Vascularized Bone Graft for scaphoid nonunion

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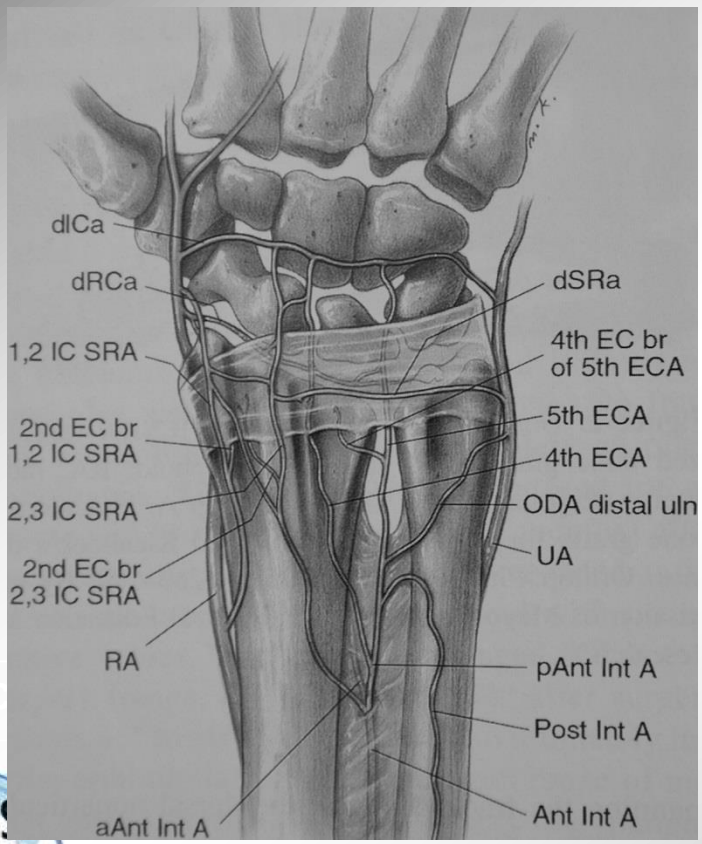
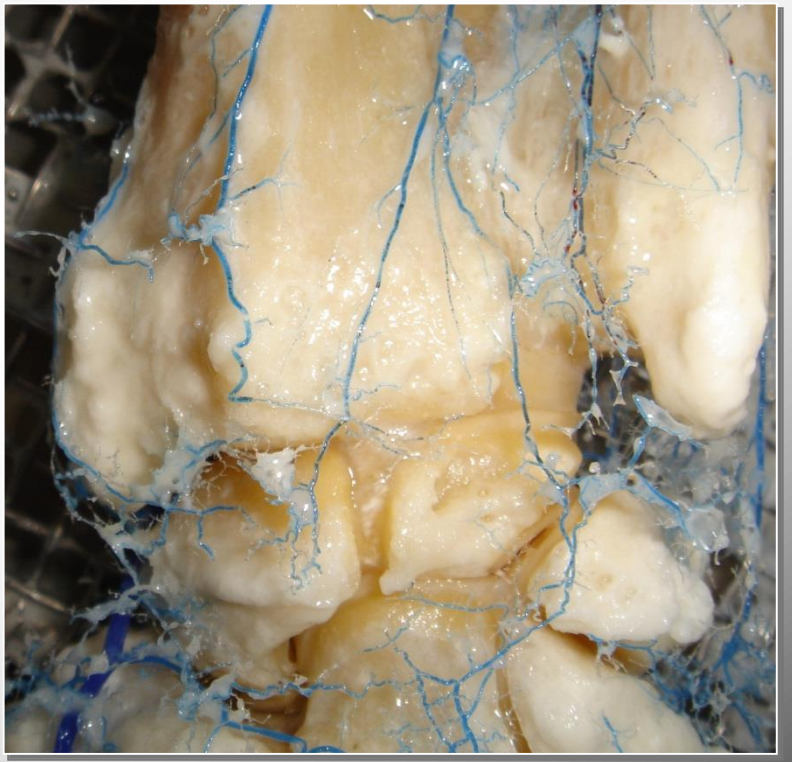
VASCULARIZED BONE GRAFT

•DORSAL
SHEETZ, BISHOP, BERGER (MAYO CLINIC)
1995-2002





•T. Balaguer, M. Verga, E. Lebreton

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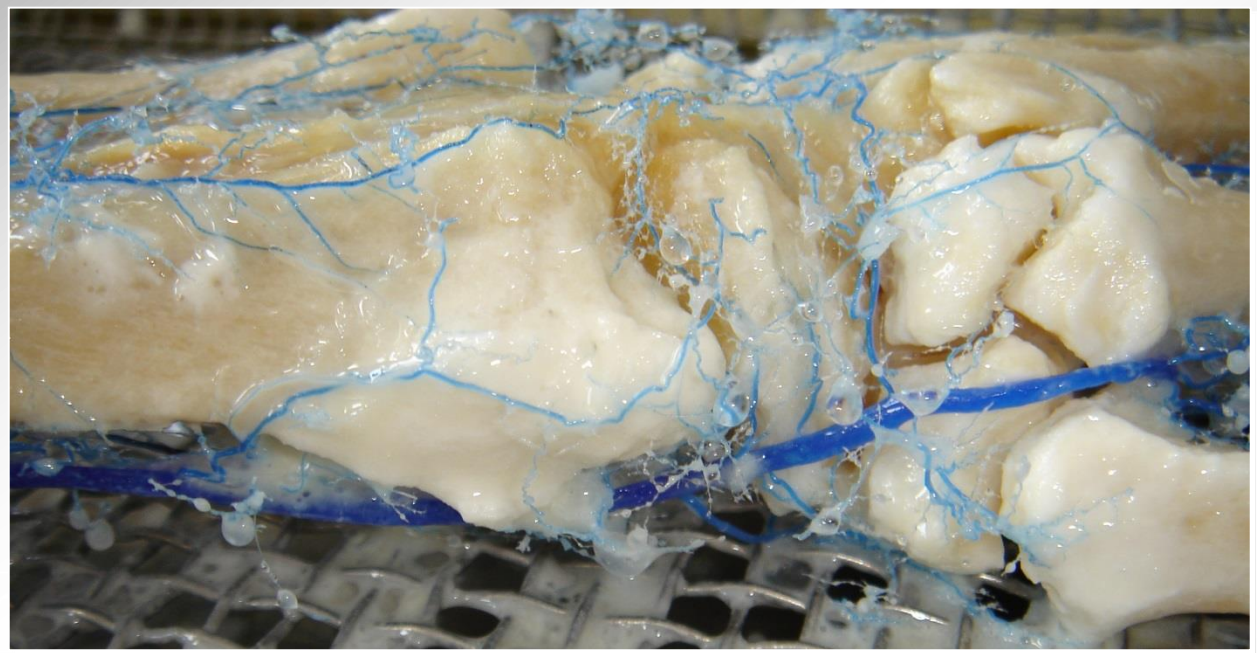
VASCULARIZED BONE GRAFT

- **LATERAL**
  ZAIDEMBERG
  1991



- Conclusion

HISTORY, ANATOMY

VOLAR CARPAL ARTERY

Robert Judet (1964-65)
Mencke (1970)
Braun (1987) Kulhman (1987)
Kawai (1988)

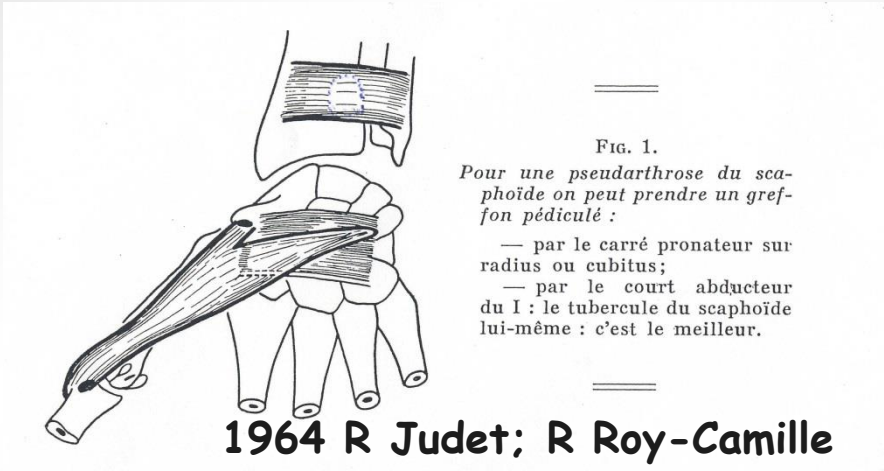


FIG. 1.

Pour une pseudarthrose du scaphoïde on peut prendre un greffon pédiculé :

— par le carré pronateur sur radius ou cubitus;
— par le court abducteur du I : le tubercule du scaphoïde lui-même : c'est le meilleur.

1964 R Judet; R Roy-Camille

Anatomical background and technical description

Mathoulin , Haerle (1995)

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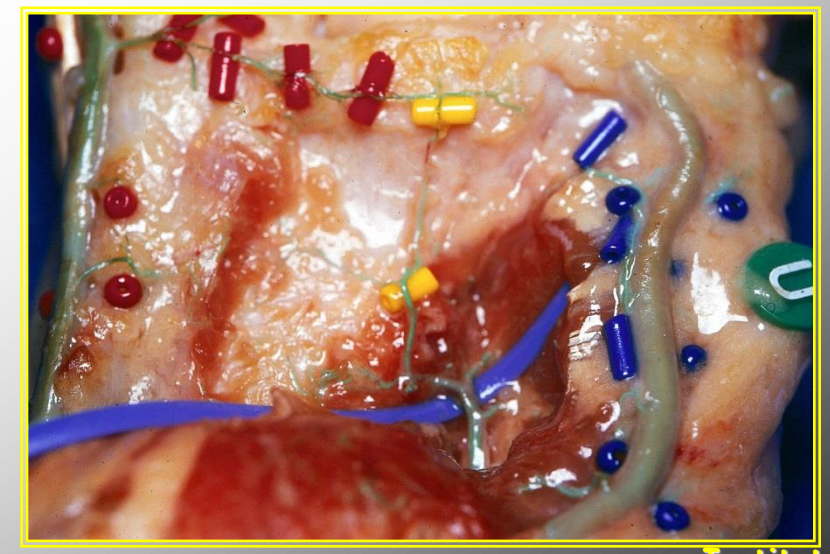
HISTORY, ANATOMY

Volar carpal artery arises from the radial artery and runs along the volar aspect of the radius

It branches on the palmar side of DRUJ forming anastomoses with a branch of interosseus artery and a branch of ulnar artery



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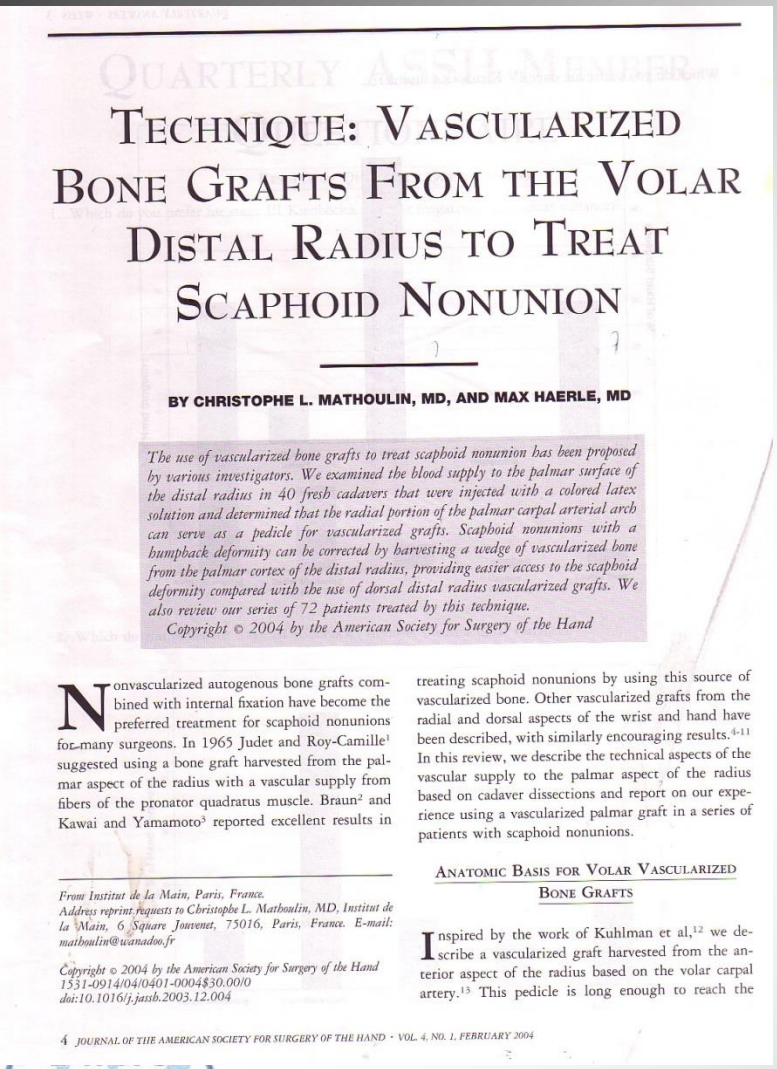
Technique

- **Local-regional anaesthesia**
- **Tourniquet**
- **Outpatient surgery**
- **Palmar approach**



TECHNIQUE: VASCULARIZED BONE GRAFTS FROM THE VOLAR DISTAL RADIUS TO TREAT SCAPHOID NONUNION

BY CHRISTOPHE L. MATHOULIN, MD, AND MAX HAERLE, MD

The use of vascularized bone grafts to treat scaphoid nonunion has been proposed by various investigators. We examined the blood supply to the palmar surface of the distal radius in 40 fresh cadavers that were injected with a colored latex solution and determined that the radial portion of the palmar carpal arterial arch can serve as a pedicle for vascularized grafts. Scaphoid nonunions with a humpback deformity can be corrected by harvesting a wedge of vascularized bone from the palmar cortex of the distal radius, providing easier access to the scaphoid deformity compared with the use of dorsal distal radius vascularized grafts. We also review our series of 72 patients treated by this technique.

Nonvascularized autogenous bone grafts combined with internal fixation have become the preferred treatment for scaphoid nonunions for many surgeons. In 1965 Judet and Roy-Camille[1] suggested using a bone graft harvested from the palmar aspect of the radius with a vascular supply from fibers of the pronator quadratus muscle. Braun[2] and Kawai and Yamamoto[3] reported excellent results in treating scaphoid nonunions by using this source of vascularized bone. Other vascularized grafts from the radial and dorsal aspects of the wrist and hand have been described, with similarly encouraging results.[4-11] In this review, we describe the technical aspects of the vascular supply to the palmar aspect of the radius based on cadaver dissections and report on our experience using a vascularized palmar graft in a series of patients with scaphoid nonunions.

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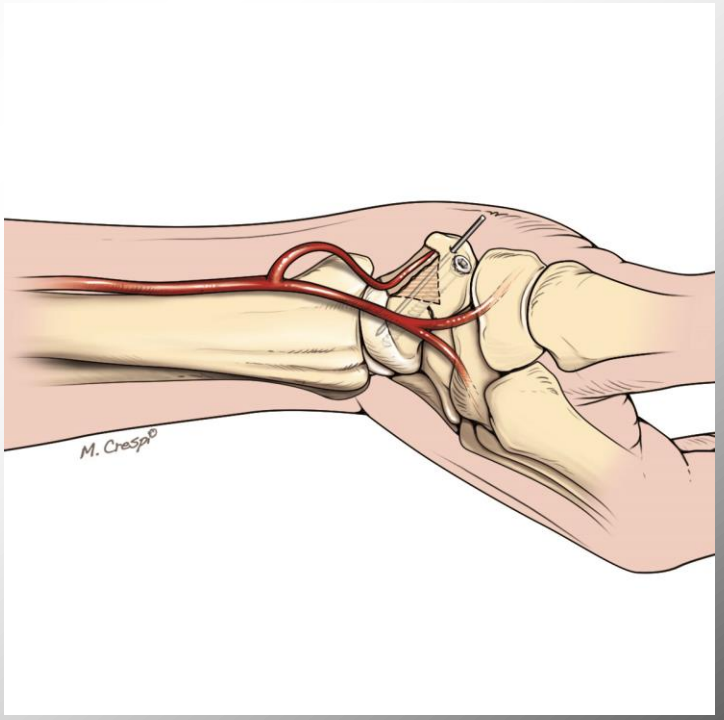
ANATOMIC BASIS FOR VOLAR VASCULARIZED BONE GRAFTS

Inspired by the work of Kuhlman et al,[12] we describe a vascularized graft harvested from the anterior aspect of the radius based on the volar carpal artery.[13] This pedicle is long enough to reach the



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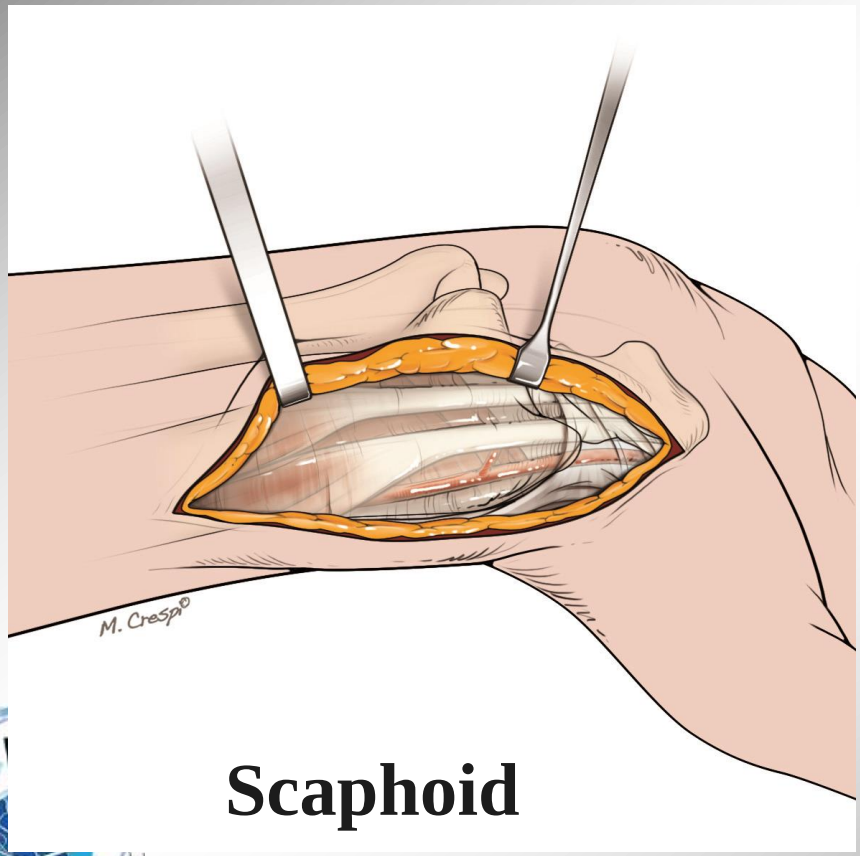
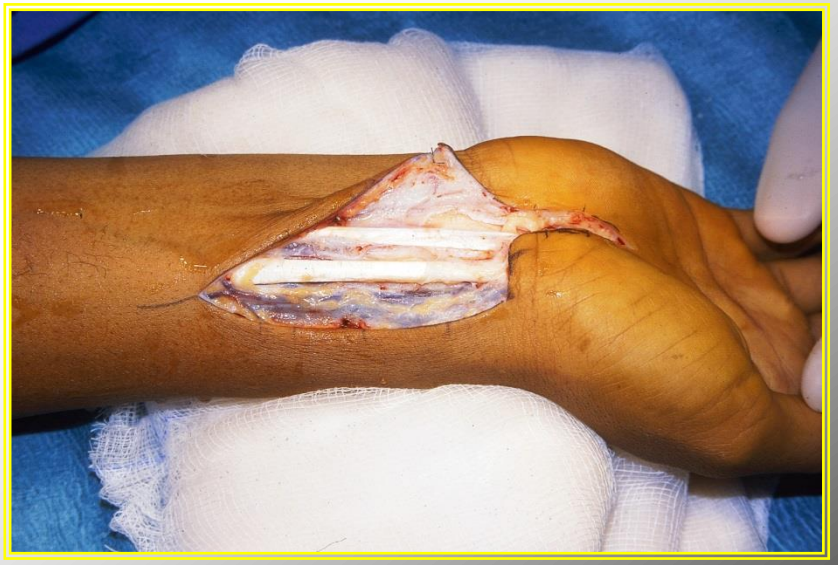
Technique

- **First spotting of F.C.R. and radial artery**



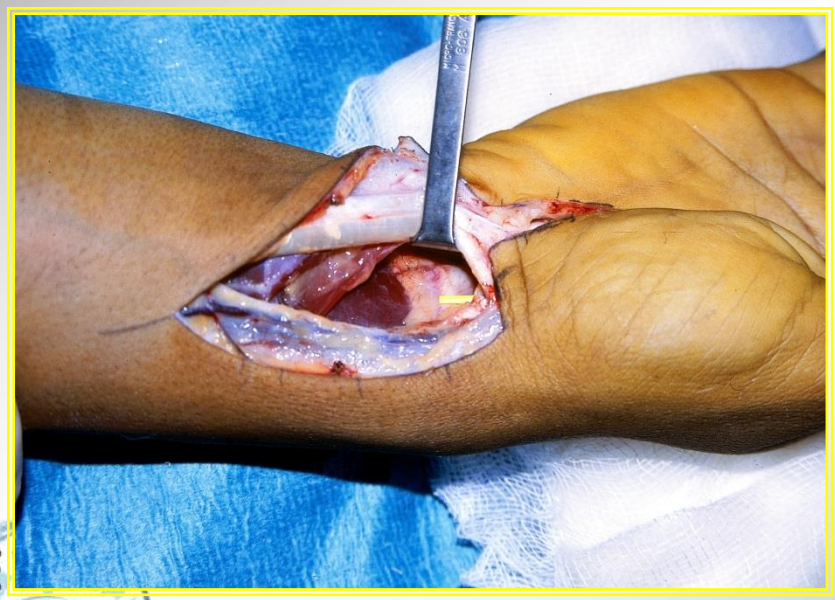
Scaphoid



Kienböck

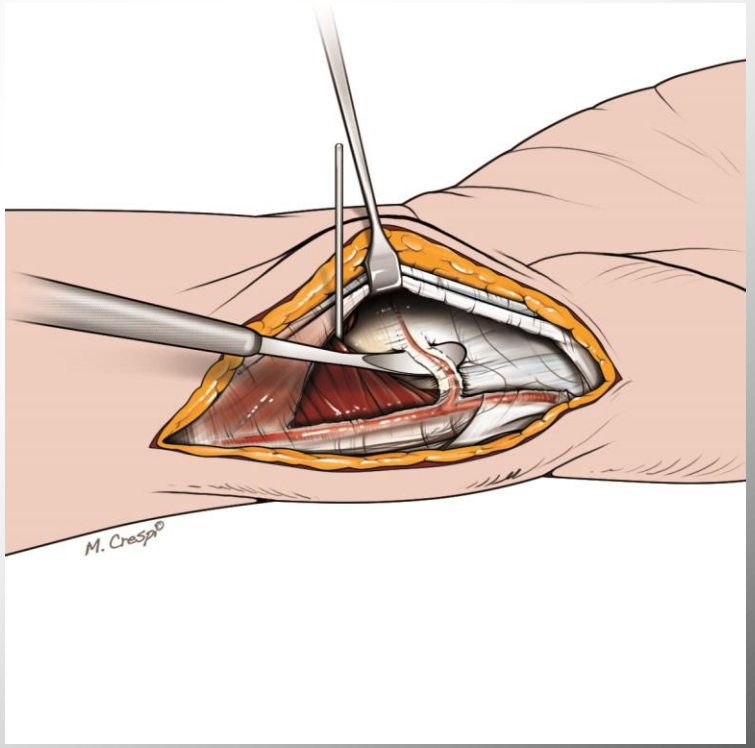
Technique

- Flexing the wrist to release tension of FCR and FPL
- Palmar carpal artery in front of and along the edge of Pronator Quadratus
- Dissection of superficial aponeurosis of PQ until periosteum



Technique

- **Temporary proximal retraction of PQ**
- **Lateral half of pedicle subperiosteally dissected**



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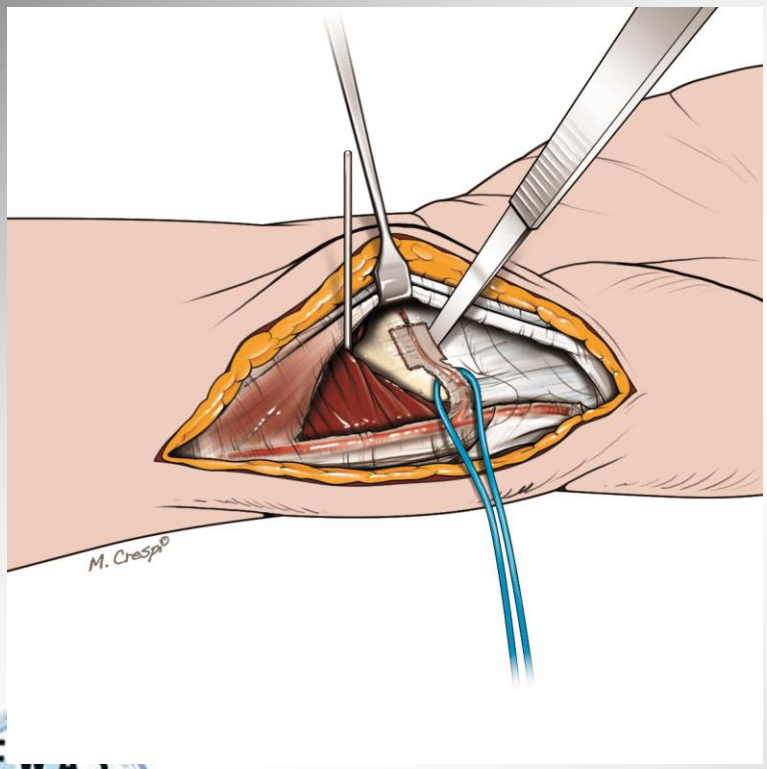
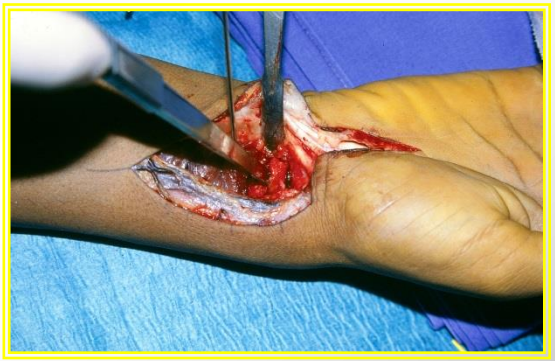
Technique

- **Harvesting of graft with an osteotome**
- **Medial half of pedicle attached to the graft was not detached**





Technique

- Graft and pedicle were dissected back to the radial artery
- Then the tourniquet is released

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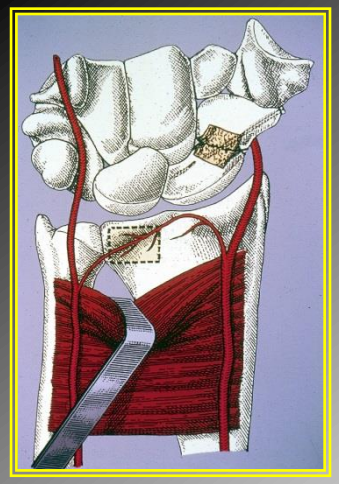

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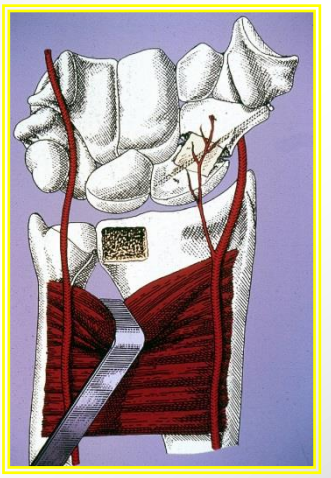
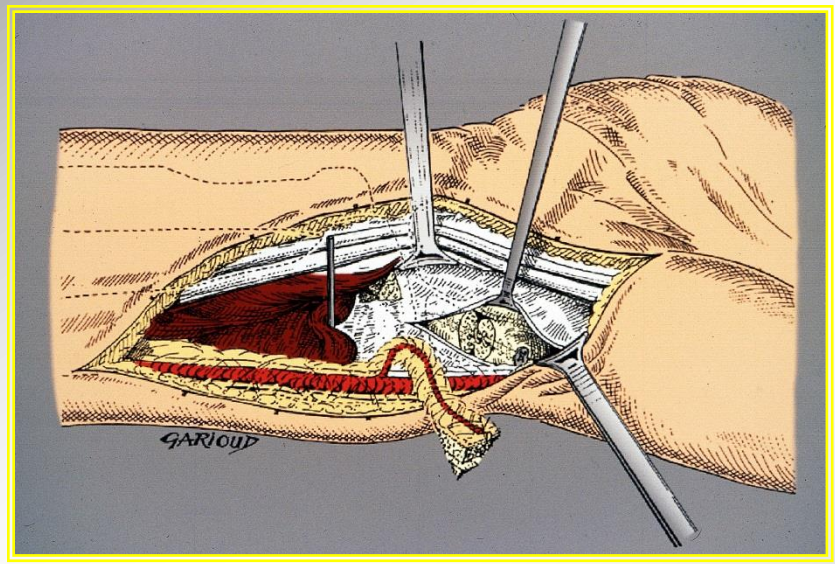
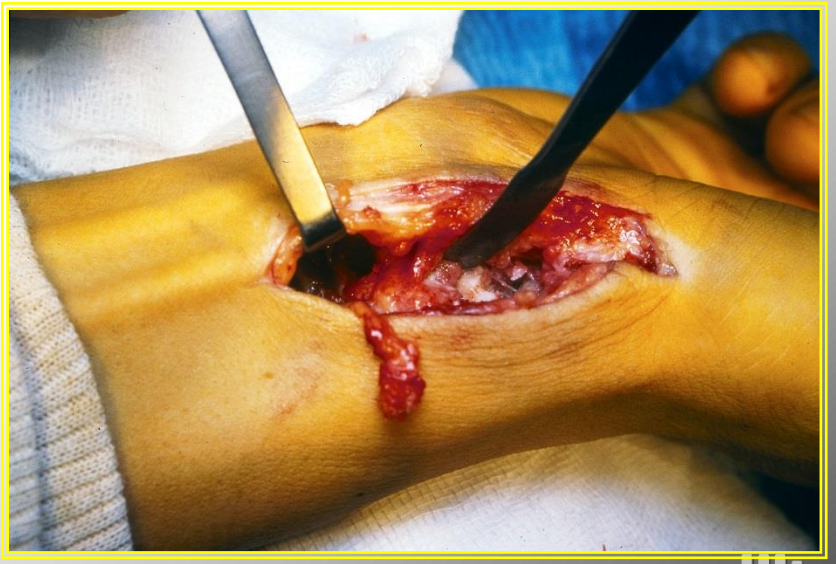


- Opening fracture site
- Freshening the bone ends
- Scaphoid osteosynthesis with screw





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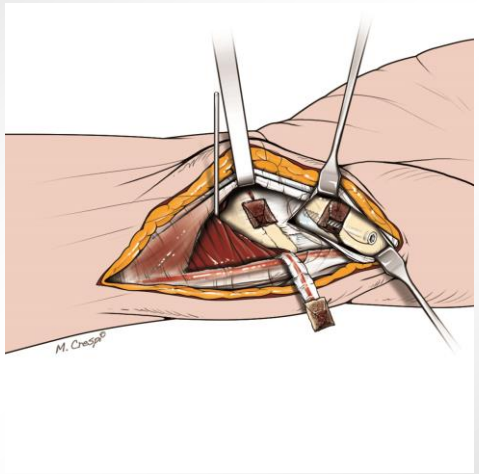
Technique



- Opening fracture site
- Freshening the bone ends
- Scaphoid osteosynthesis with screw

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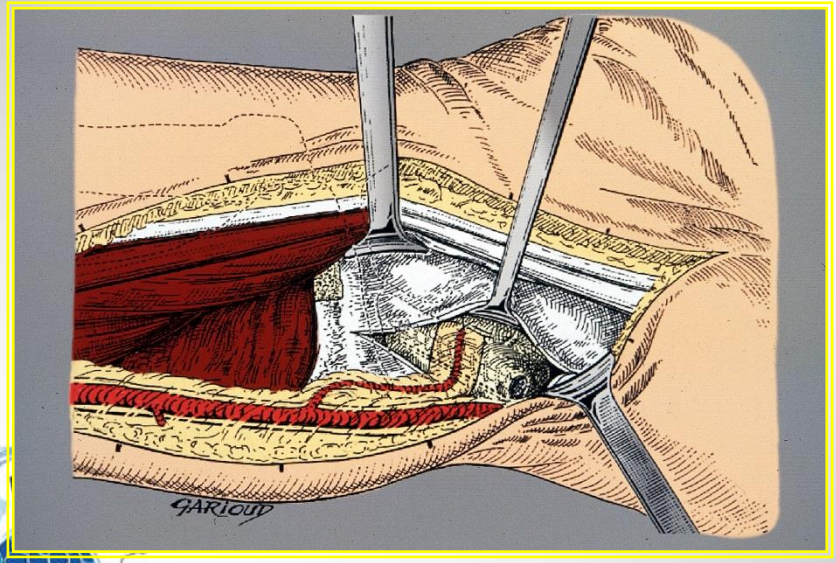
Technique

- Graft placed at the anterior site of bone loss
- Scaphoid osteosynthesis with screw
- Graft fixed by 10 mm K-wire parallel to screw



Technique

- Graft placed at the anterior site of bone loss
- Scaphoid osteosynthesis with screw
- Graft fixed by 10 mm K-wire parallel to screw

Technique

- **Pin removal at 3 weeks**
- **Below elbow plaster cast until union**

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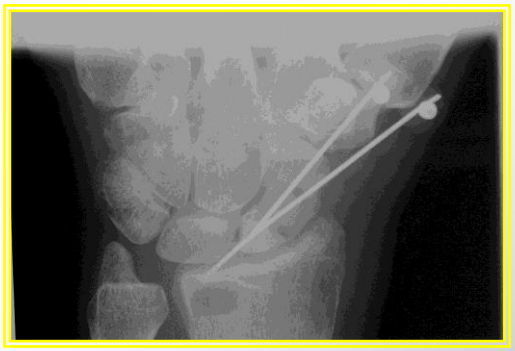
Material

103 patients

12 female – 91 male Previous surgery: 31 patients

- 39 left – 64 right : 67 dominant hands
- 51 manual workers – 52 sedentaries
- Mean Age : 30.6 y.o.(15-61)
- Average period before surgery : 23 months
- Average follow-up: 28.98 m (range 10 to 65)



8 years of follow-up

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Clinical case

Stage D3 (herbert)

Adaptative DISI

Man 42 y.o.
Scaphoid fracture 6m
Scaphoid nonunion
Disabling pain

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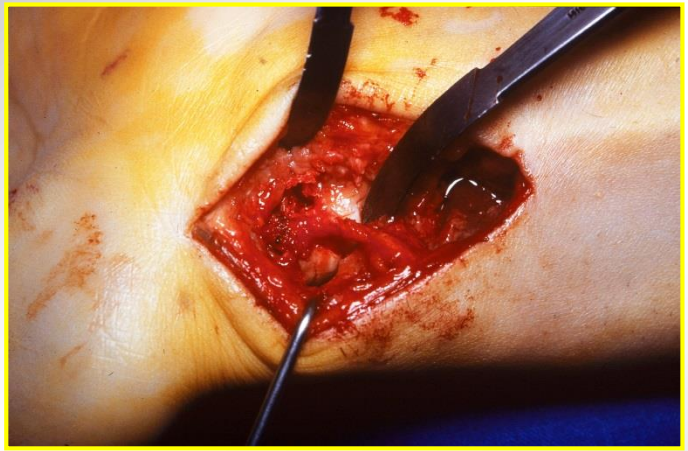
Clinical case



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Clinical case

D + 21

D + 45

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Clinical case

D + 6 months

No DISI

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Results

Time to union : 8.6 weeks (6-14 w)
Nonunion : 6

Range of motion

- **Increase in mean flexion : 45° ➡ 58°**
- **Increase in mean extension : 54° ➡ 67°**

Grip strength

- **52% ➡ 90% of controlateral wrist**

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Clinical case

Man 22 y.o.
Professional Rider
of motorcycle
Scaphoid fracture unknown
Scaphoid nonunion
Disabling pain

Stage D3 (Herbert)

Adaptative DISI

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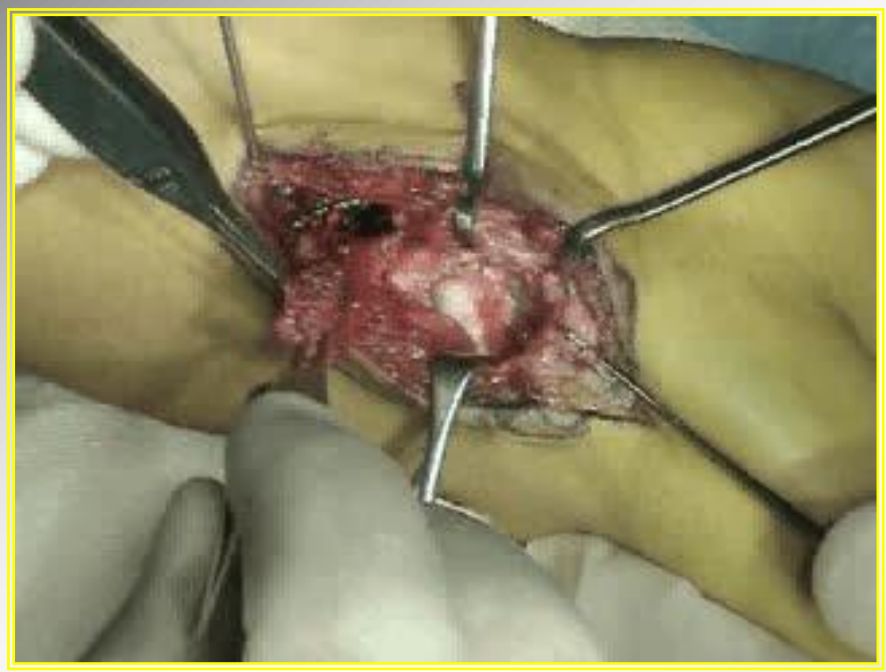
Clinical case



D + 60

D + 90

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CONCLUSION

94 % union in 7 weeks

97 % satisfied patients

89 % excellent or good results

Vascularized bone graft give good union in short delay, even in failure of previous surgery

Volar approach is enough simple to be recommanded as primary treatment of scaphoid nonunion

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