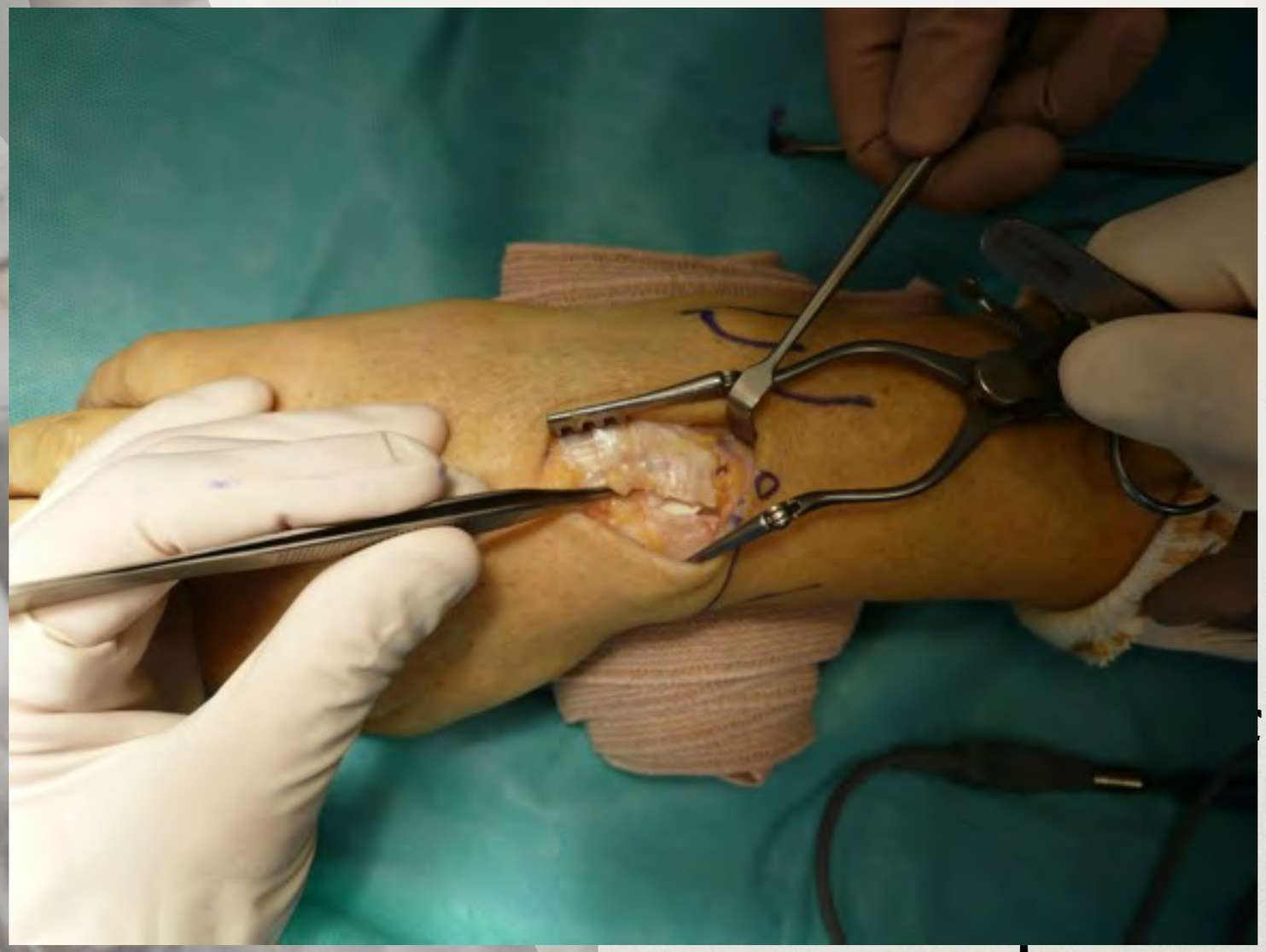
INSTALLATION

- Anesthésie Loco-Régionale
- Decubitus dorsal
- Garrot pneumatique
- Avant-bras en pronation

Incision

- Dorsale
- Longitudinale / sinusoïdale
- Transversale
- Permettant de réséquer le Nerf I.O.P.
- Et de travailler sur le carpe....

Incision



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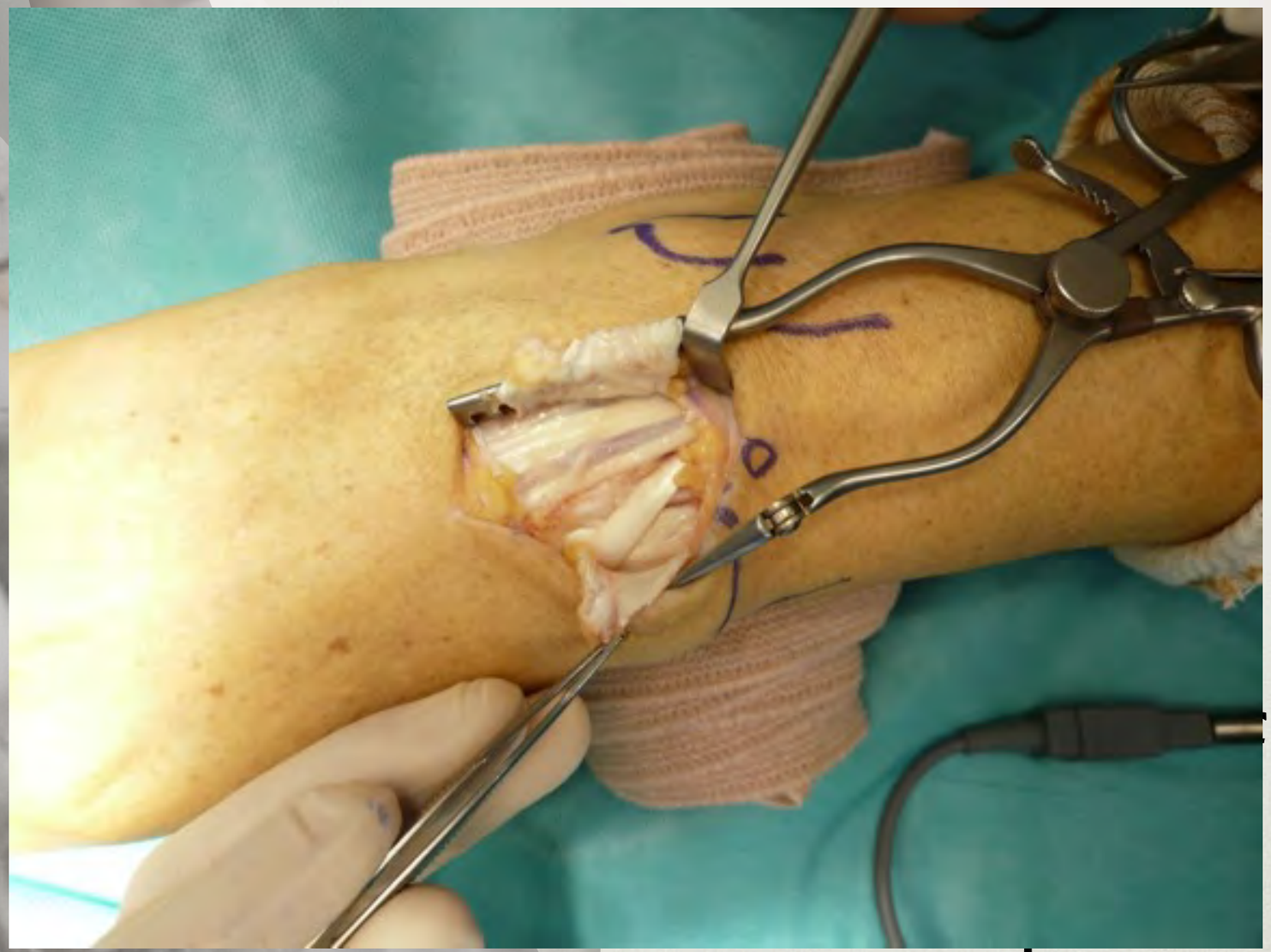
I.O.P.

Incision



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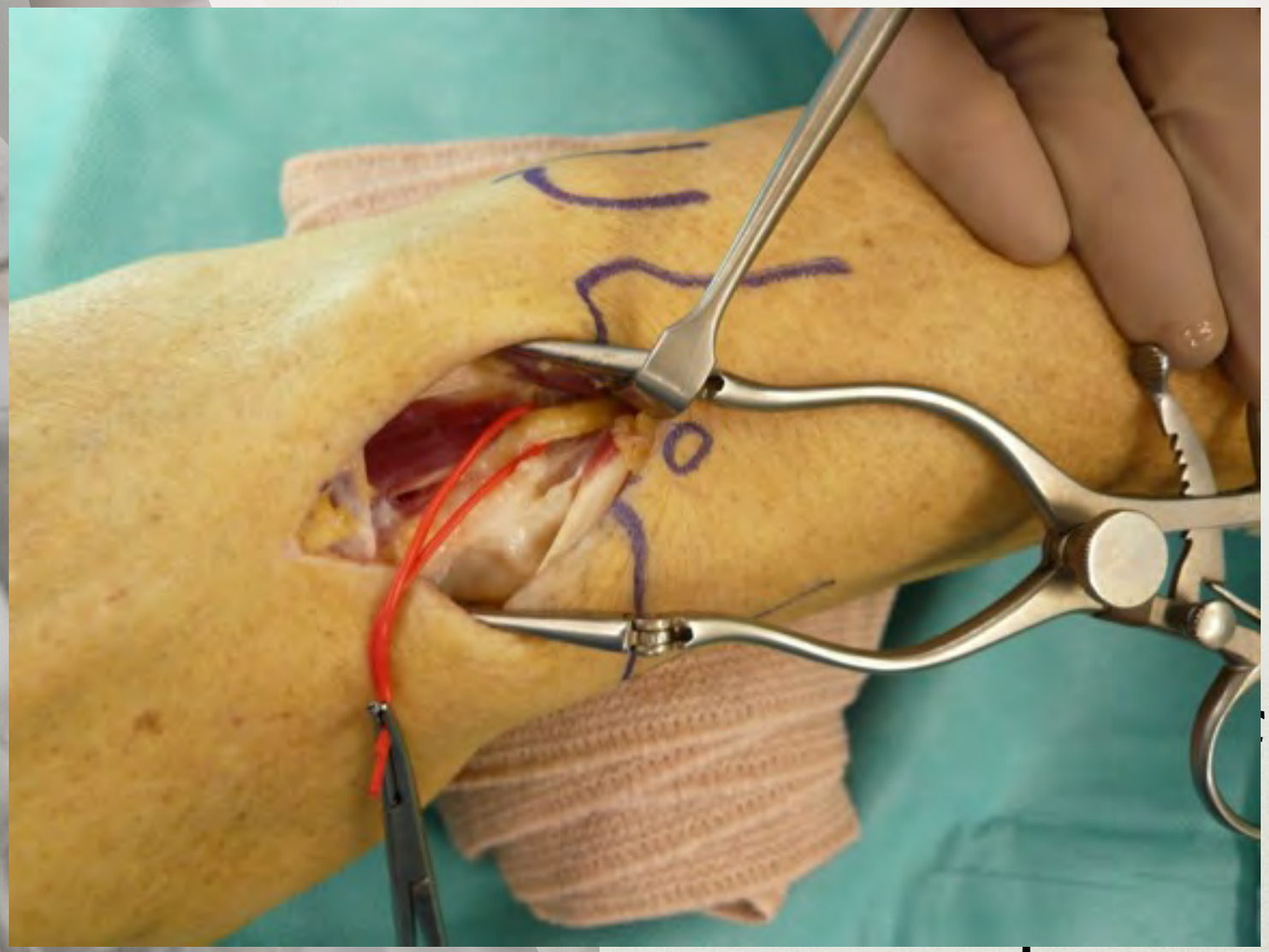

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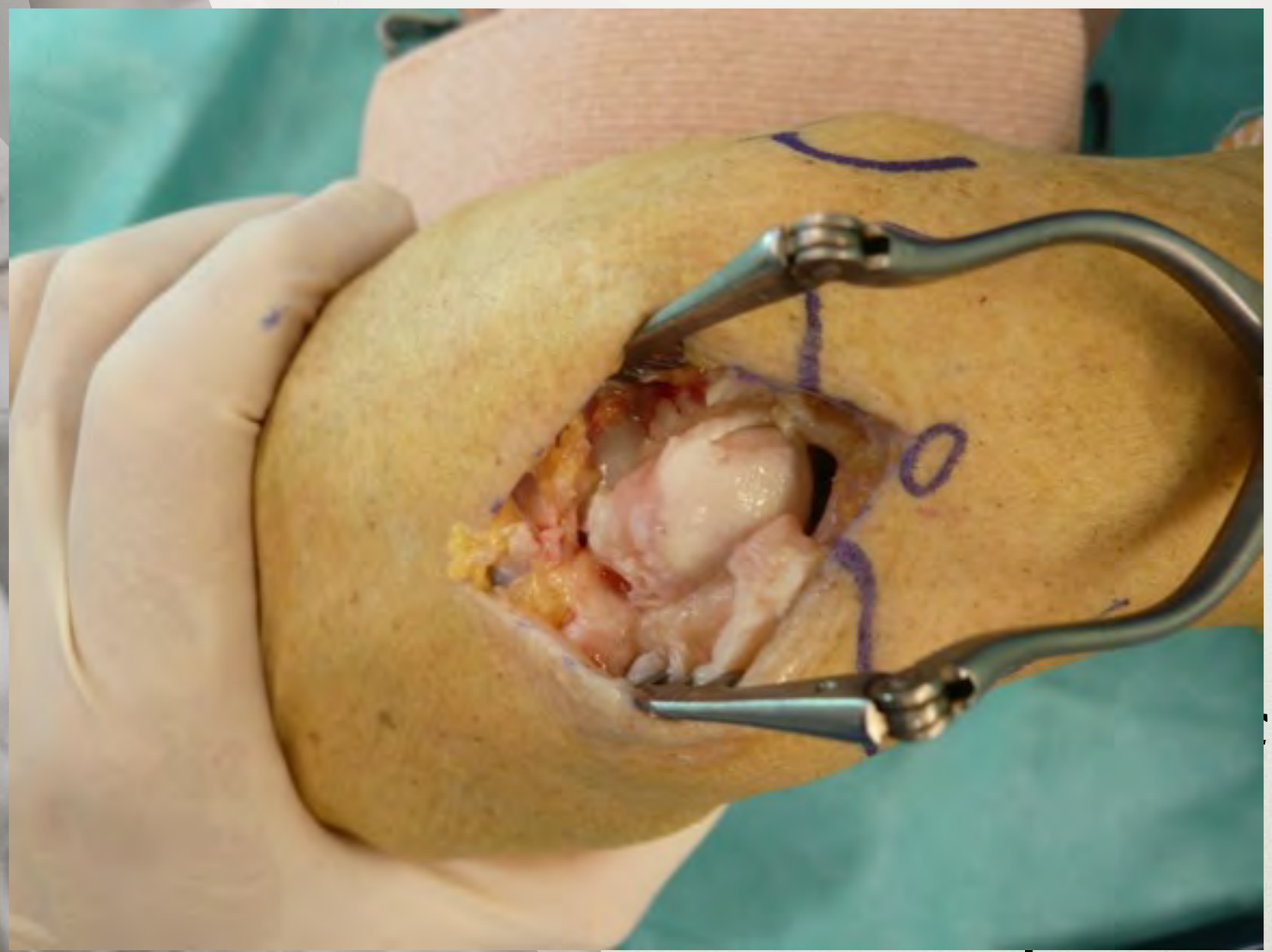
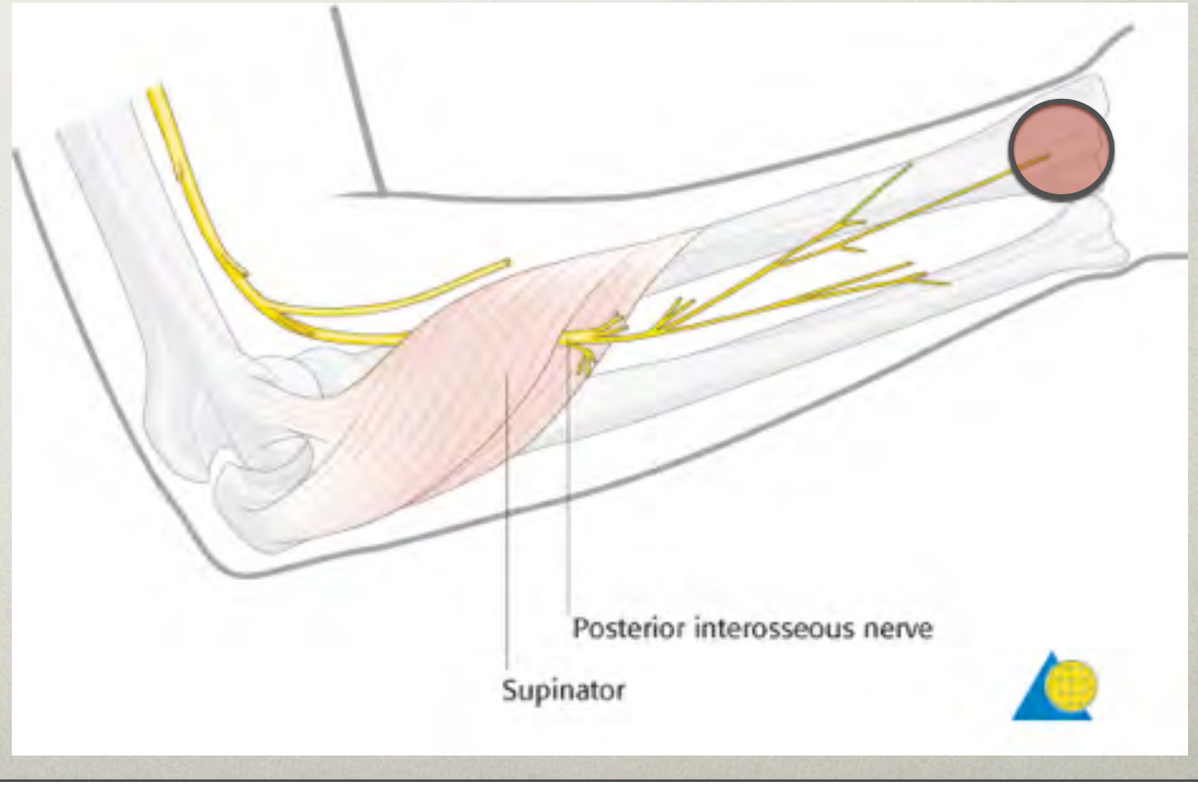


- I.O.P.

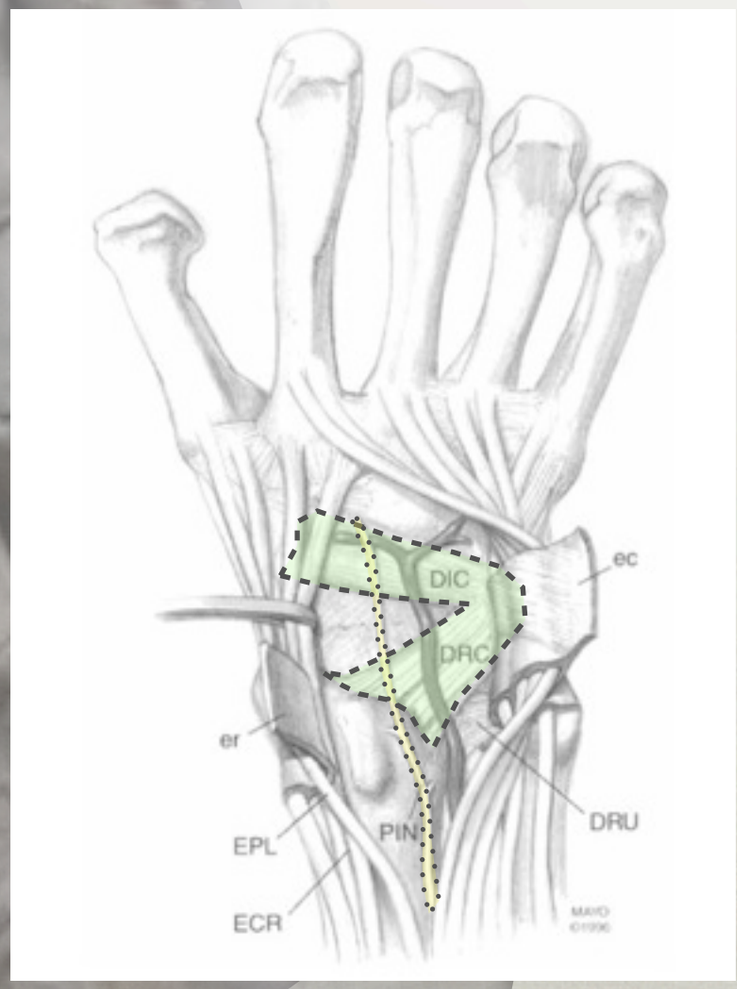
DISSECTION

- Dénervation dorsale
- Ouverture du retinaculum dorsal
- Résection du nerf I.O.P. (plancher du 4e compartiment)



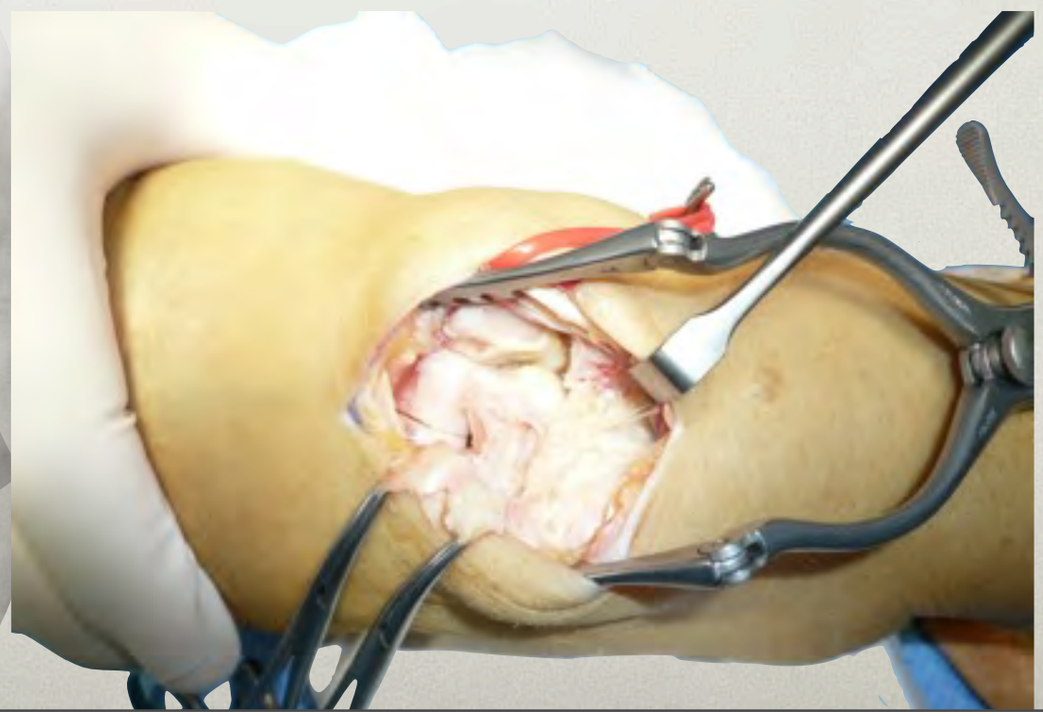
ARTHROTOMIE

- Respectant les ligaments dorsaux
- Capsulotomie selon Berger



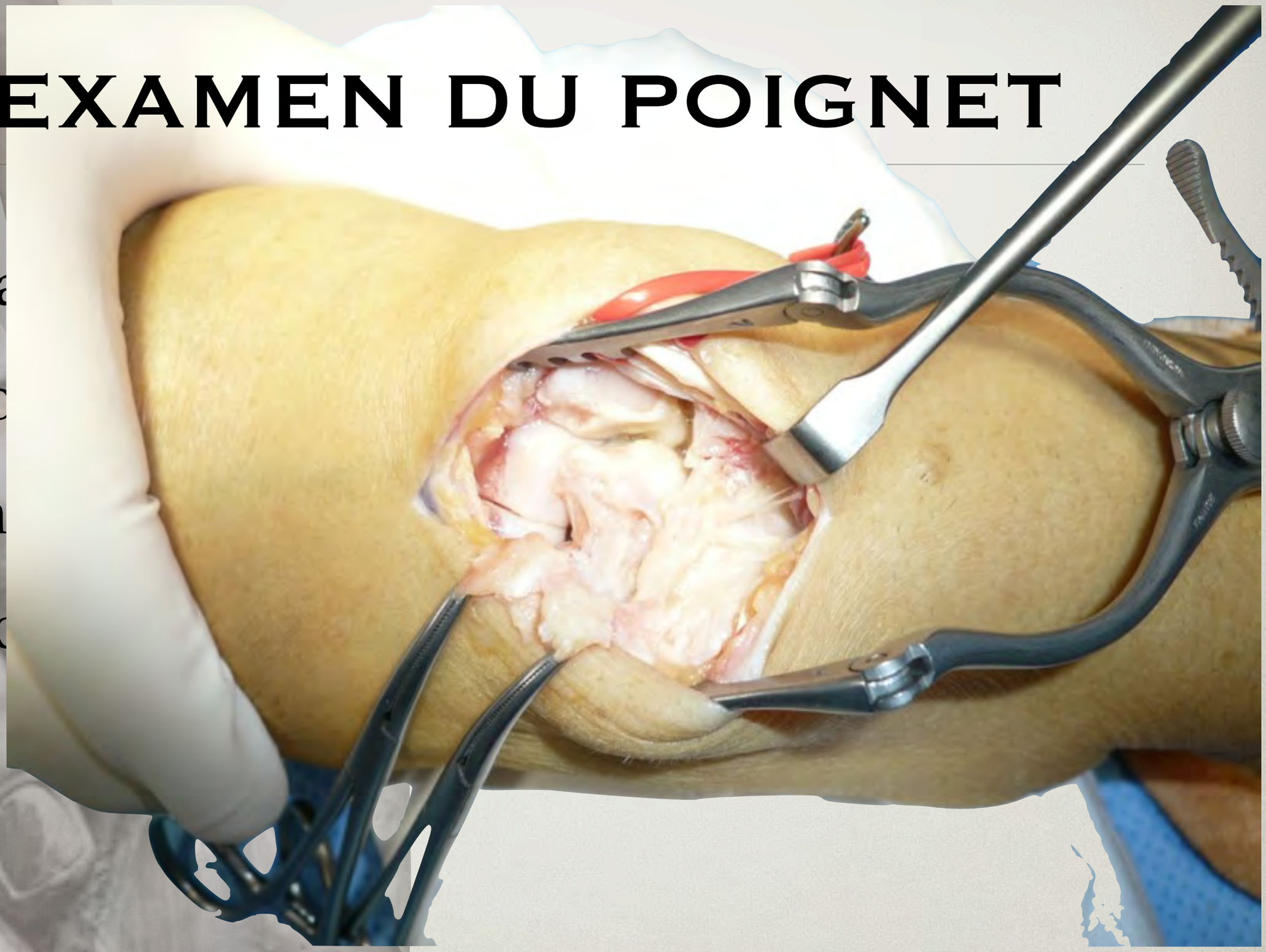
EXAMEN DU POIGNET

- Surfaces articulaires
- Synovite
- Arthrose, corps étrangers
- Lésion initiale (rupture lig., pseudarthrose)



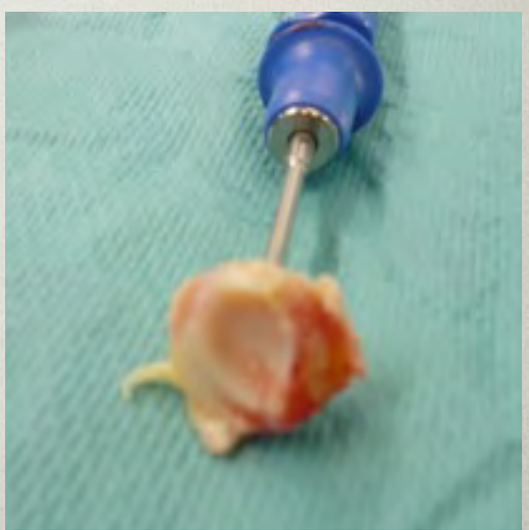
EXAMEN DU POIGNET

- Surfa
- Sync
- Arth
- Lésio



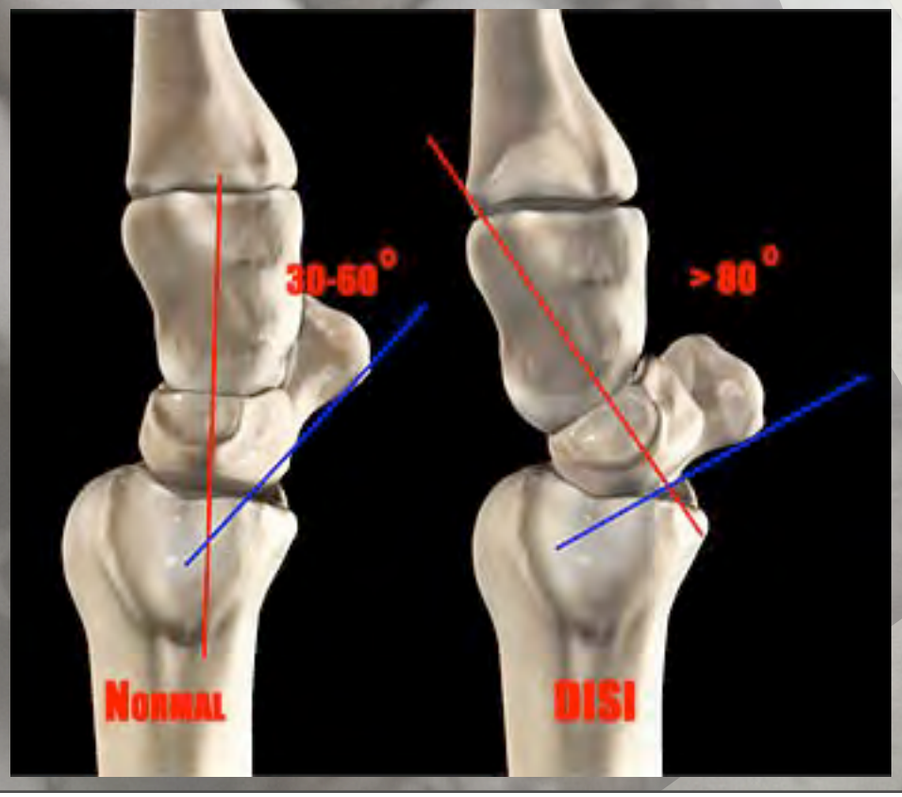
SCAPHOIDECTOMIE

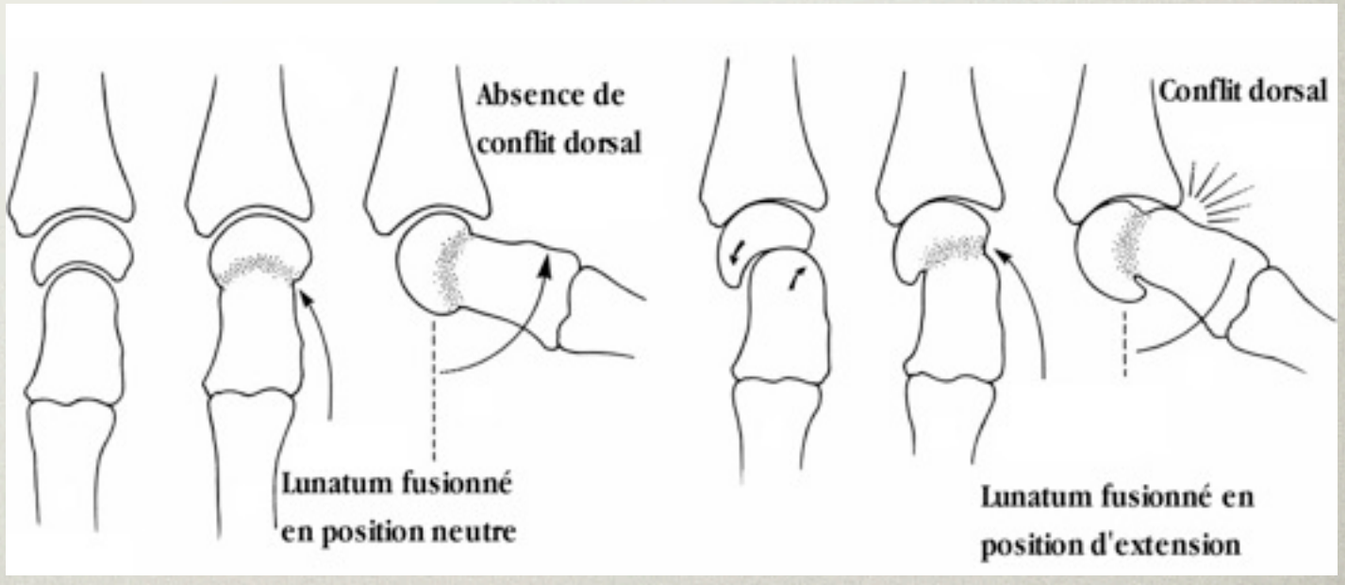
- Temps difficile
- Fragmentation
- Libération du pôle distal +++
- Tire-fond, pince d'Ombrédanne
- Patience & méticulosité



ARTHRODESE

- Réductibilité des os du carpe
- Extension de la 1ère rangée
- Translation interne
- Pourra-t-on réduire le carpe ?





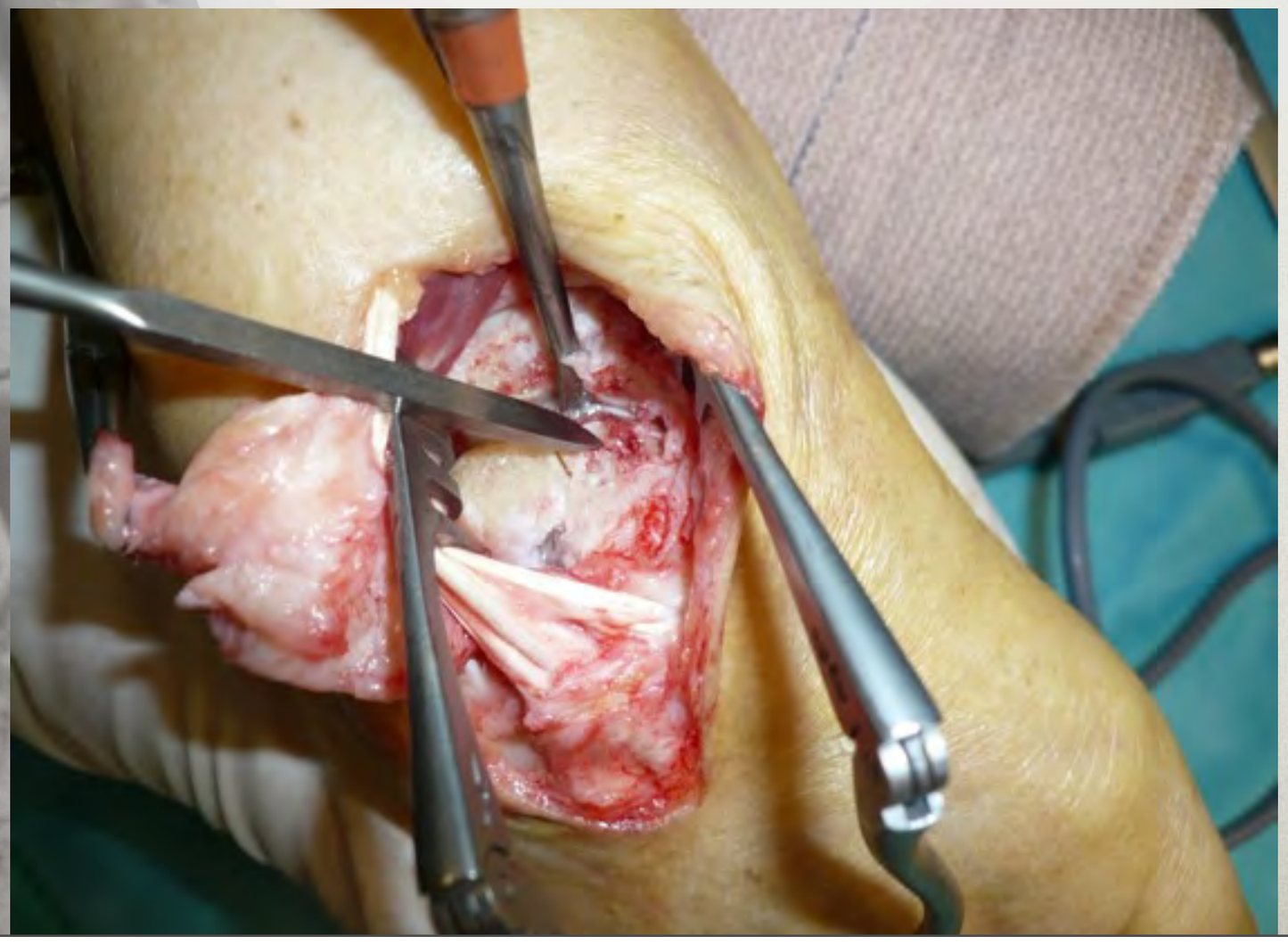
d'après Four-corner arthrodesis. Shin A., J Am Surg Hand, 2001, 1, 2, 93-111.
L'arthrodèse capitato-lunaire dans l'arthrose du poignet : à propos de vingt cas. A. DURAND, B. NURBEL, E. DEHOUX & al. Rev Chir Orthop Reparatrice Appar Mot. 2007 Feb;93(1):37-45

ARTHRODESE

- Avivement des surfaces M.C.
- Lunatum (face distale)
- Capitatum (tête)
- Hamatum (face proximale)
- Triquetrum (face distale)
- Interligne C.H. +/- LT

ARTHRODESE

- Jusqu'en os sous-chondral
- «Piqueté hémorragique»
- Permettra d'obtenir une fusion osseuse



GREFFE OSSEUSE

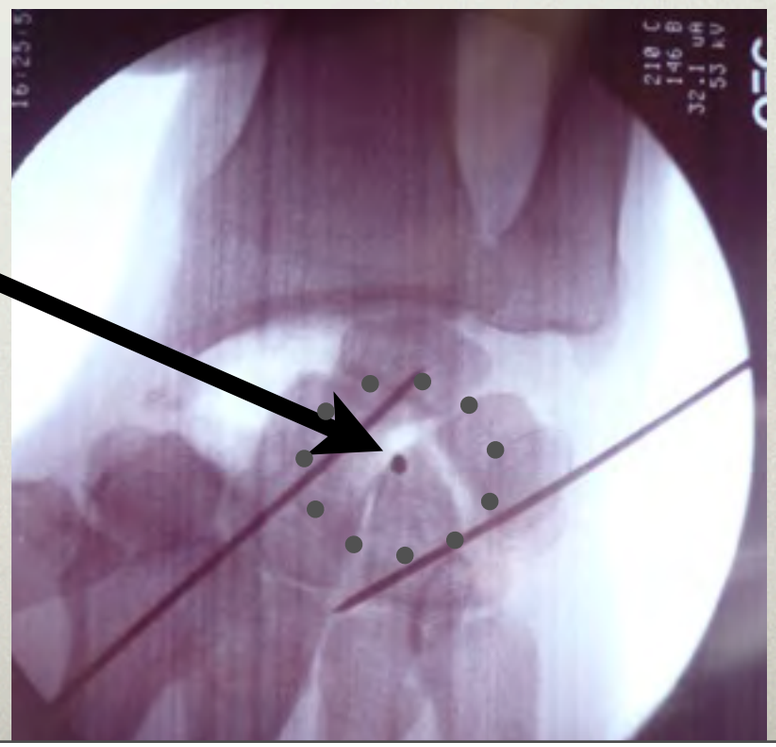
- Scaphoïde, crête iliaque, radius, ...
- Copeaux et fragments de petite taille
- Encastré dans les interlignes avivés avant le fraisage

ARTHRODESE

- Fixation temporaire par broches
- Contrôle radioscopique

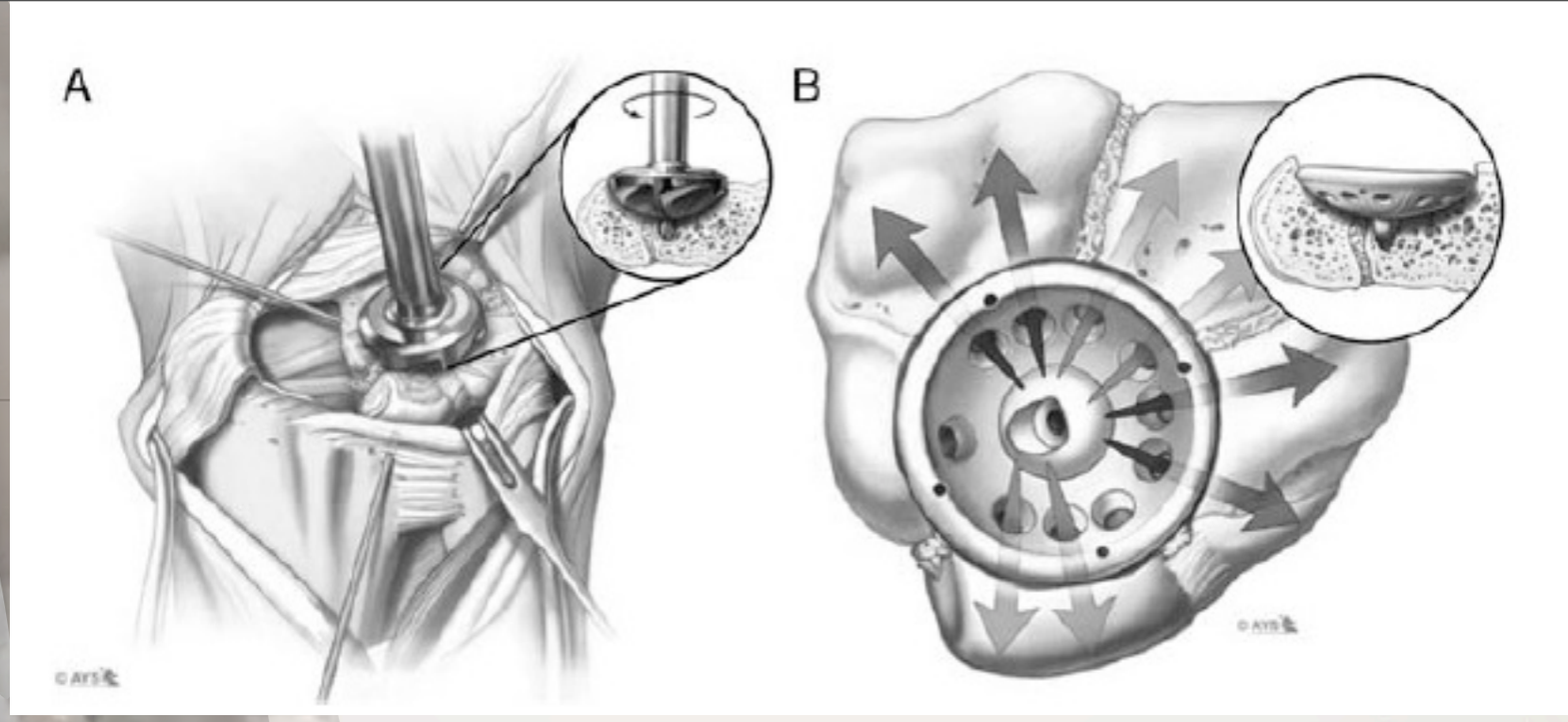
ARTHRODESE

- Repérage de la position de la plaque
- Utilisation du fantome
- Broche de centrage



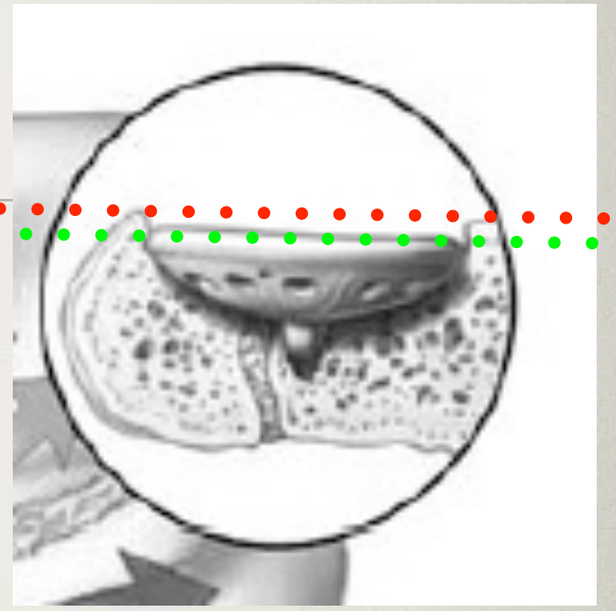
ARTHRODESE

- Fraisage
- Prudent
- Par étapes successives
- Débourrage de la fraise
- Suffisant pour «enfouir» la cupule



Four-corner arthrodesis with a locking, dorsal circular polyether-ether-ketone (PEEK-Optima) plate.
Rhee C.R.; Kakar S.; Shin A.Y. Tech Hand Surg 2012; 16:236-241

ARTHRODESE



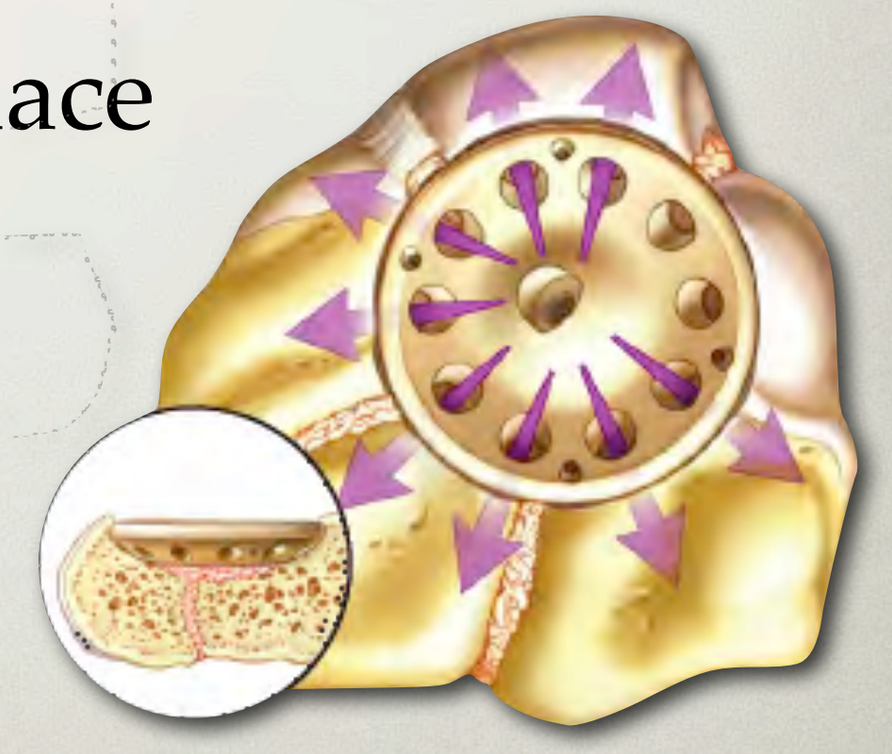
- Mise en place de la cupule
- Doit être «sous le niveau du cartilage»
- Risque de conflit avec le radius, les tendons extenseurs
- Mise en place de la greffe puis de la cupule

ARTHRODESE

- Positionnement de la cupule
- 1 ou 2 vis par os
- Privilégier le Lunatum & le Capitatum +++
- Broches temporaires
- Perçage, mesure, vissage

ARTHRODESE

- Vissage prudent, asymétrique
- Cupule maintenue en place
- Contrôle radioscopique
- vis 12 à 18 mm



ARTHRODESE

- Ablation des broches temporaires
- Lavage
- Mobilité passive
- Contrôle radioscopique

ARTHRODESE

ARTHRODESE

- Ablation des broches temporaires
- Lavage
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ARTHRODESE

- Ablation des broches temporaires
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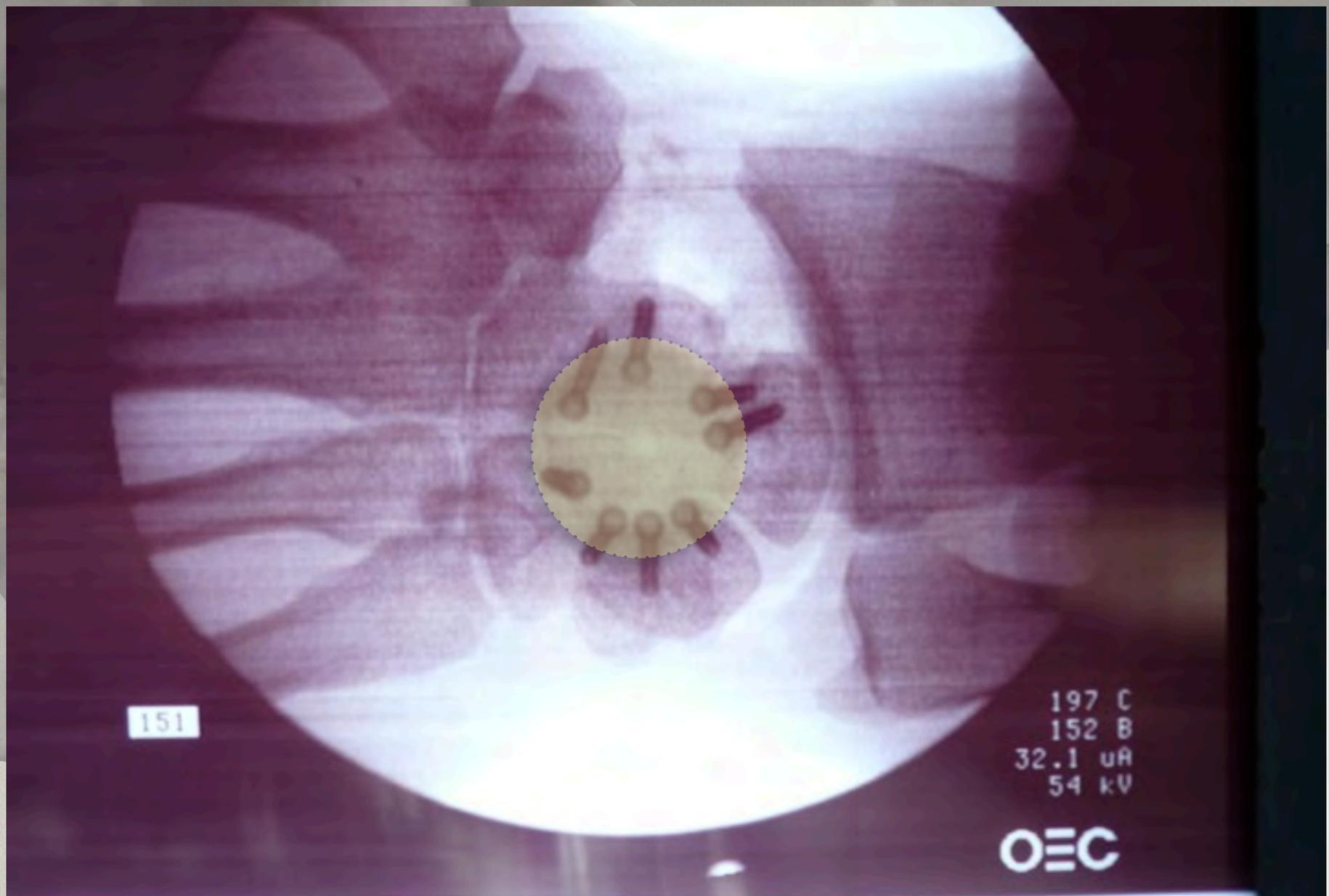
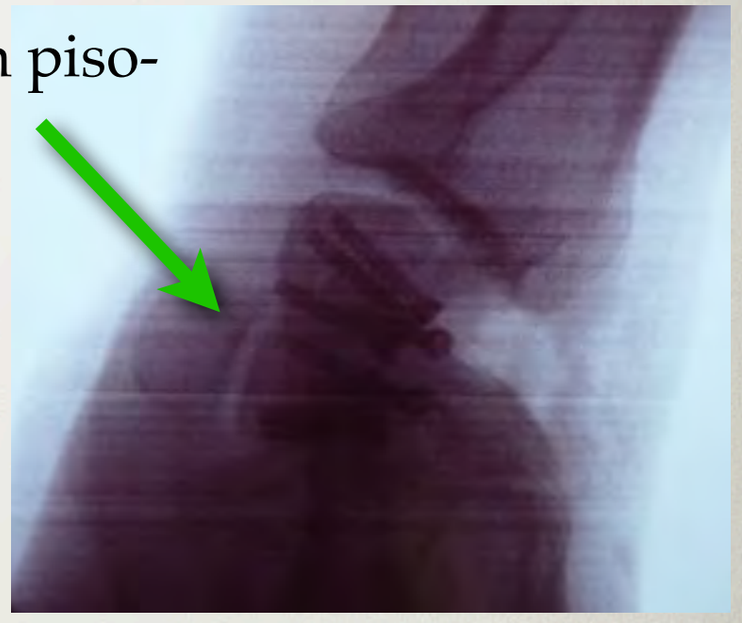

151
197 C
152 B
32.1 uA
54 kV
OEC

17:34:00
153
214 C
145 B
32.1 uA
53 kV
OEC

ARTHRODESE

Pas de protrusion piso-triquétrale



- VERIFIER :
  - Absence de conflit dorsal
  - Longueur des vis
  - Absence de conflit articulaire

SUITES

- Suture capsulaire
- Sans brider l'articulation radio-carpienne
- Suture retinaculum dorsal
- Redon aspiratif
- Attelle palmaire puis orthèse sur-mesure

SUITES

- Immobilisation stricte ≥ 3 semaines
- Soins, manœuvre de Moberg
- Puis auto-mobilisation douce
- Rééducation entre S3 et S6
- Suivi clinique / radiographique +++

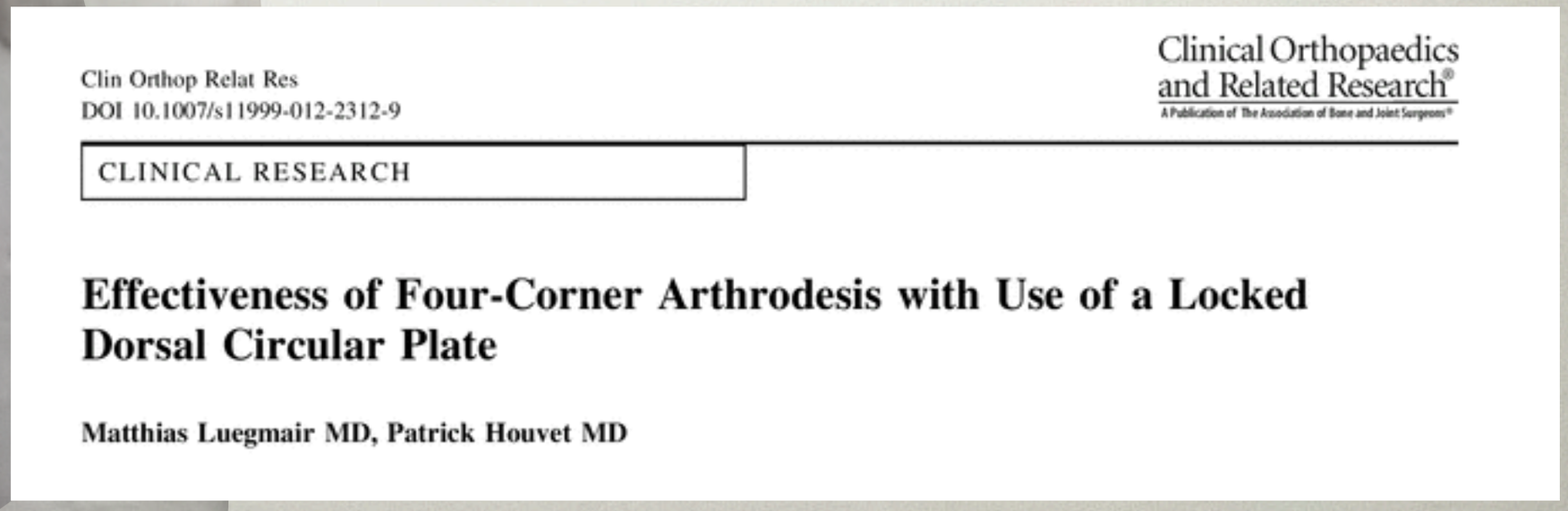
RESULTATS

- Arthrodèse des 4 os : SLAC procedure
- Gold standard
- Recul > 25 ans
- Techniques variées
- Résultats variés...

RESULTATS

- Etudes rares sur les cupules
- 2008 - GEM - Paris - P. HOUVET
- Suivi rétrospectif
- 41 patients

- Effectiveness of Four-Corner Arthrodesis with Use of a Locked Dorsal Circular Plate
  Luegmair M., Houvet P.; Clin Orthop Rel Res; 2012, 470, 10, 2764-2770.



Clin Orthop Relat Res
DOI 10.1007/s11999-012-2312-9

Clinical Orthopaedics and Related Research®
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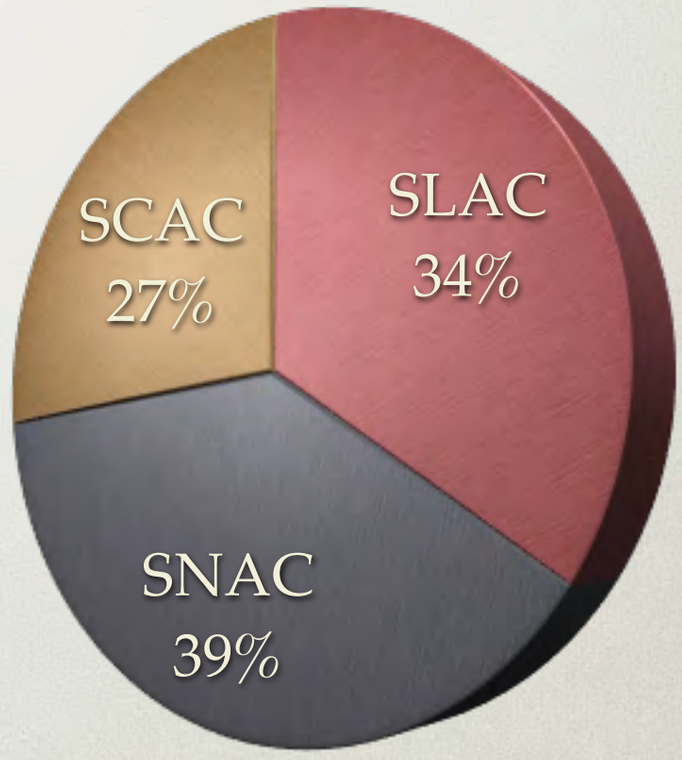
CLINICAL RESEARCH

Effectiveness of Four-Corner Arthrodesis with Use of a Locked Dorsal Circular Plate

Matthias Luegmair MD, Patrick Houvet MD

Etude

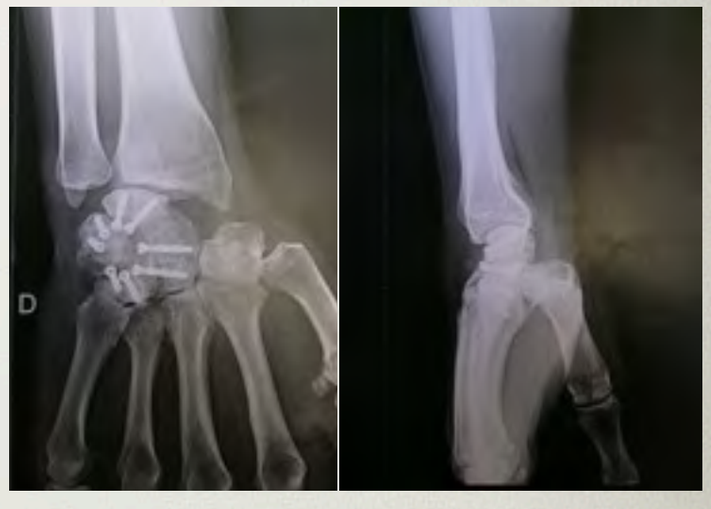
- 41 patients, série rétrospective de 2003 à 2005
- 13 F / 28 H
- 51,7 ans d'âge moyen
- 14 SLAC wrist
- 16 SNAC wrist
- 11 SCAC wrist



Etude

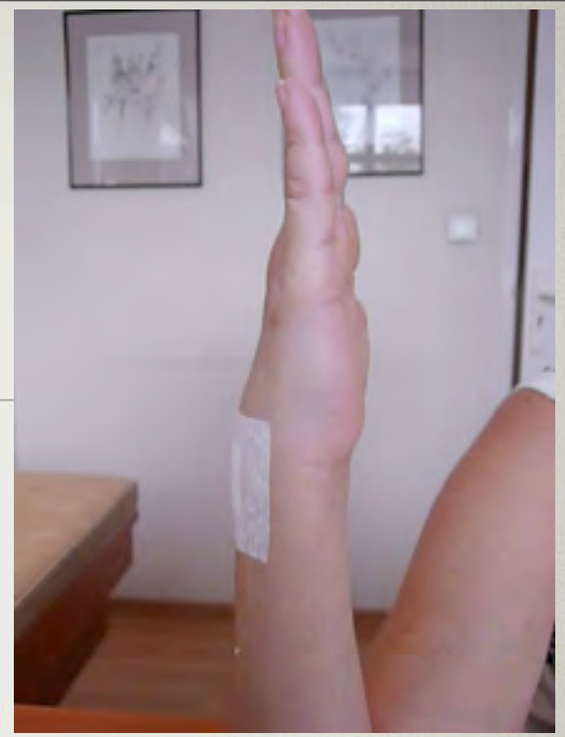
- Origine de l'arthrose :
  - 27 traumatiques
  - 10 rhumatismales
  - 5 indéterminées

Etude



- Scaphoïdectomie
- Arthrodèse des 4 os
- Greffe osseuse
- Cupule XPode
- Recul : 30,1 mois

Etude



J30

- F / E : 35,6° / 34,5°
- IR / IU : 20,5° / 17,9°
- Force : 71 % / côté sain (45 % préop)
- Diminution des douleurs
- 39 / 41 consolidés en 6,2 mois en moy.
- 2 pseudarthrodèses => reprise + greffe

J90

Full length article

JHS(E)

The rate of successful four-corner arthrodesis with a locking, dorsal circular polyether-ether-ketone (PEEK-Optima) plate

The Journal of Hand Surgery
(European Volume)
38E(7) 767–773

DOI: 10.1177/1753193413475962
jhs.sagepub.com
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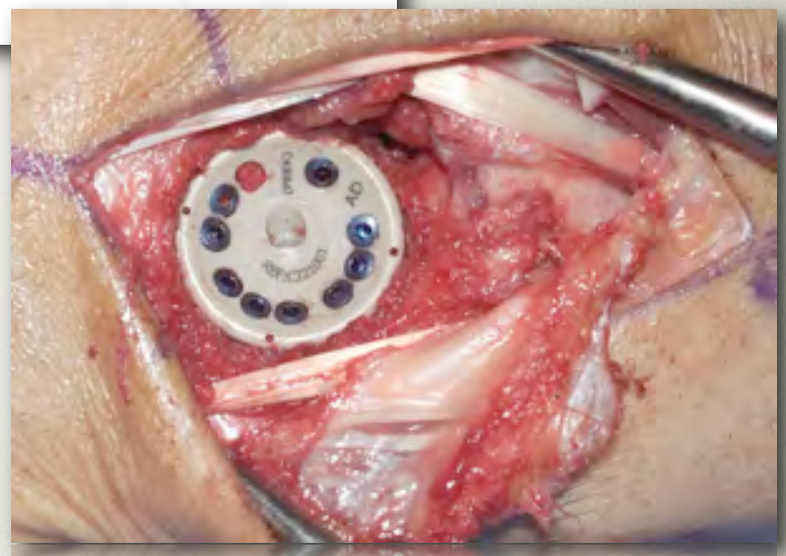
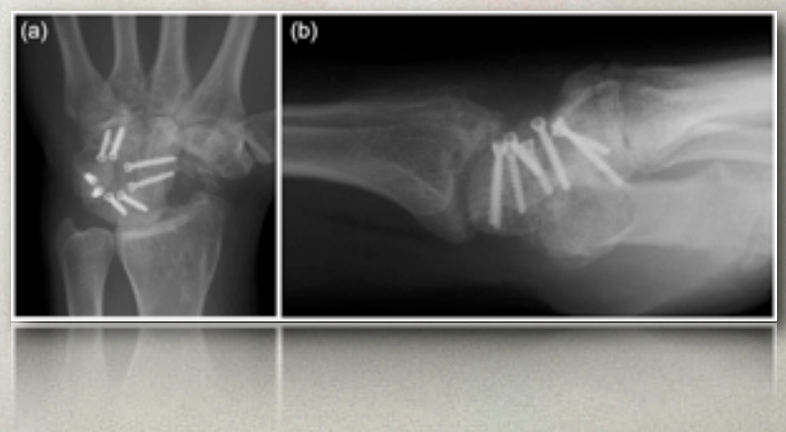
P. C. Rhee and A. Y. Shin
Department of Orthopedic Surgery, Division of Hand and Microvascular Surgery, Mayo Clinic, Rochester, MN, USA



- Evaluation du taux de consolidation
- 26 poignets opérés, 23 suivis (16 mois en moyenne)
- 22/23 consolidation en 3 mois (1-12) => **96 %**
- Une pseudarthrodèse partielle => reprise => consolidation
- Bonne évaluation de la fusion (matériau radio-transparent)



CAS CLINIQUE

- Patiente de 54 ans, droitière, vigneronne
- Poignet SLAC 3 confirmé par arthroscopie
- Douleurs, perte de force, mobilités conservées

CAS CLINIQUE

M2

M3

M18

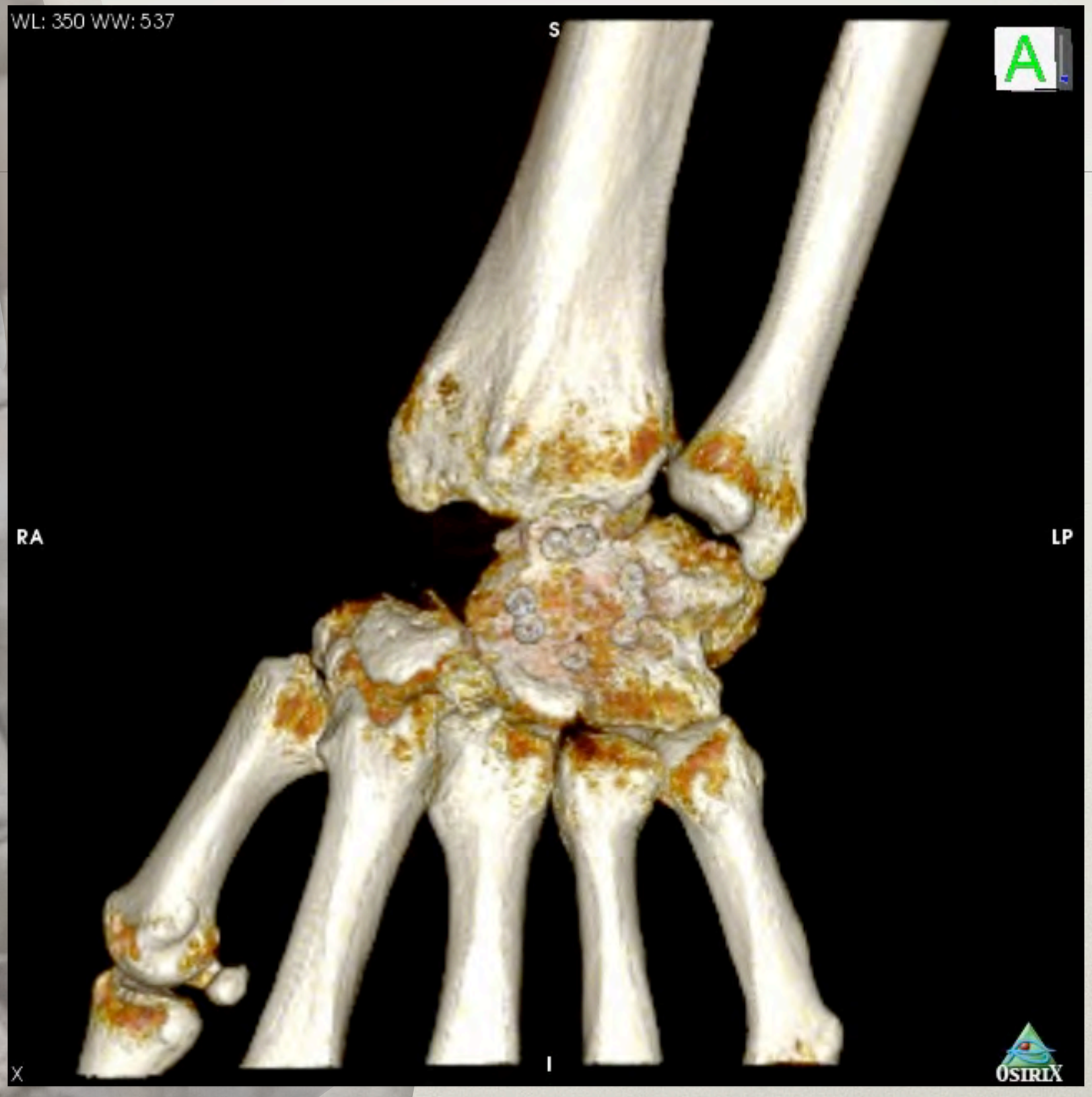
M30

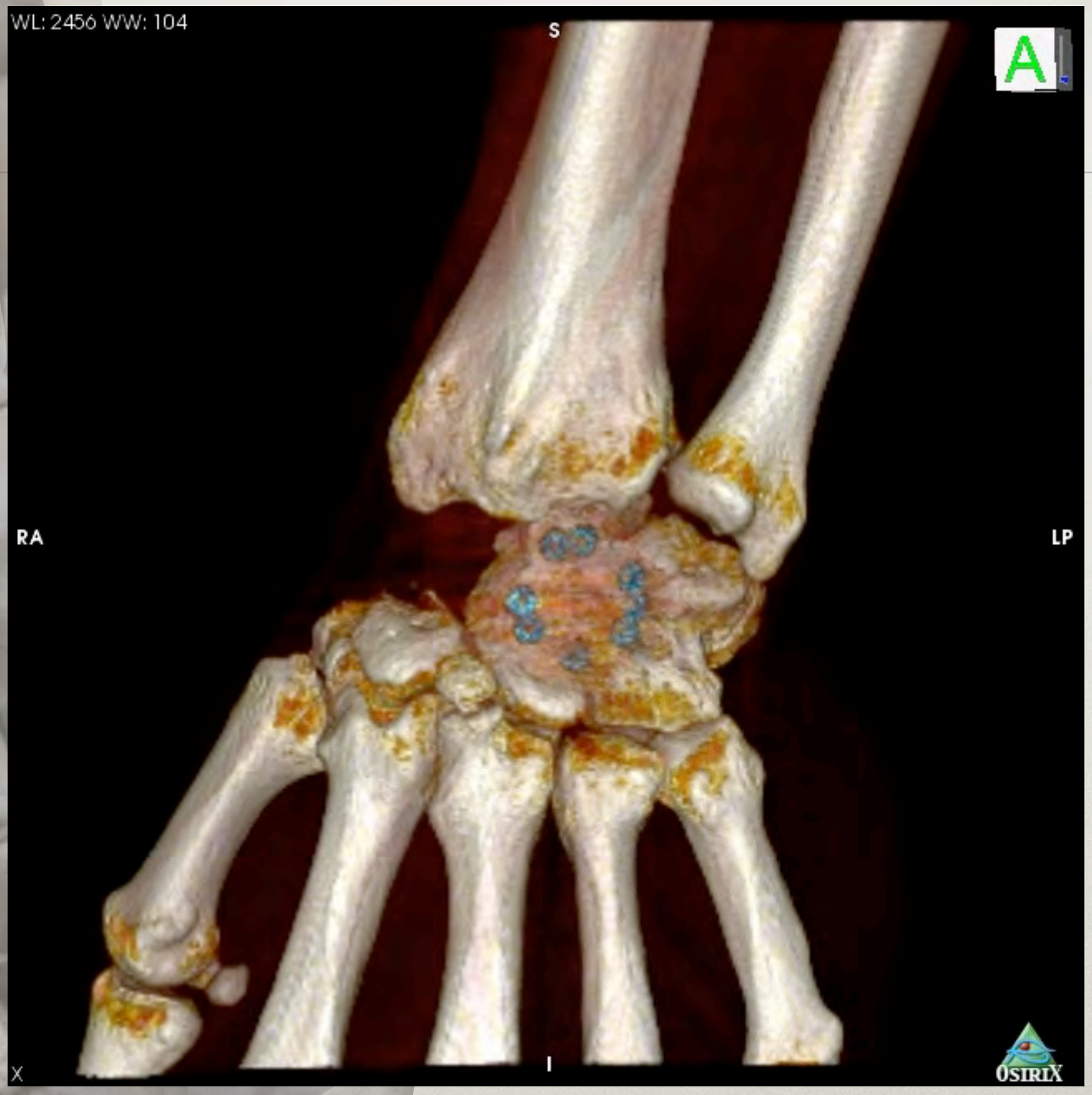
CAS CLINIQUE

- A 3 ans de recul :
- aucune douleur
- 50/50/15/25/90/90
- Jamar : 24 Kg D / 32 Kg G (75 %)
- Gênée pour le sport, jardinage
- Satisfaite +++

CAS CLINIQUE


WL: 637 WW: 2962
S
A
RA
LP
X
I
OsiriX


WL: 350 WW: 537
S
A
RA
LP
X
I
OSIRIX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S
A
RA
LP
X
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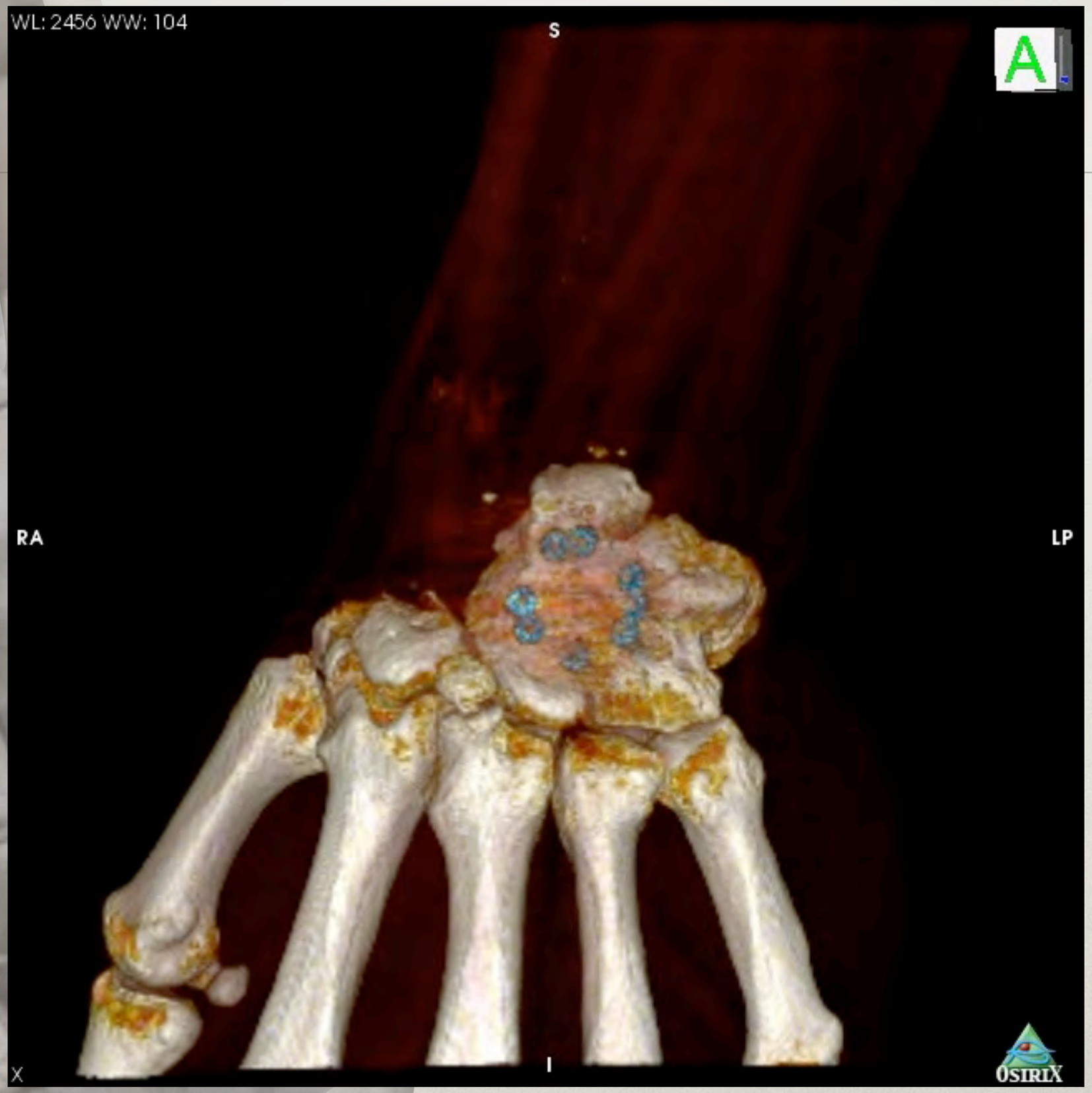
OSIRIX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S
A
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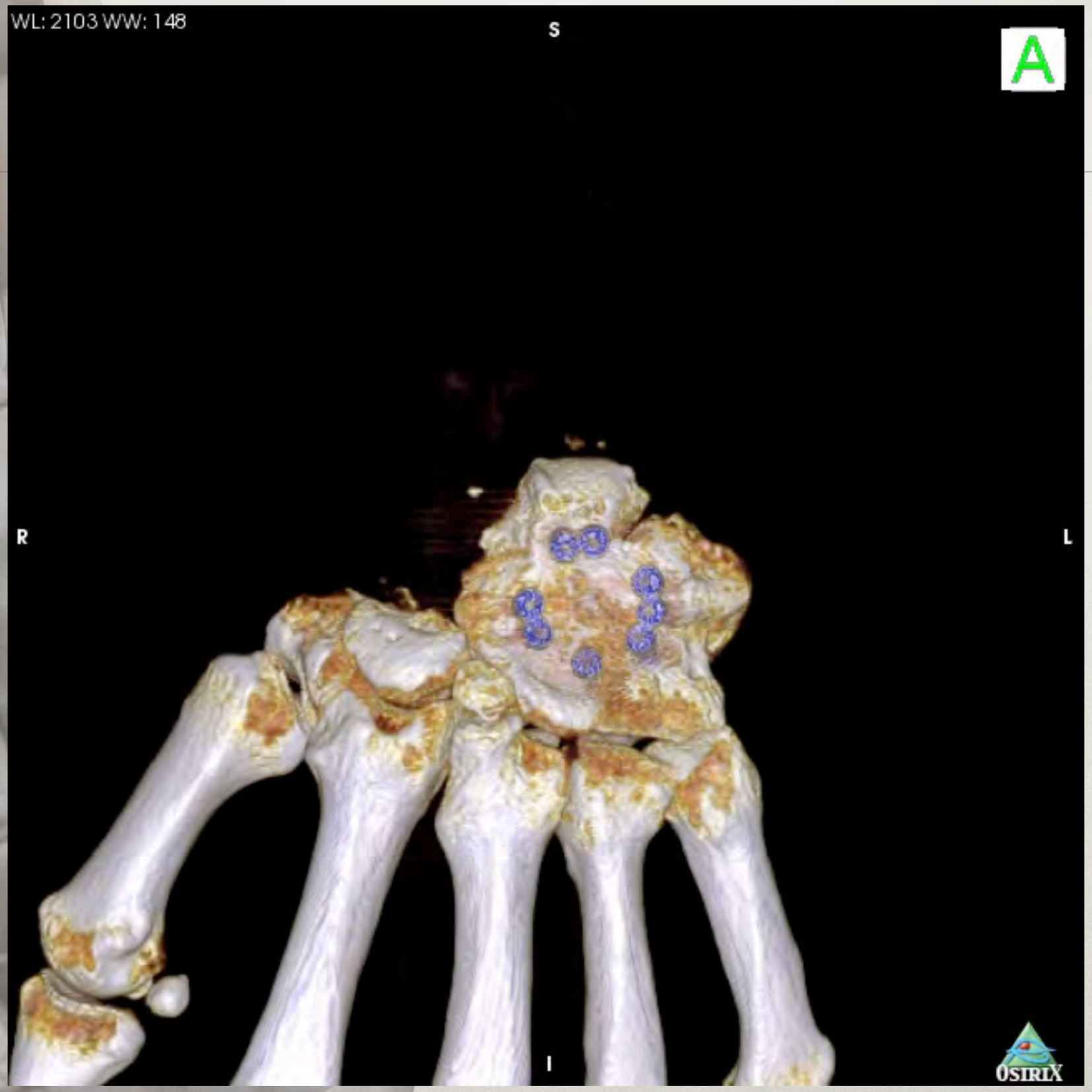
OSIRIX


WL: 2103 WW: 148
S
A
R
L
I
OSIRIX

CONCLUSION

- ALTERNATIVE FIABLE A L'ARTHRODESE GLOBALE
- MOBILITES ET FORCE COMPARABLES / AUTRES TECHNIQUES
- EVITER LE CONFLIT DORSAL
- TAUX DE PSEUDARTHRODESE < 4 %
- VISUALISATION RADIOLOGIQUE DE LA FUSION

CONCLUSION

- RESPECT DES REGLES DE L'ARTHRODESE
- QUALITE DE LA FIXATION PRIMAIRE
- DIMINUTION DE LA PERIODE D'IMMOBILISATION ?
- SYSTEME MOINS INVASIF ?

MERCI POUR VOTRE ATTENTION