Vascularised bone grafts in wrist surgery

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Institut de la Main

VBGs in wrist surgery

- Roy-Camille and Judet (1965)
- Kuhlman (1987) described the volar vascularisation of the distal radius
- Zaidenberg (1991) then the Mayo team (1995) described the vascularisation of the dorsal radius
- Experimental works gave some justification to their use

Experimental works

- In a dog radius model
- VBGs preserve circulation
- VBGs preserve viable osteoclasts and osteoblasts that allows primary bone healing without creeping substitution

Experimental works

- Immediate blood flow was 51% of the circulation in the controlateral radius
- Hyperhemic response at 2 weeks doubles the flow (compare to controlateral wrist) and multiplies it by 54 compare to conventional grafts

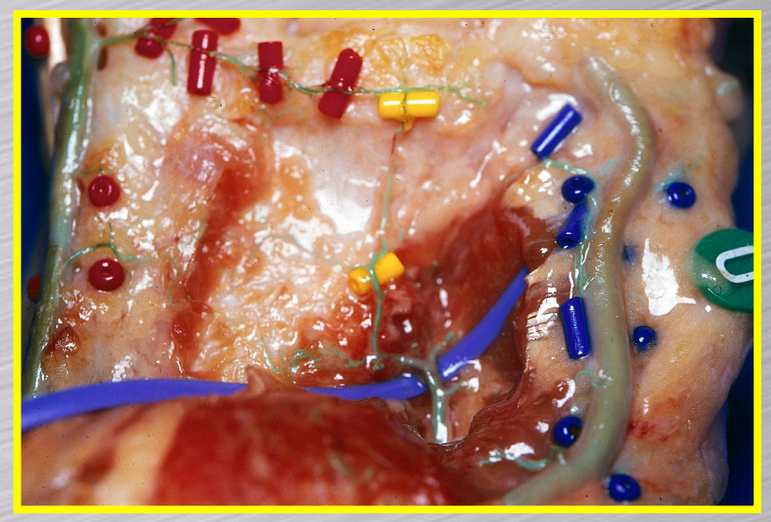
Experimental works

Intercalary graft

- Animal works have shown their superiority compare to conventional grafts

Zaidenberg's VBG

Anatomical works



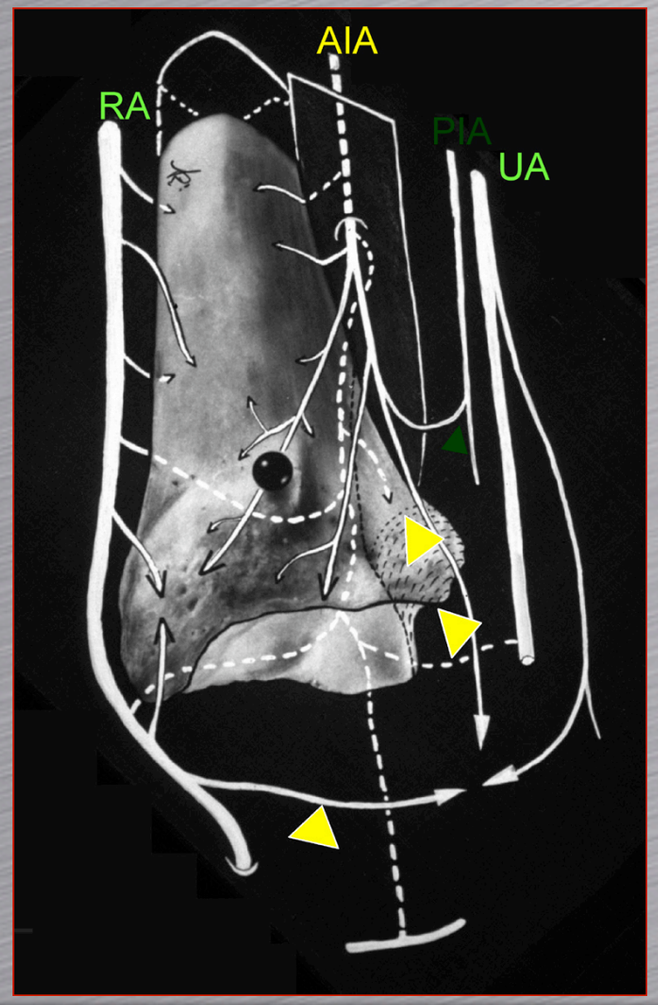
- Have shown that anatomy is quite constant
- Have shown that both cortical and cancellous bone were richly vascularised by those vessels

Anatomical works

- Have shown that anatomical landmarks make their dissection secure
- Have shown that it is possible to raise VBGs that can reach the carpal bones without undue tension

VBGs from the dorsal radius

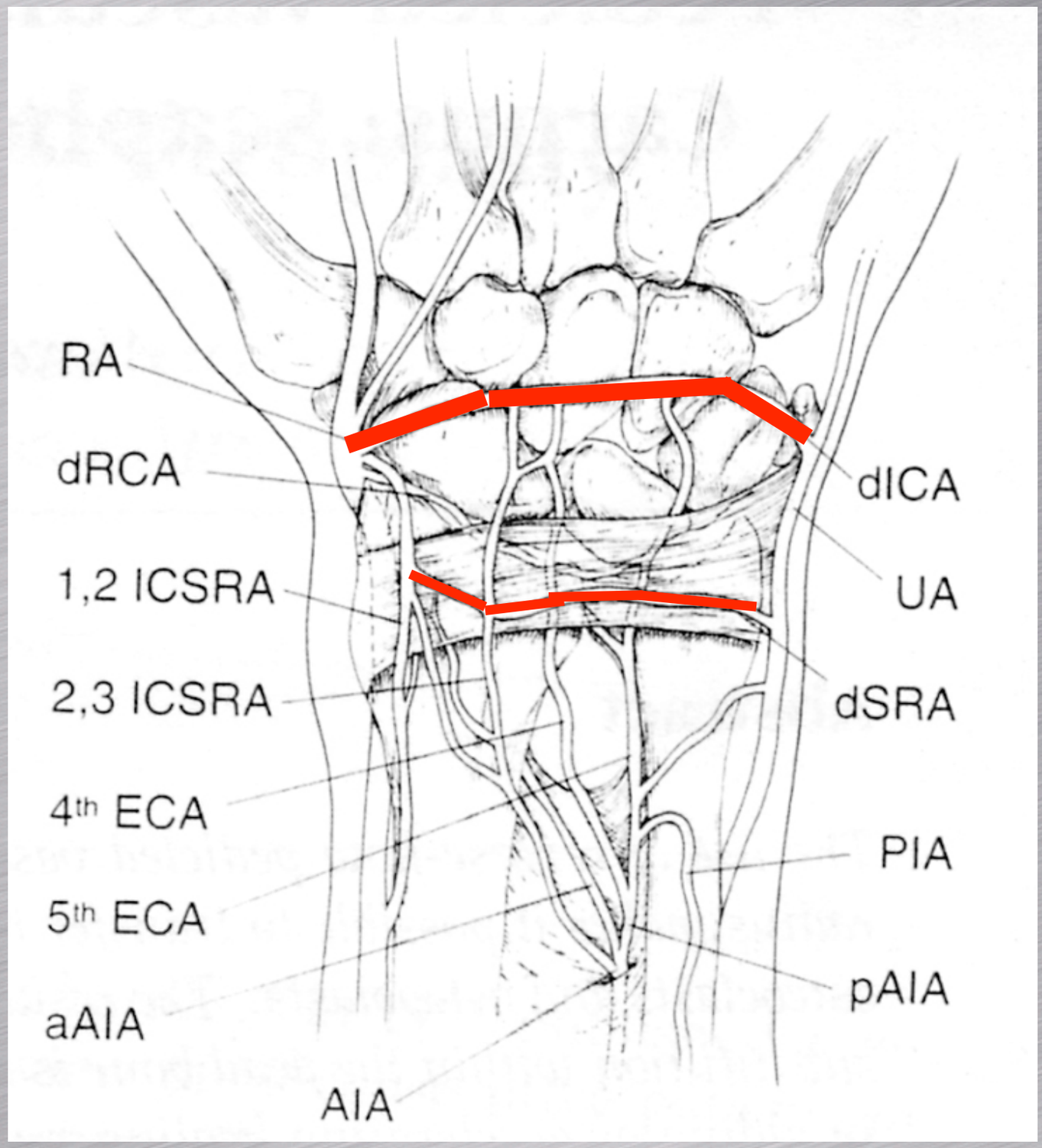
- Four vessels contribute to the vascularisation of the dorsal radius

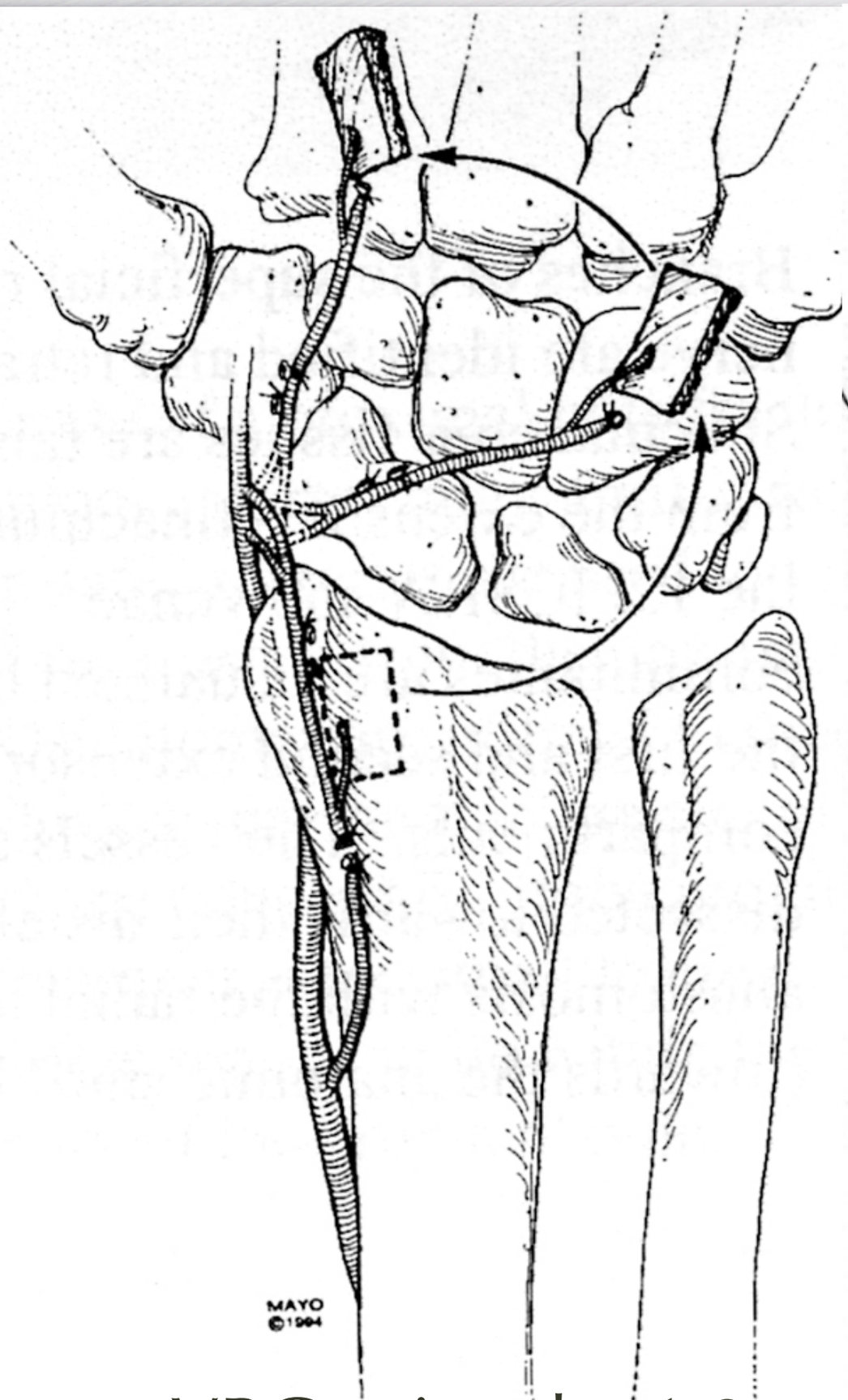


RA
dRCA
1,2 ICSRA
2,3 ICSRA
4th ECA
5th ECA
aAIA
AIA
dICA
UA
dSRA
PIA
pAIA

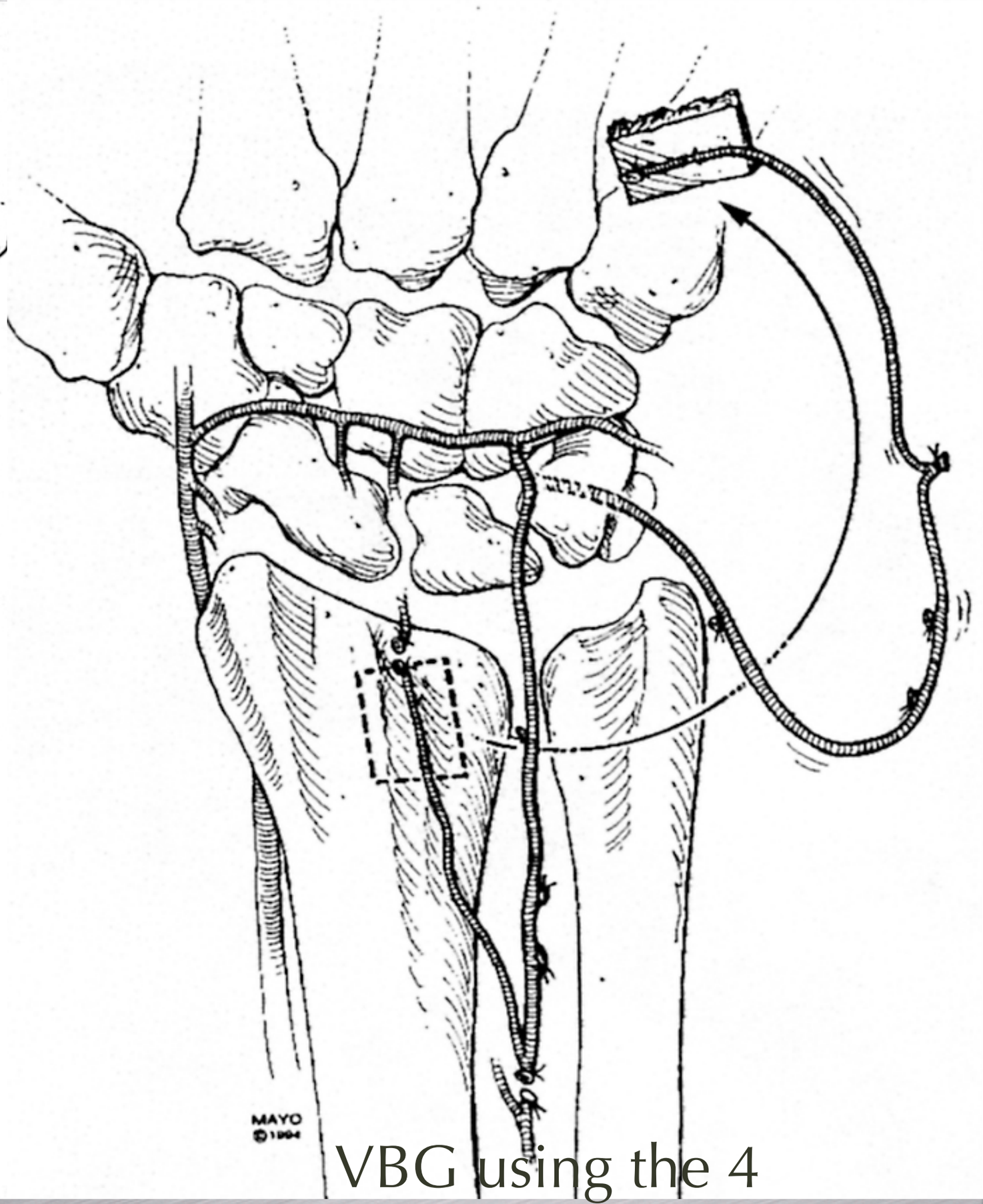
VBGs from the dorsal radius

- Multiple anastomoses allow mobilization of multiple VBGs





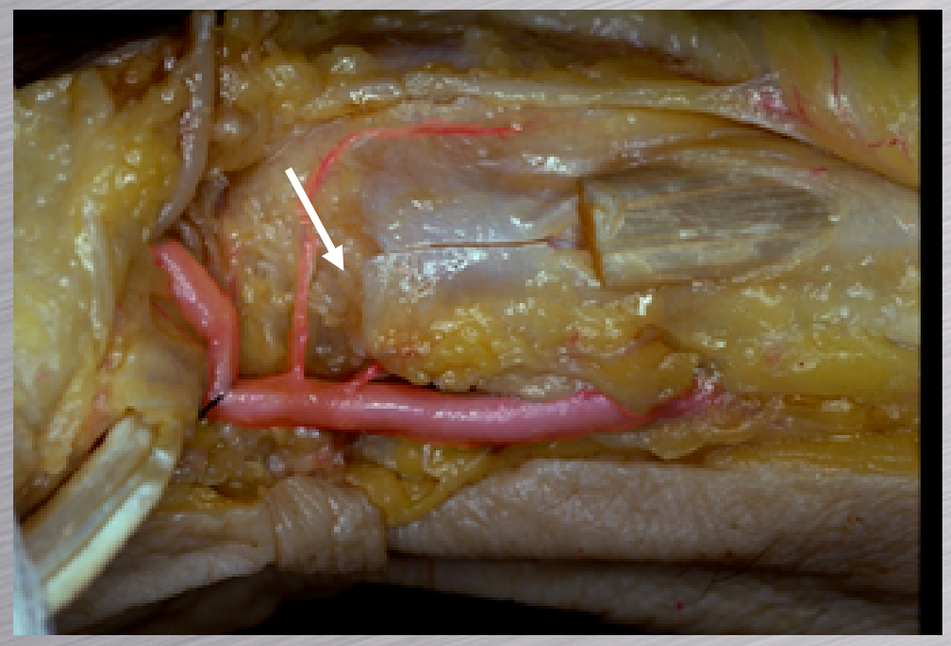
VBG using the 1,2 supraretinacular artery

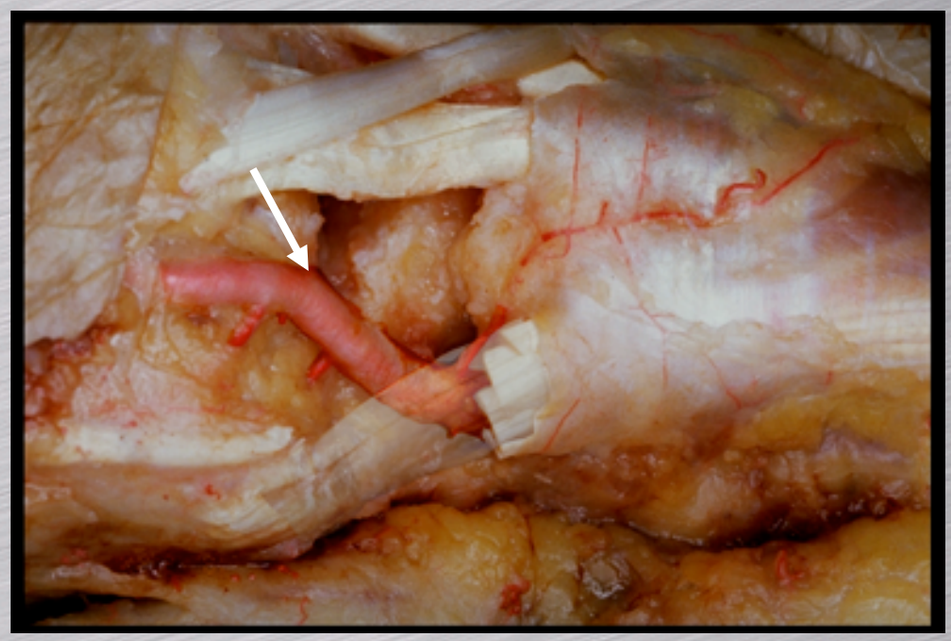


VBG using the 4 compartment artery

Anatomy of the 1,2 supraretinacular artery

TYPE I

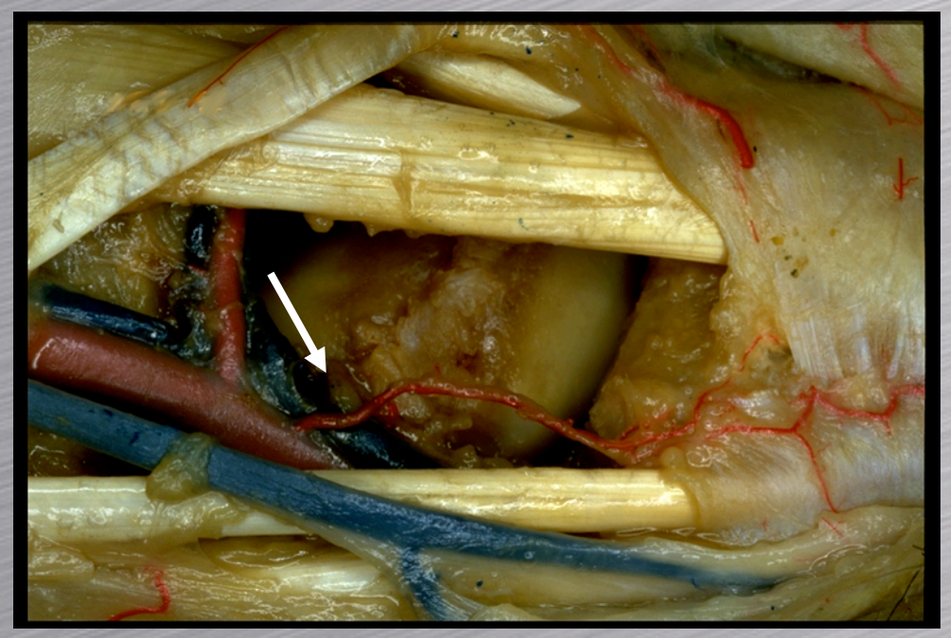


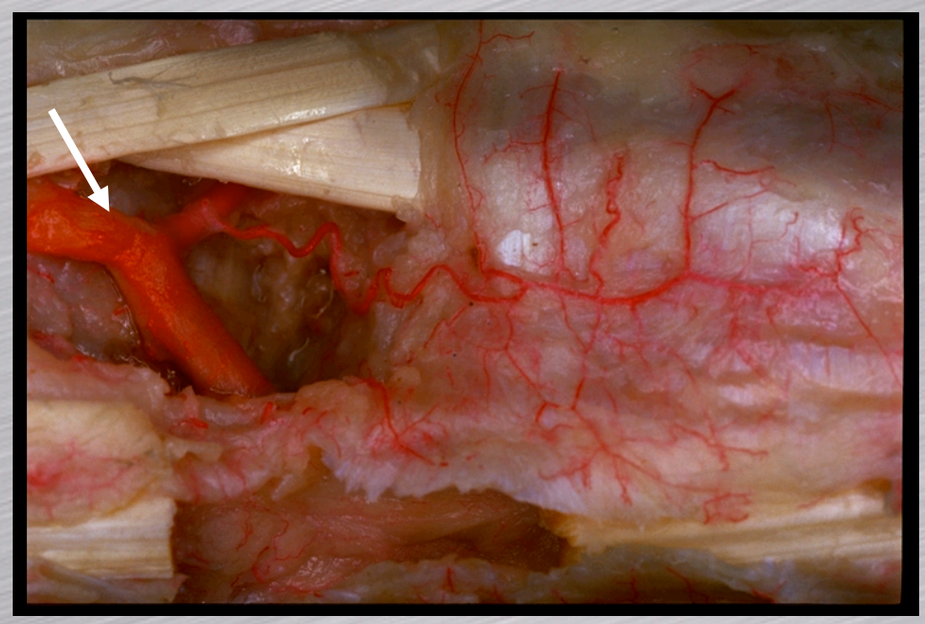


TYPE II

- 4 types have been described (Saint-Cast)

TYPE III

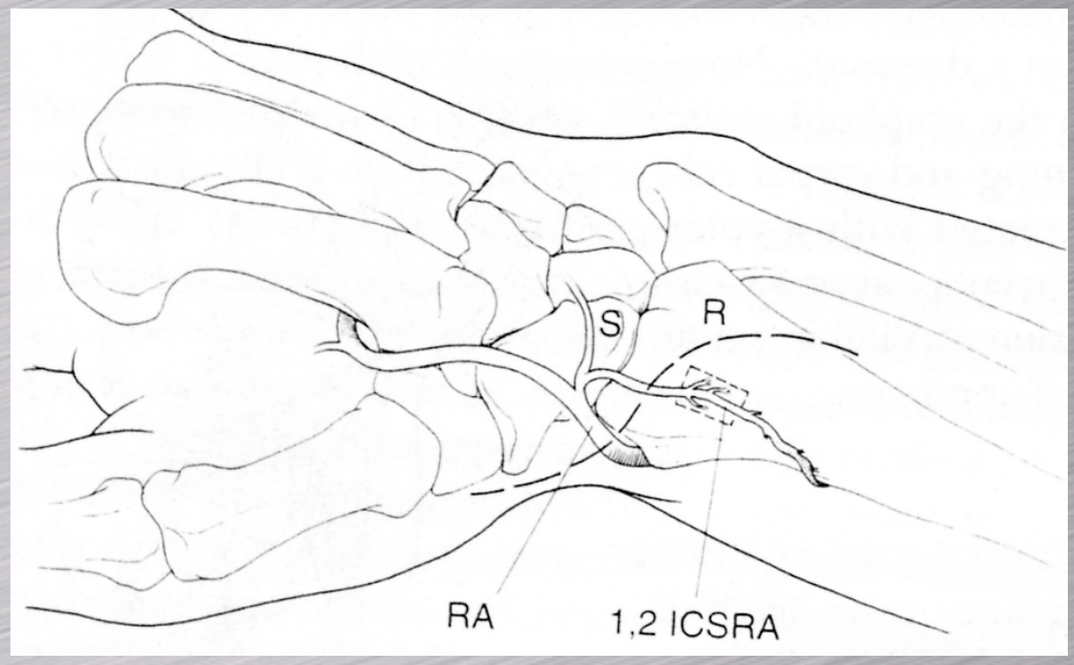


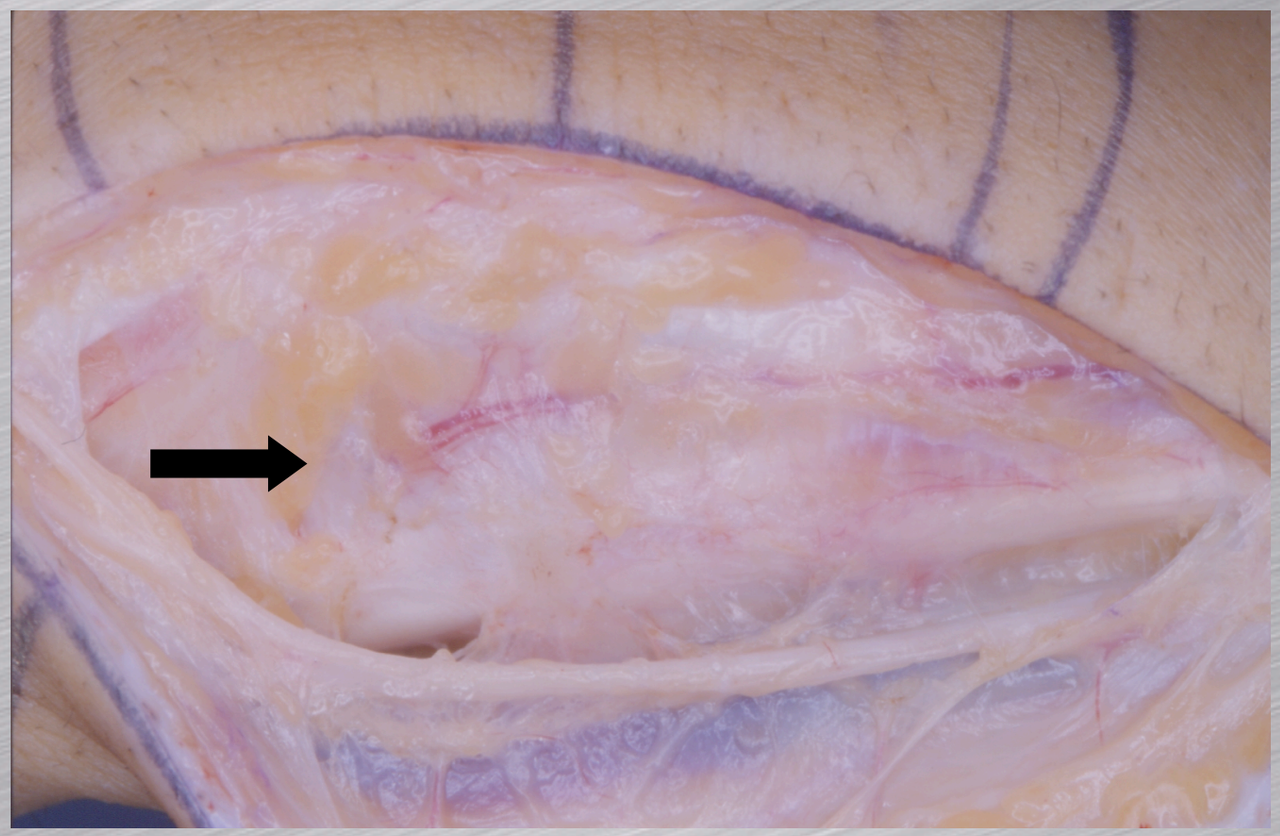


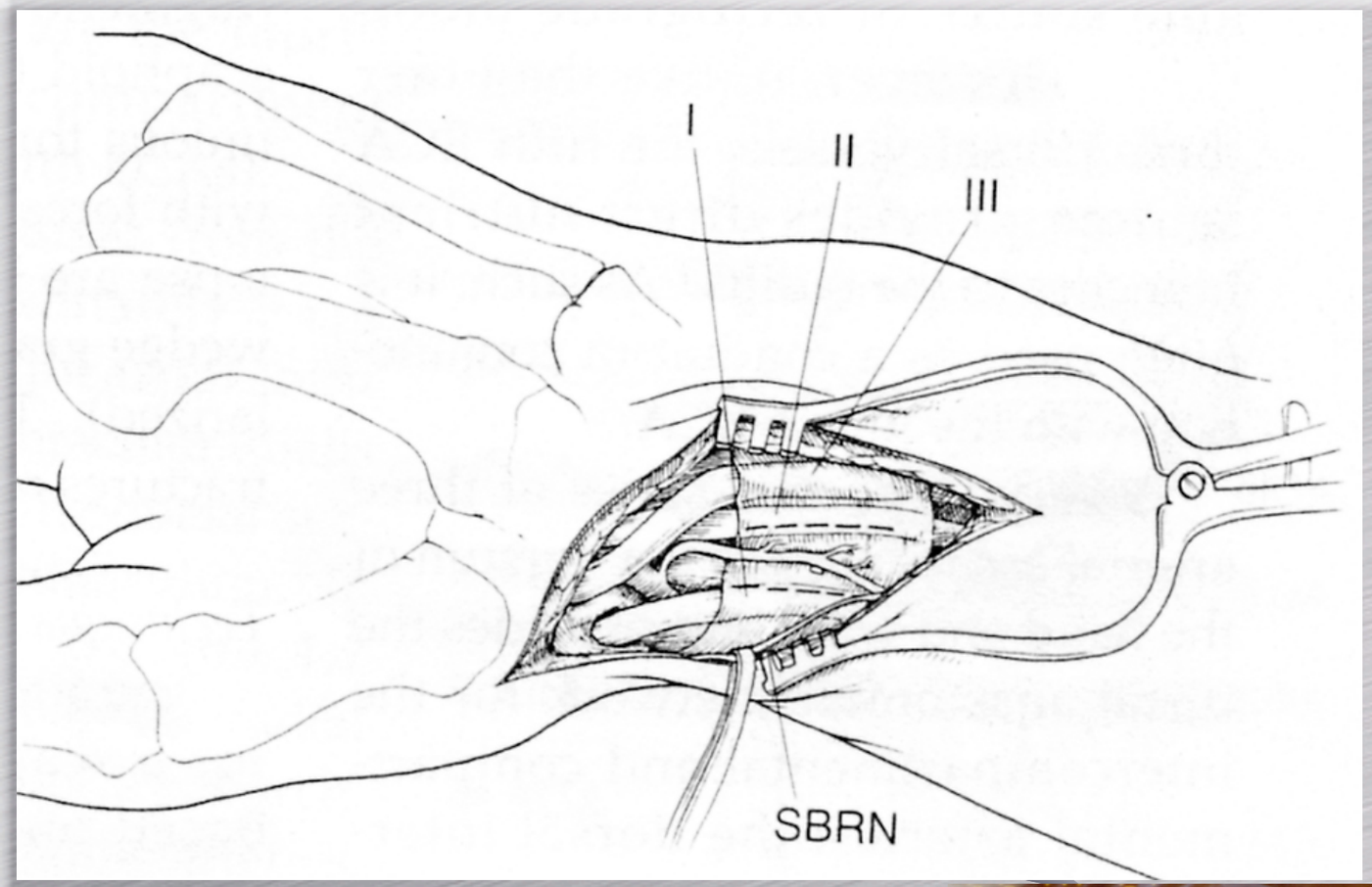
TYPE IV

Surgical technique

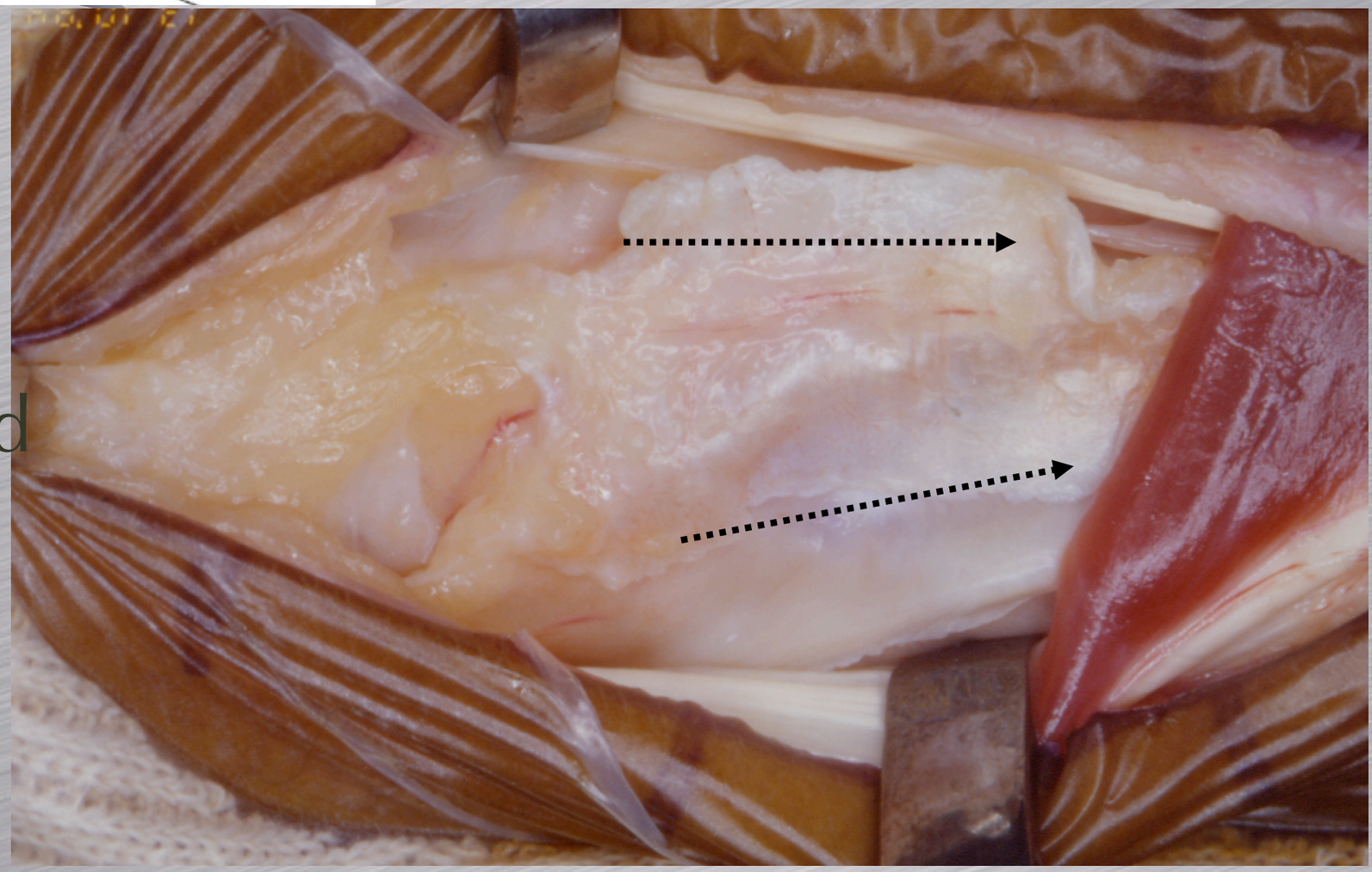
- Lazy S incision
- Protection of the radial nerve
- Visualisation of the 1,2 supra-retinacular artery



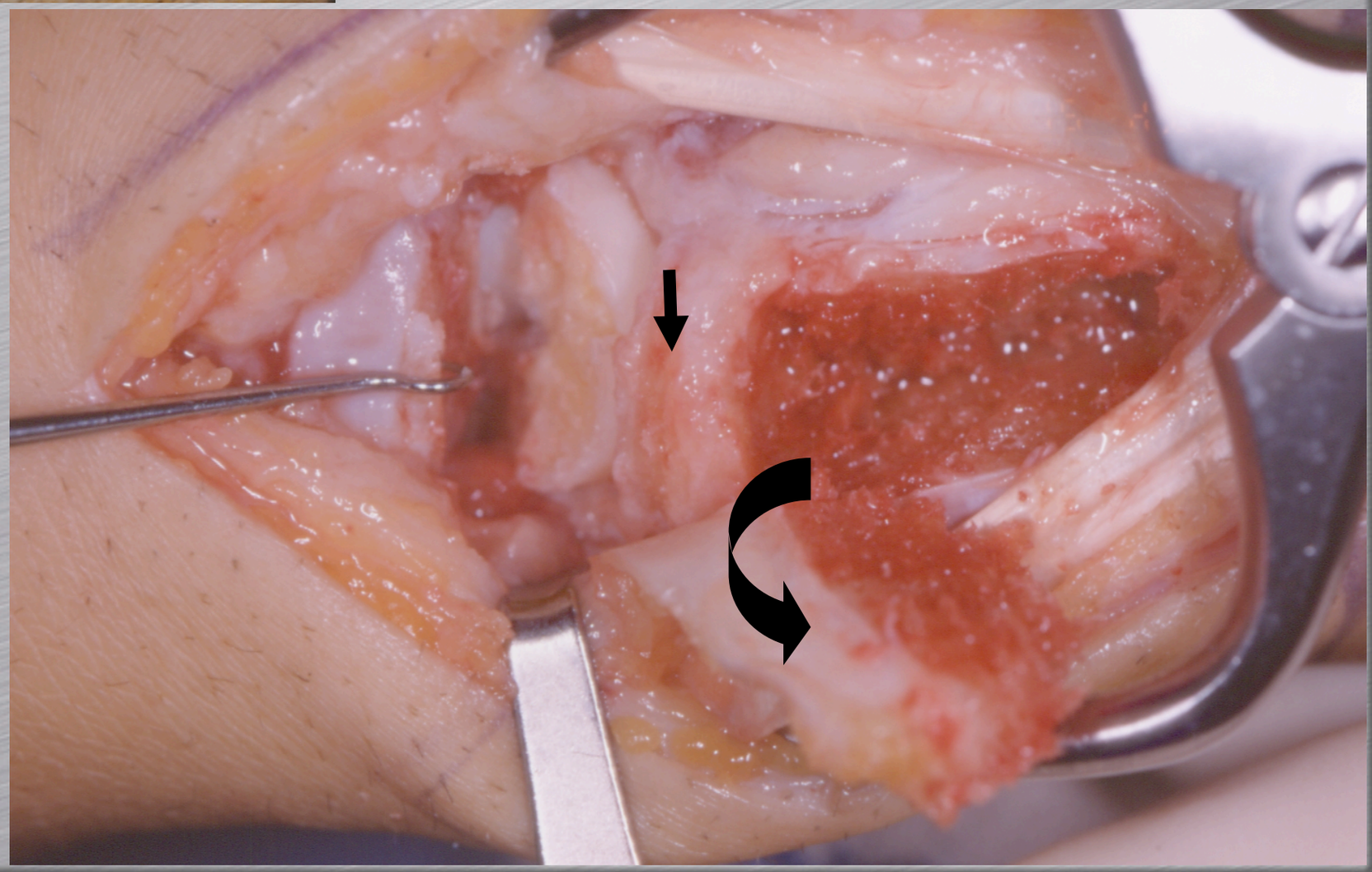




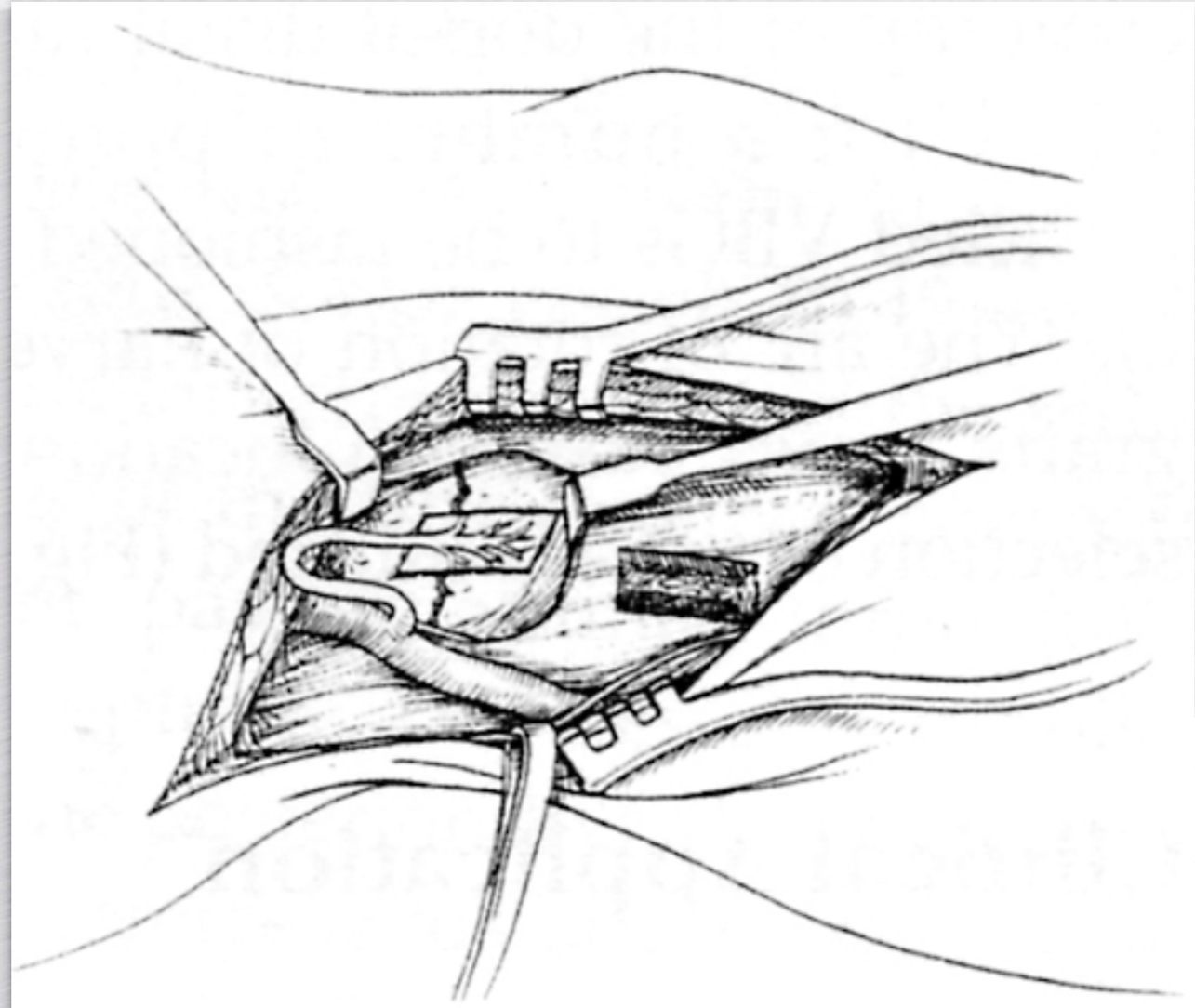
Opening of the 1st and 2nd extensor compartments



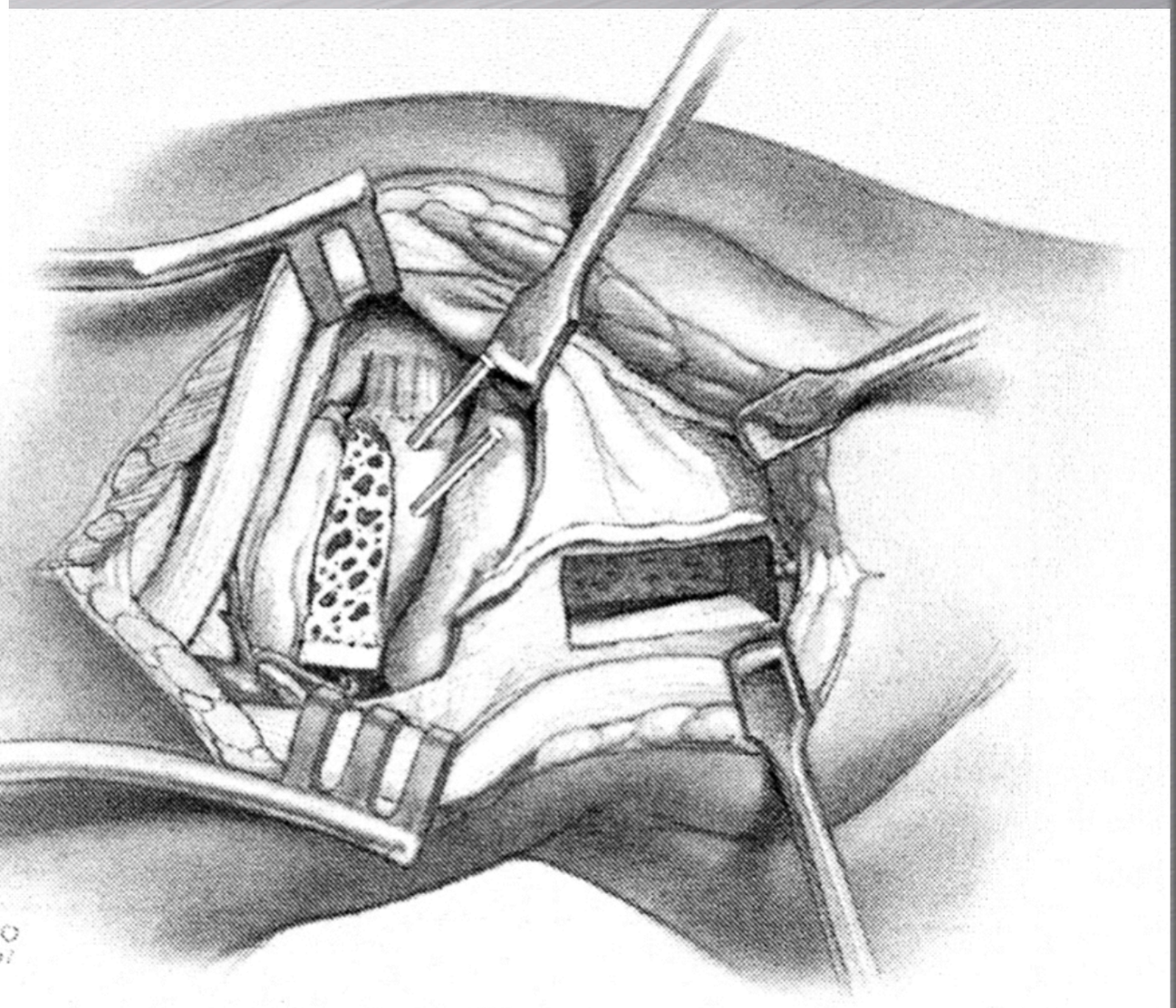
The pedicle is raised and let attached to the capsule and periosteum
The size of the graft is then measured



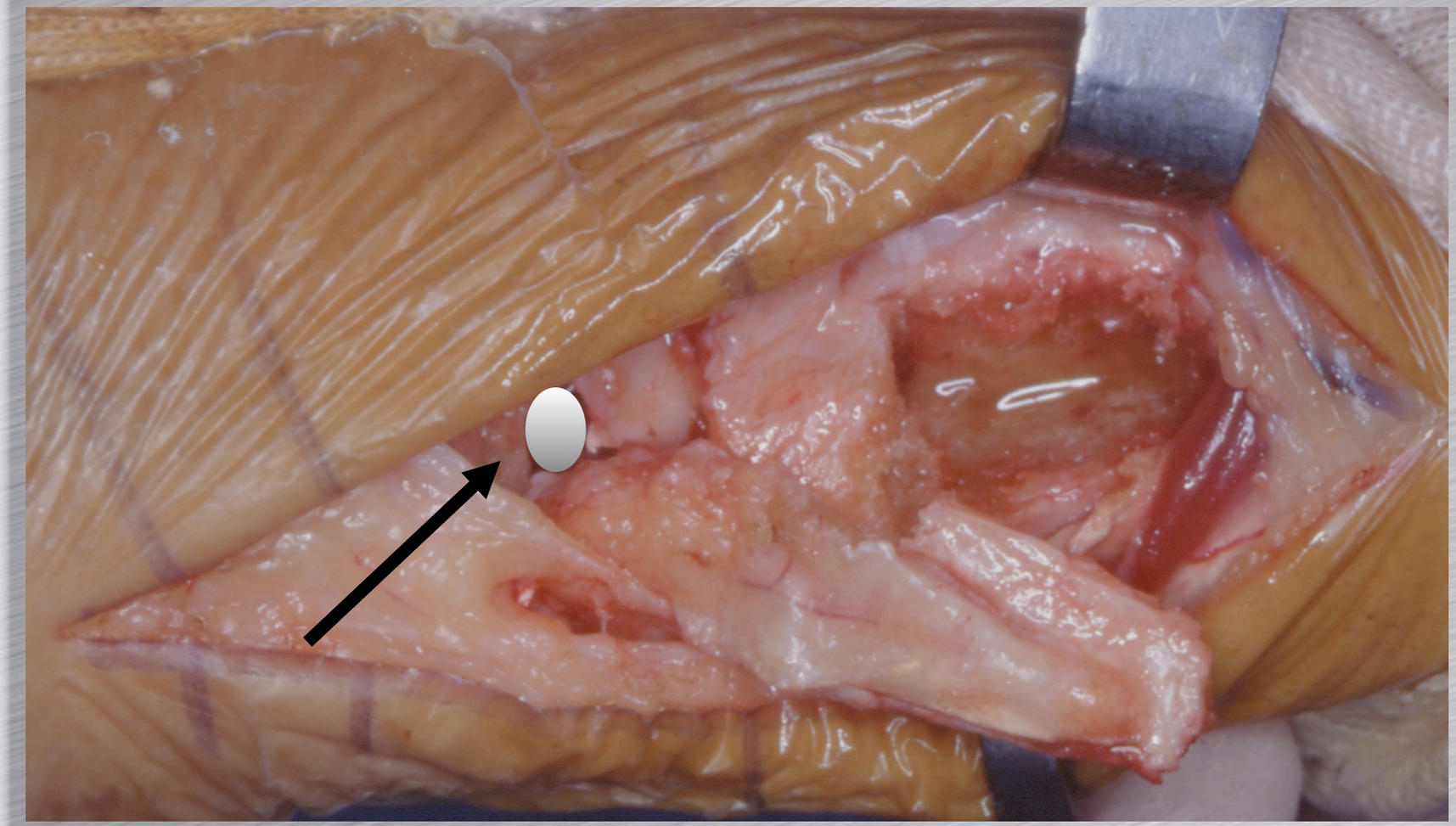
The VBG is raised from the radius
A styloidectomy is performed



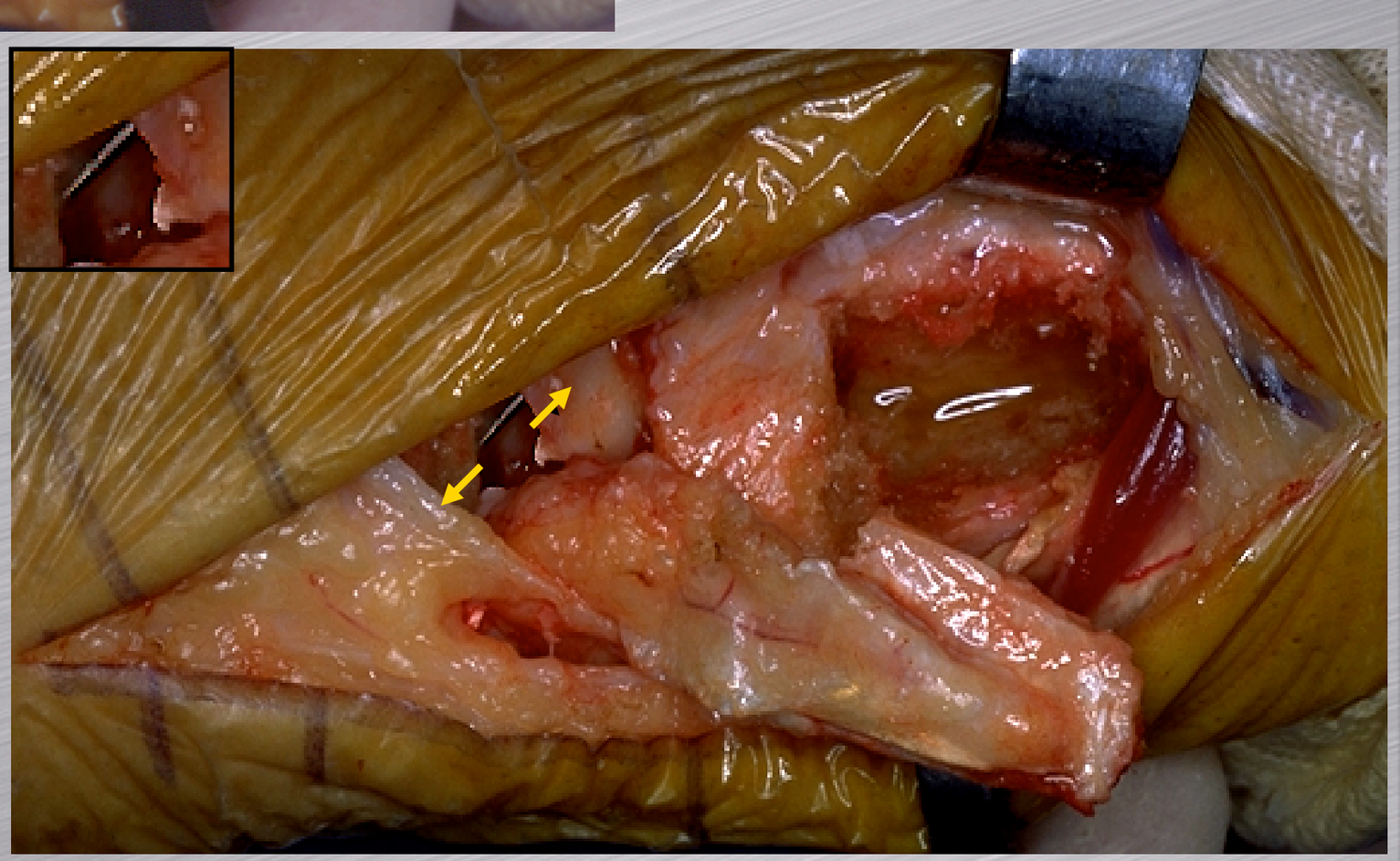
Graft is placed longitudinally if there is no bone loss



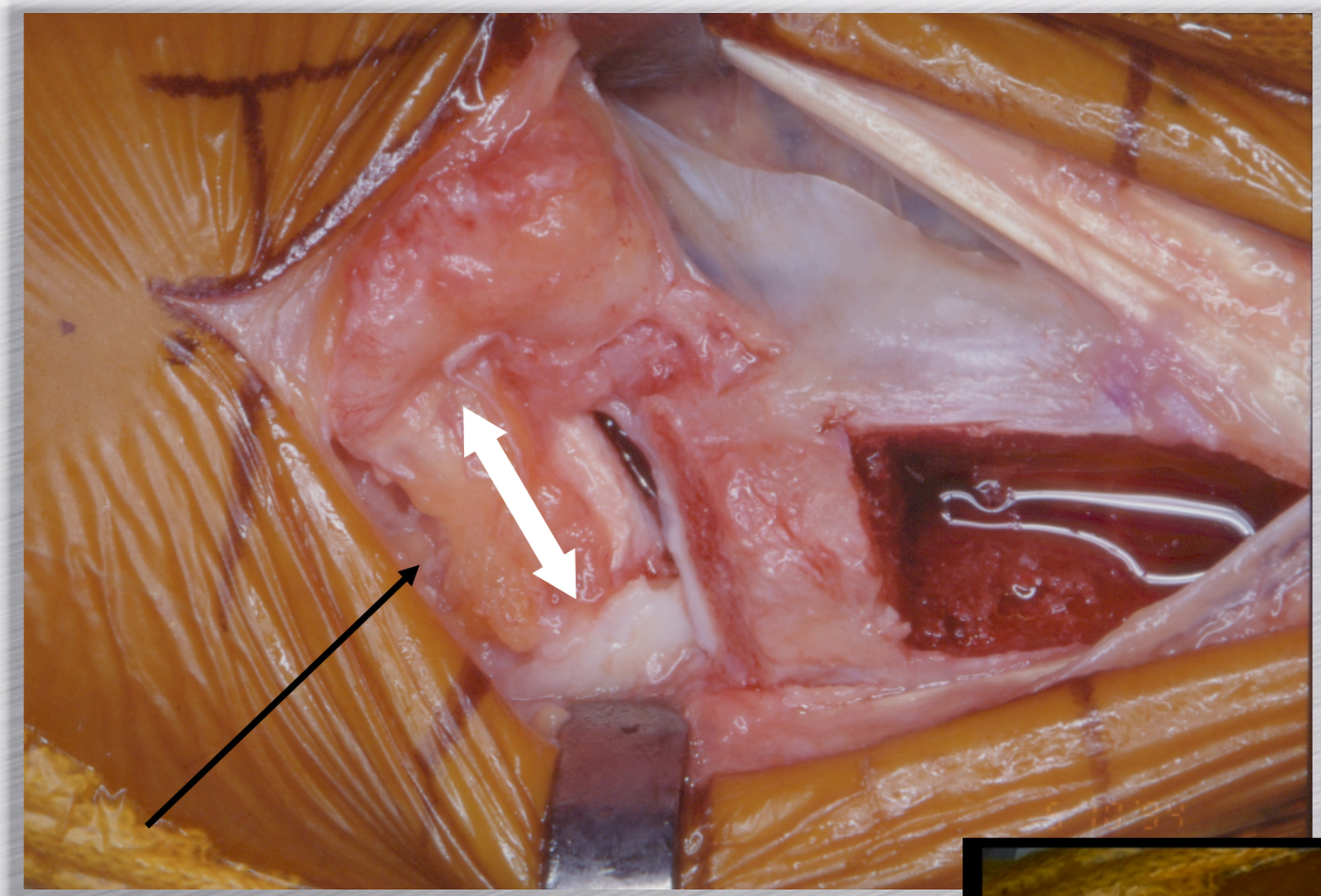
And introduced, transversally into a defect



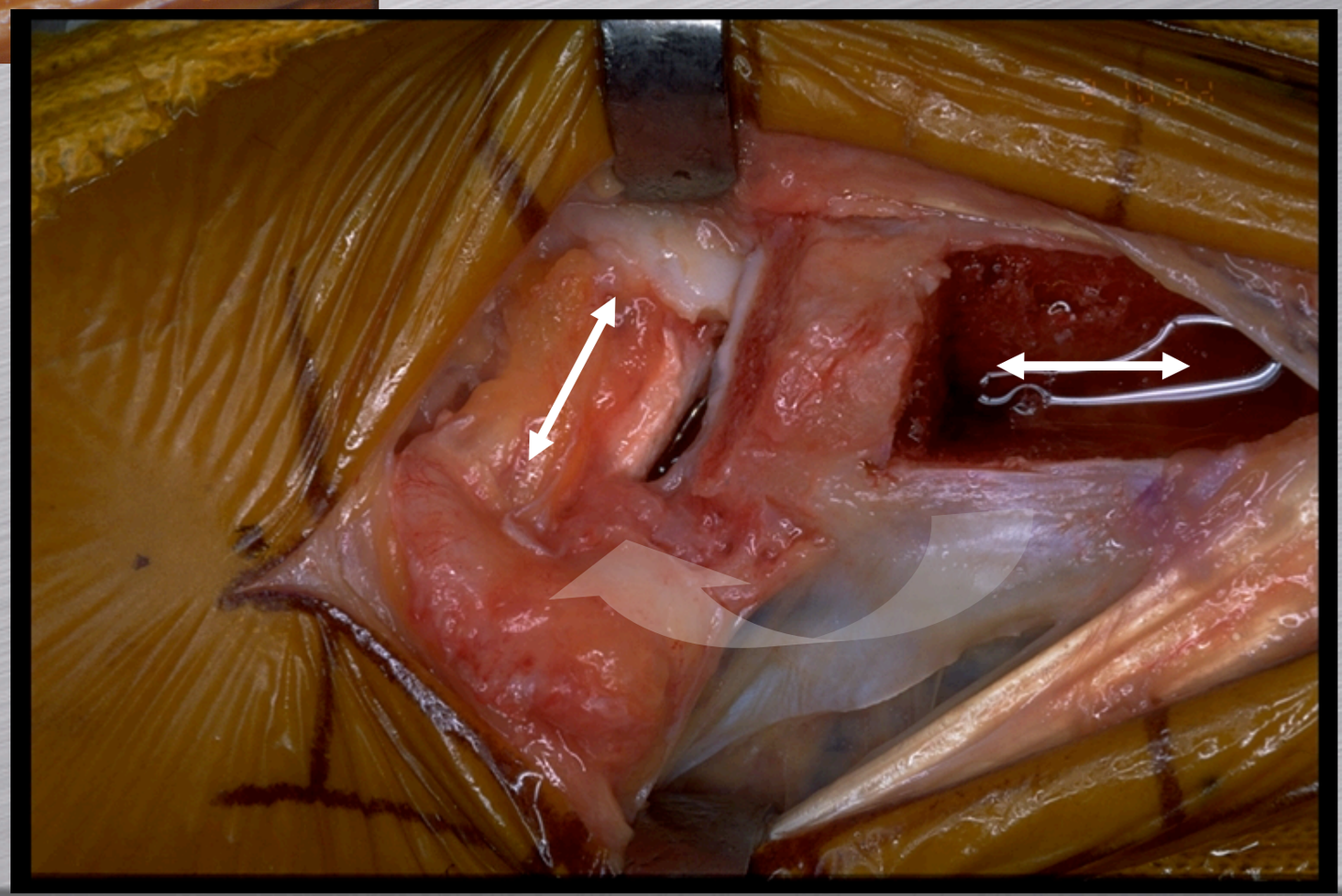
K-wires are then introduced



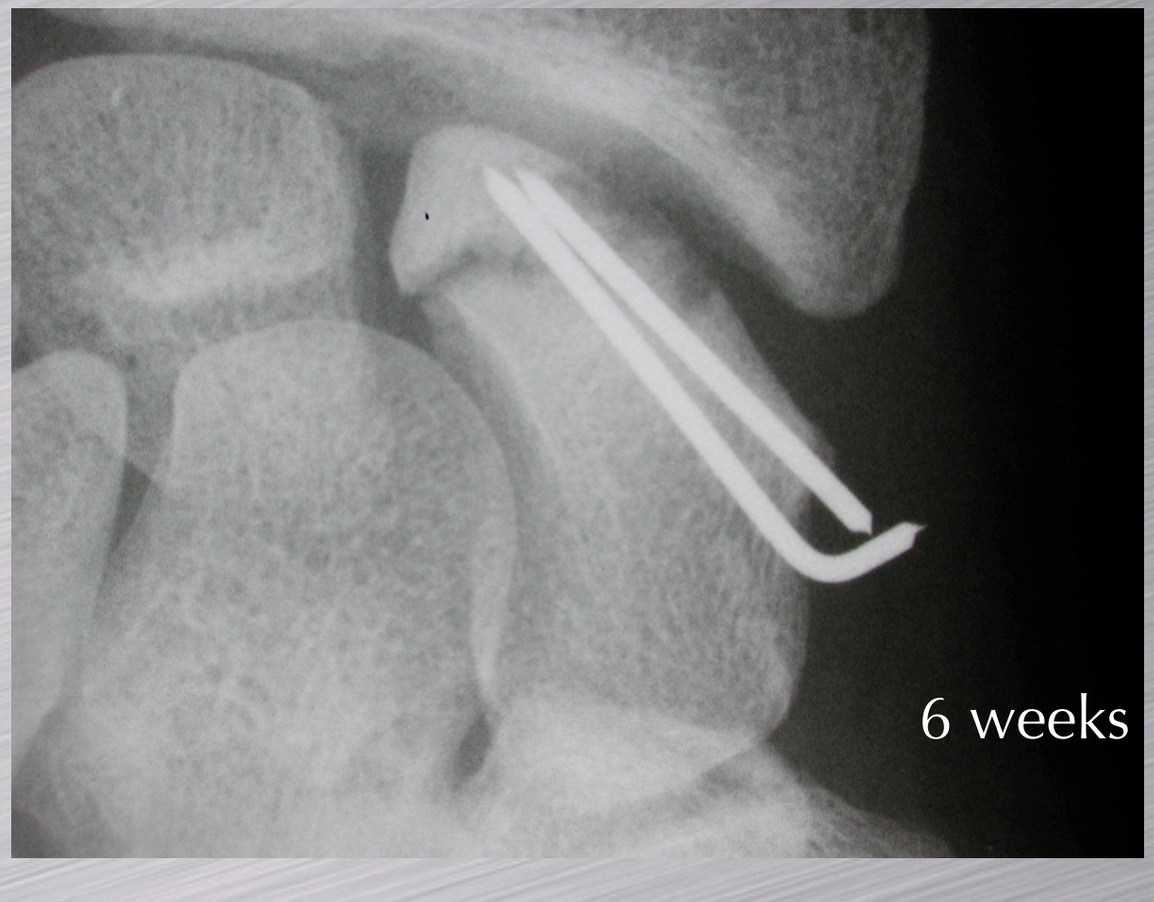
And their position controlled by direct vision in case of bone loss

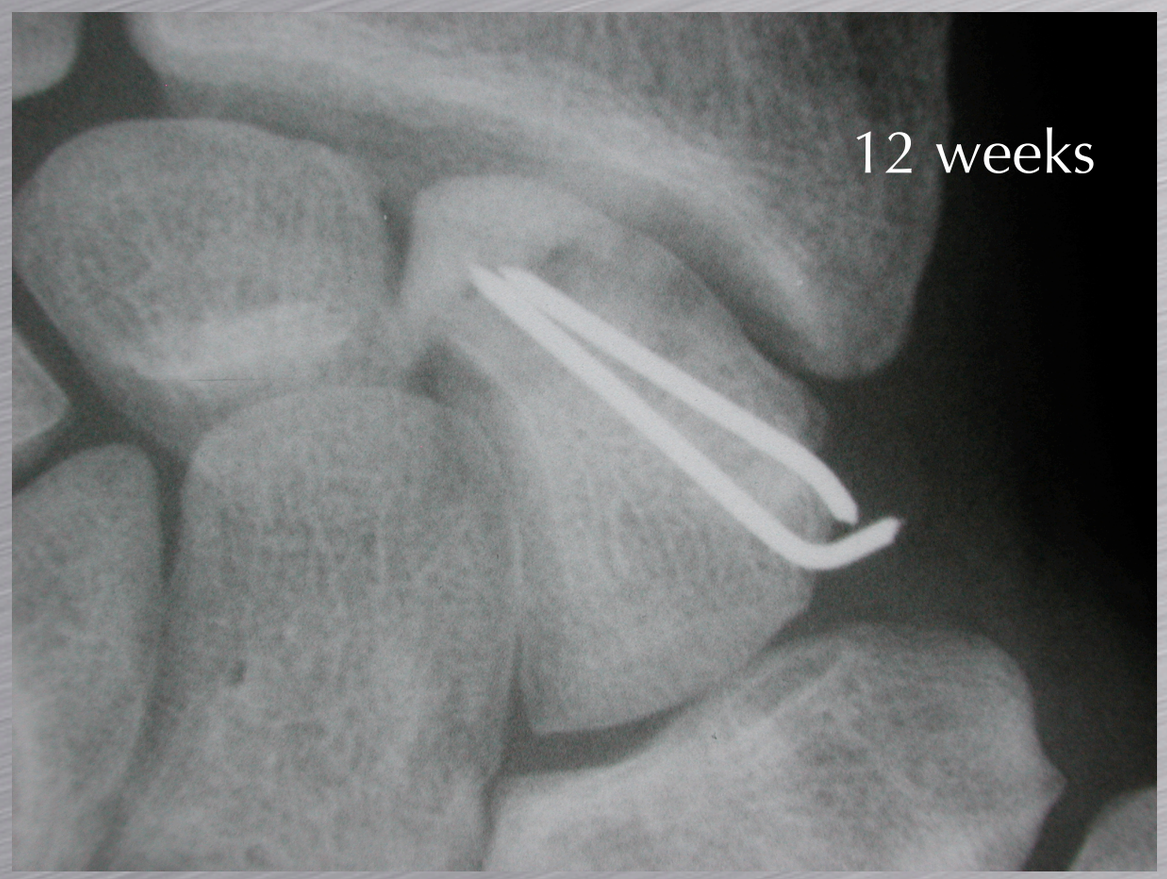


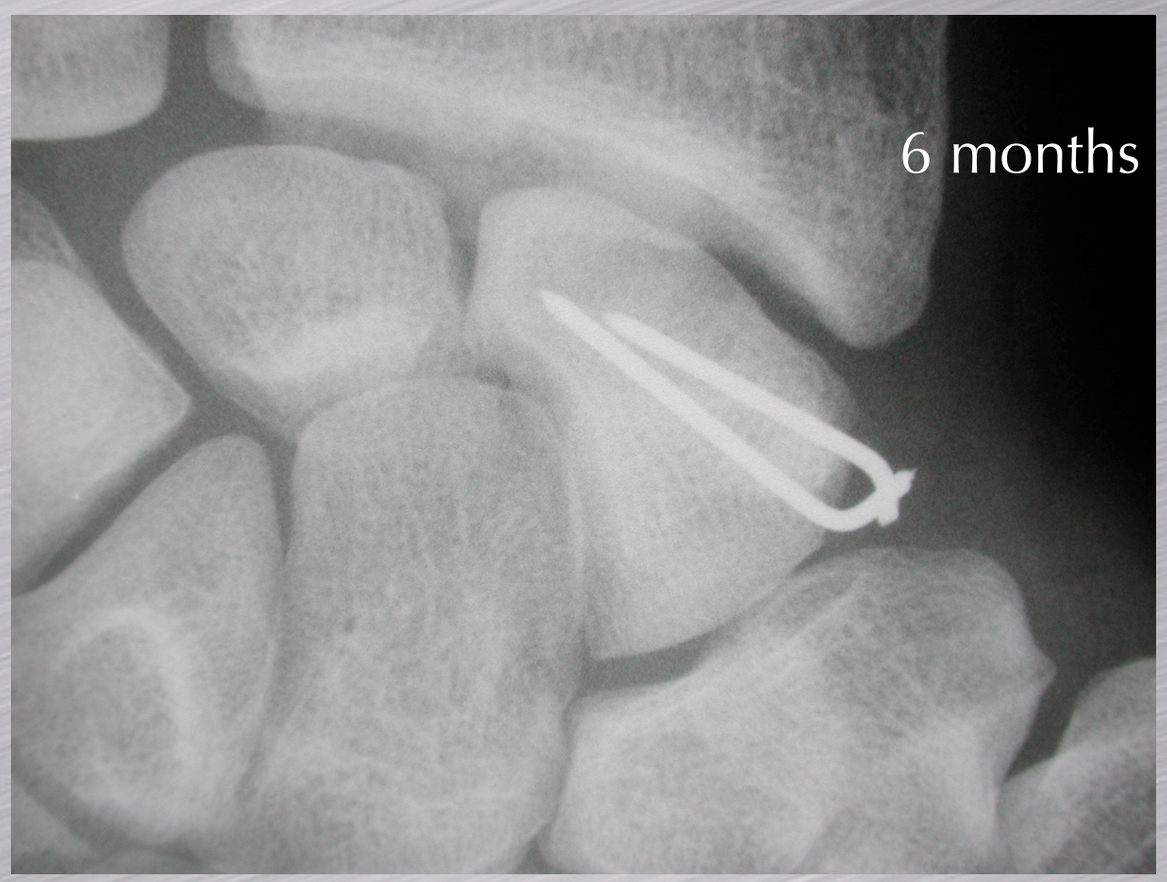
The graft is then introduced, transversally, into the defect



And K-wires are pushed into the proximal pole

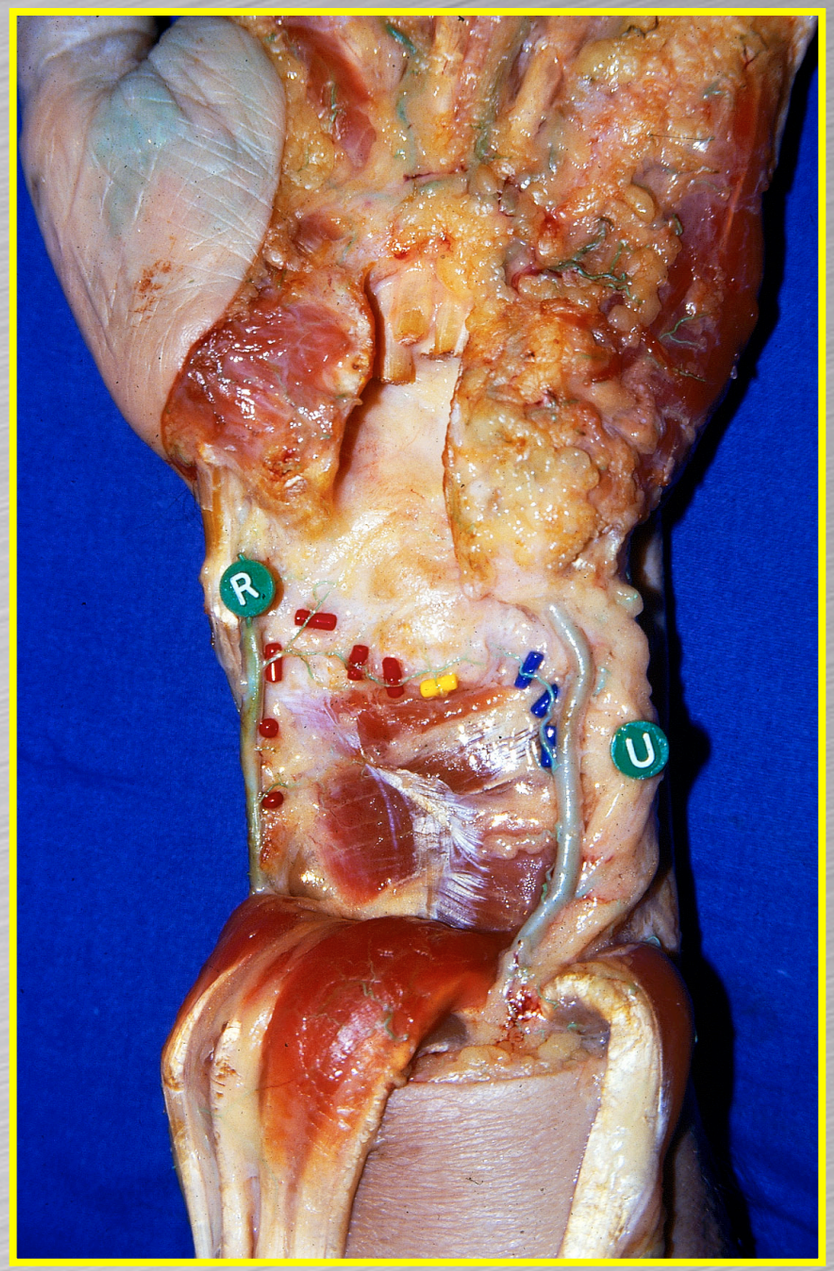

6 weeks


12 weeks

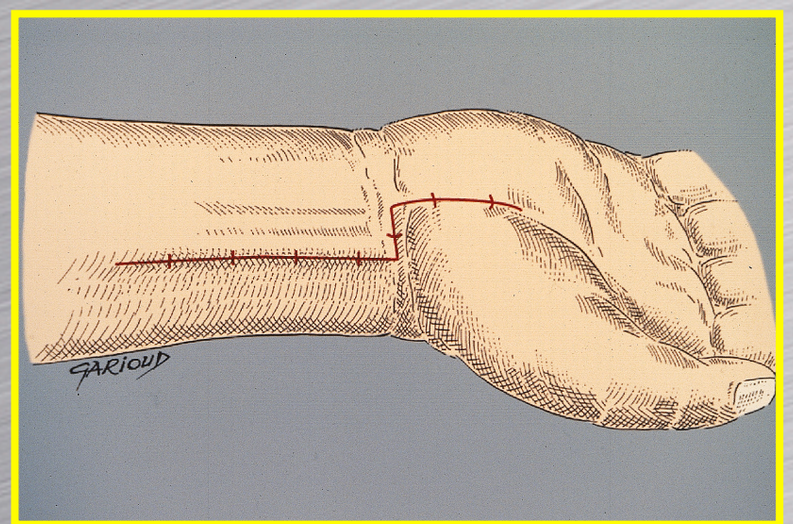

6 months

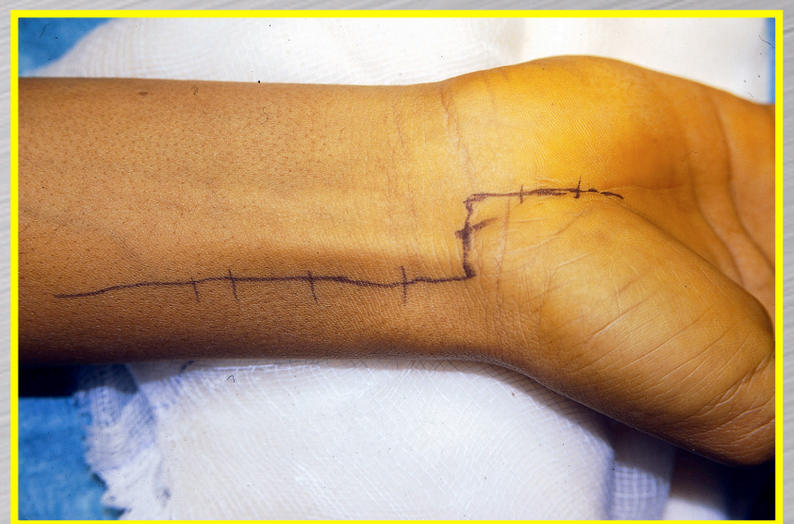
VBGs from the volar radius

- The transverse carpal artery comes from the radial artery
- Is parallel to the distal fibers of the pronator quadratus
- And anastomoses with the anterior branch of the anterior interosseous artery and branches from the ulnar artery

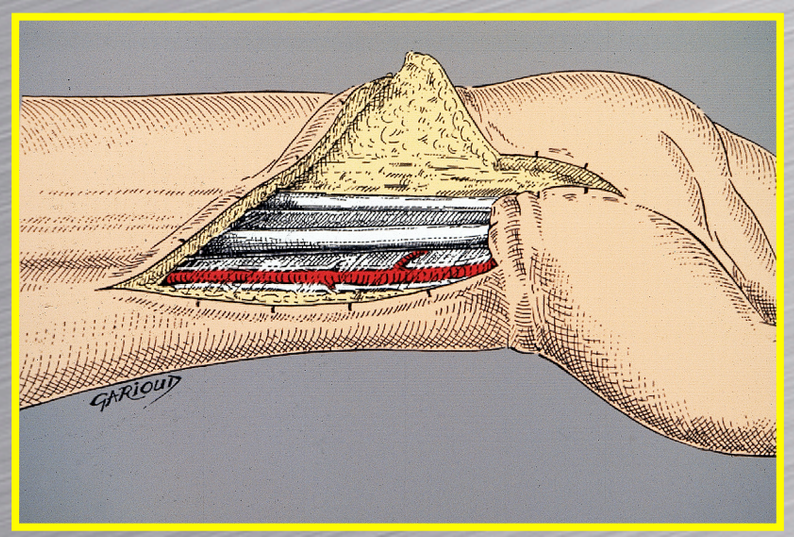


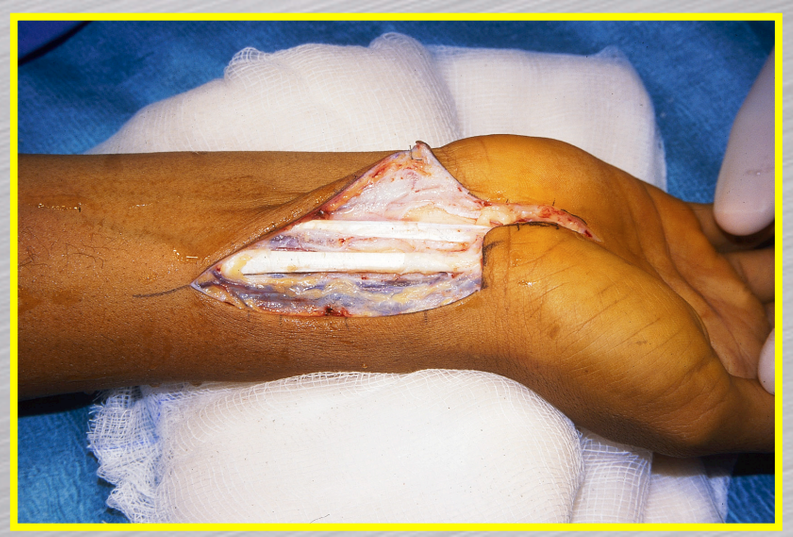
Technique



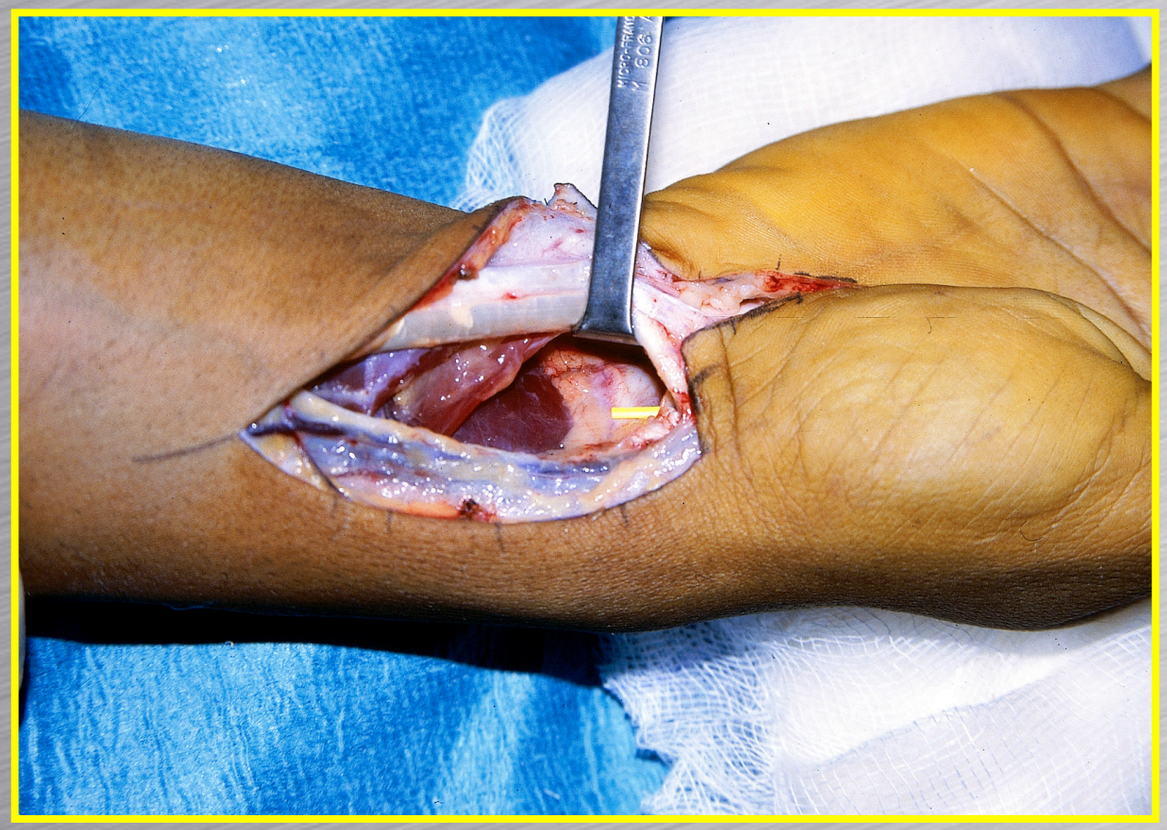


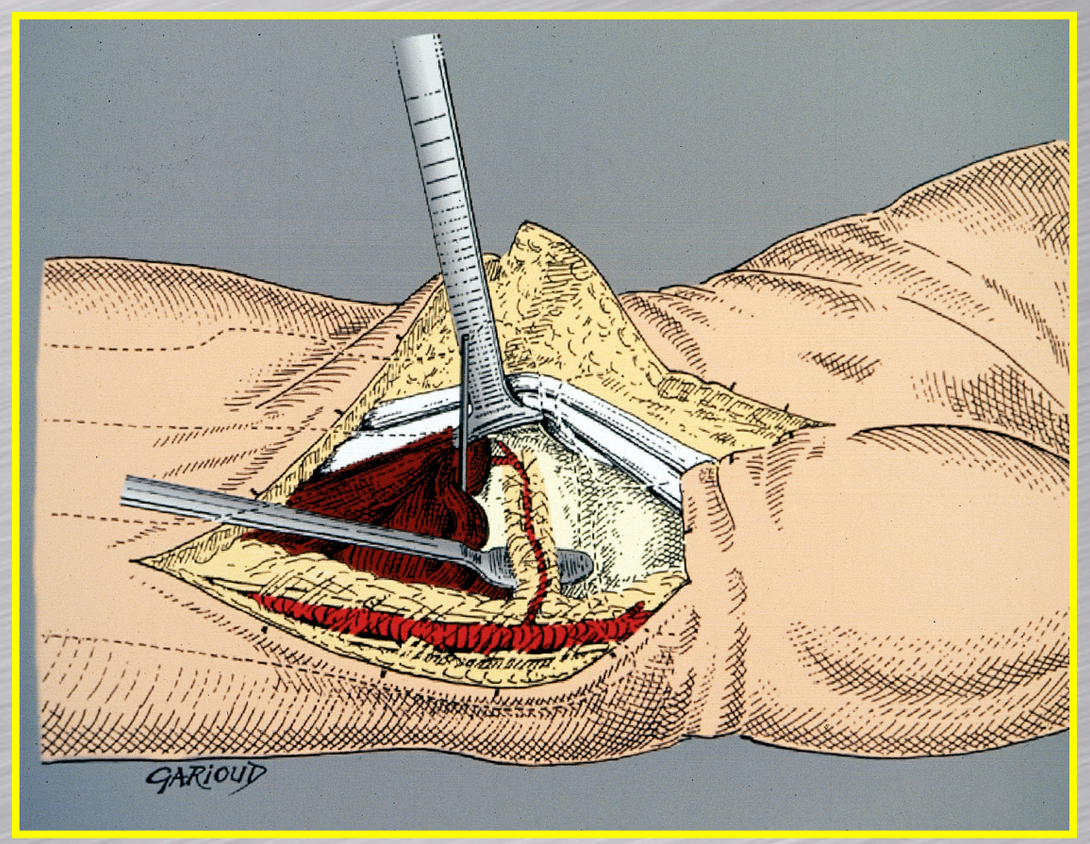
Volar Henry's approach

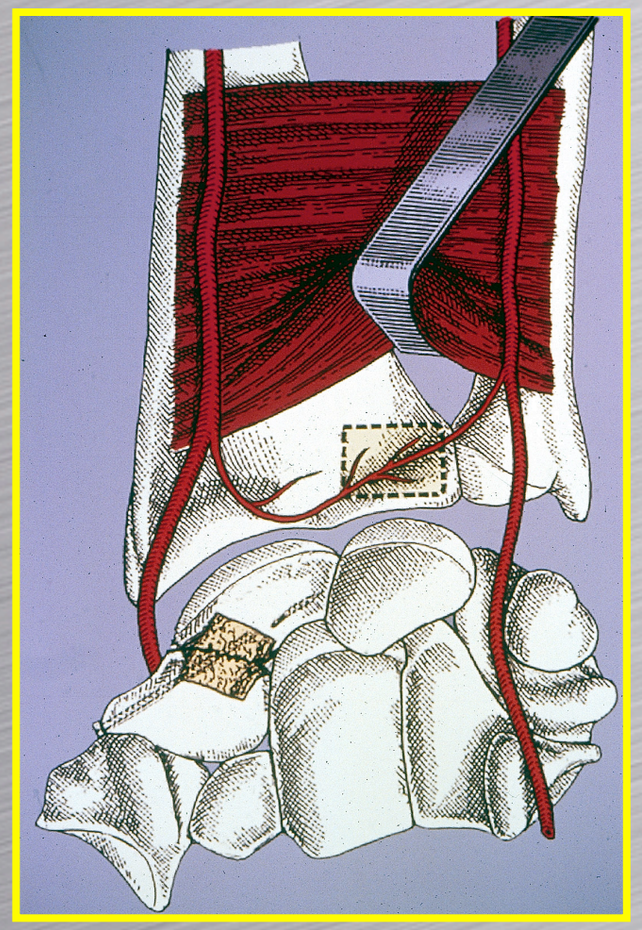


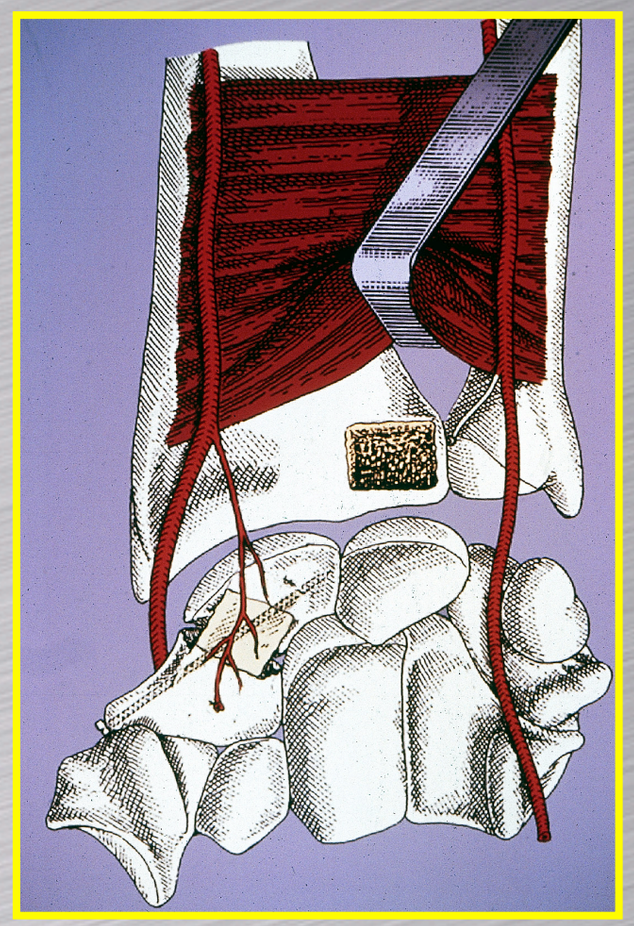


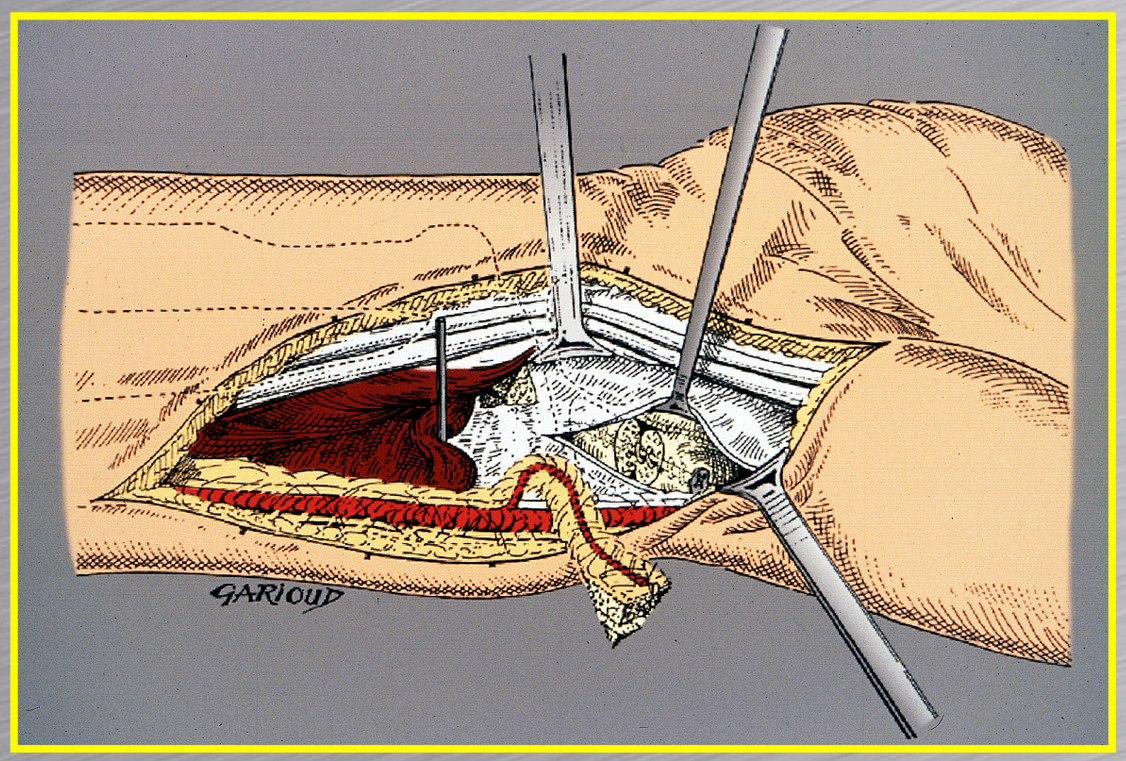
First spotting of F.C.R. and radial artery

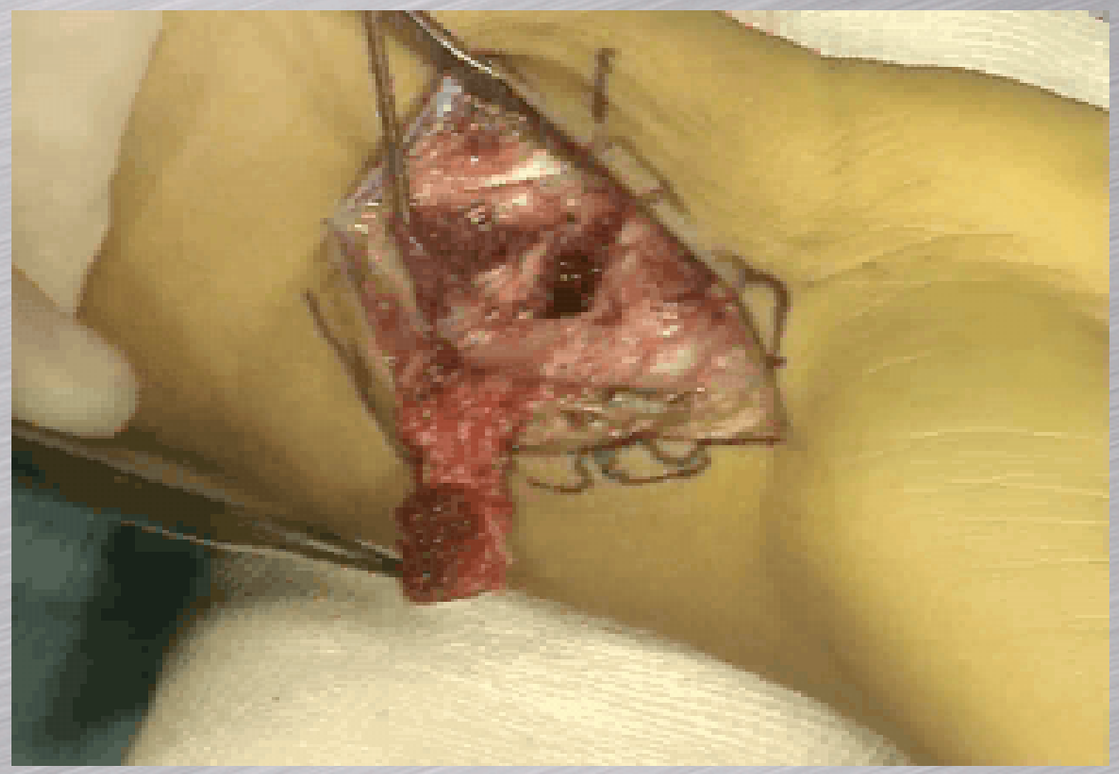


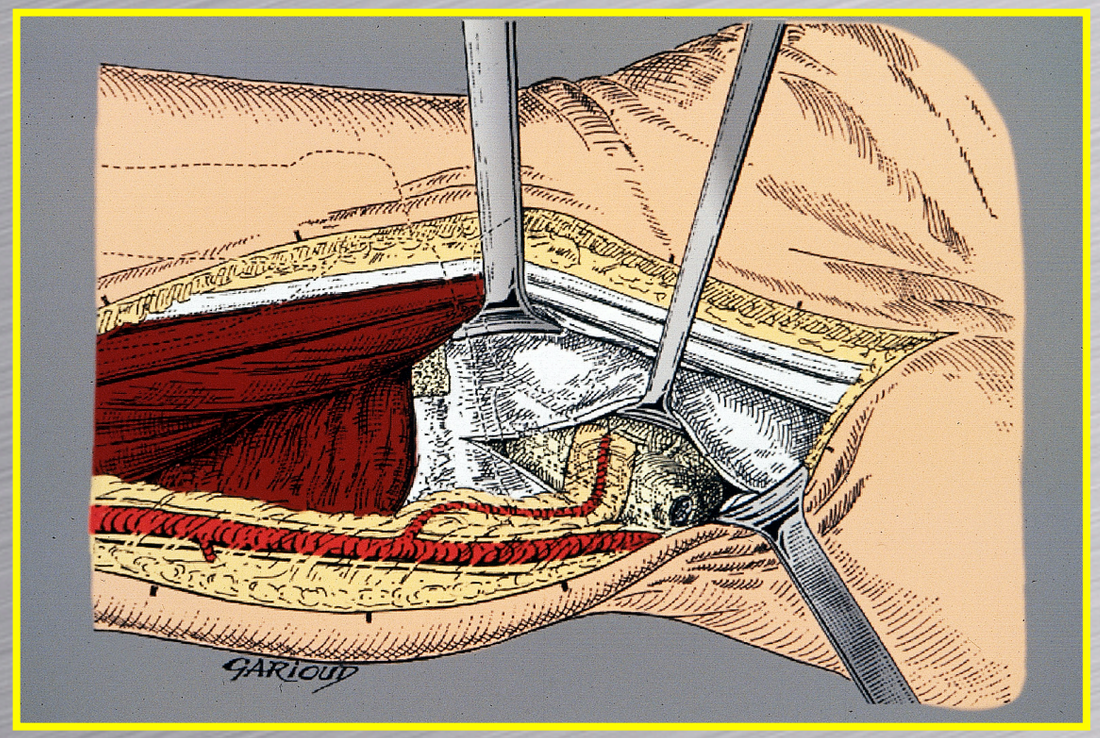

GARIOUD

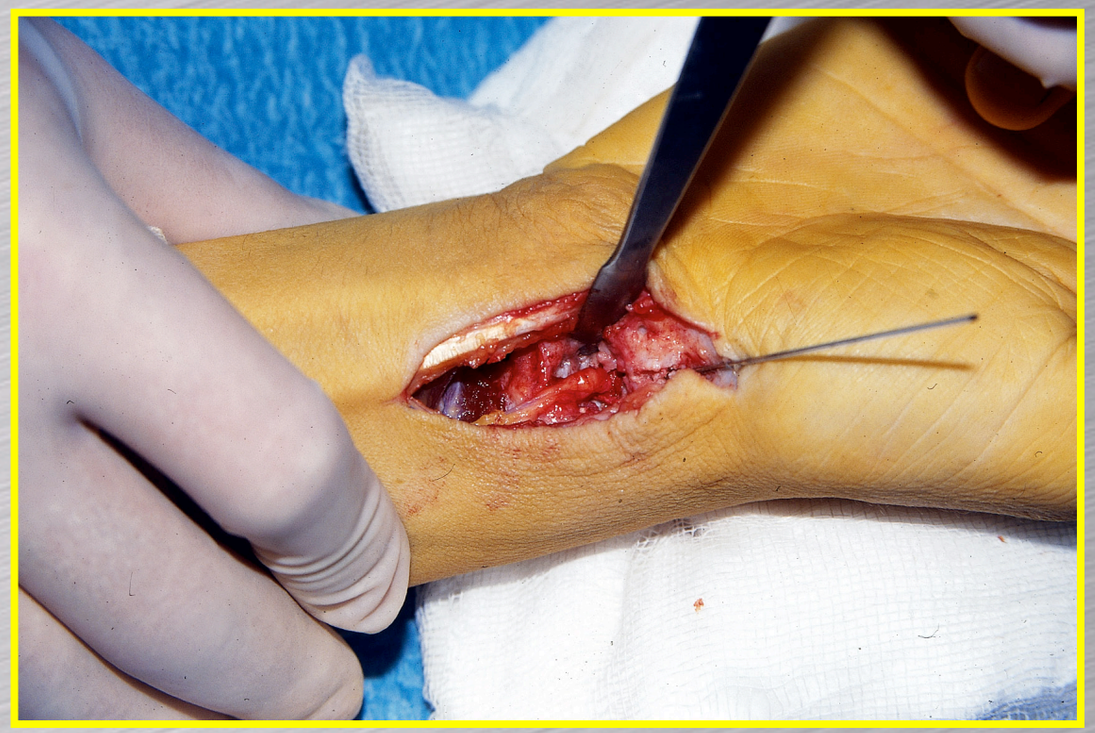




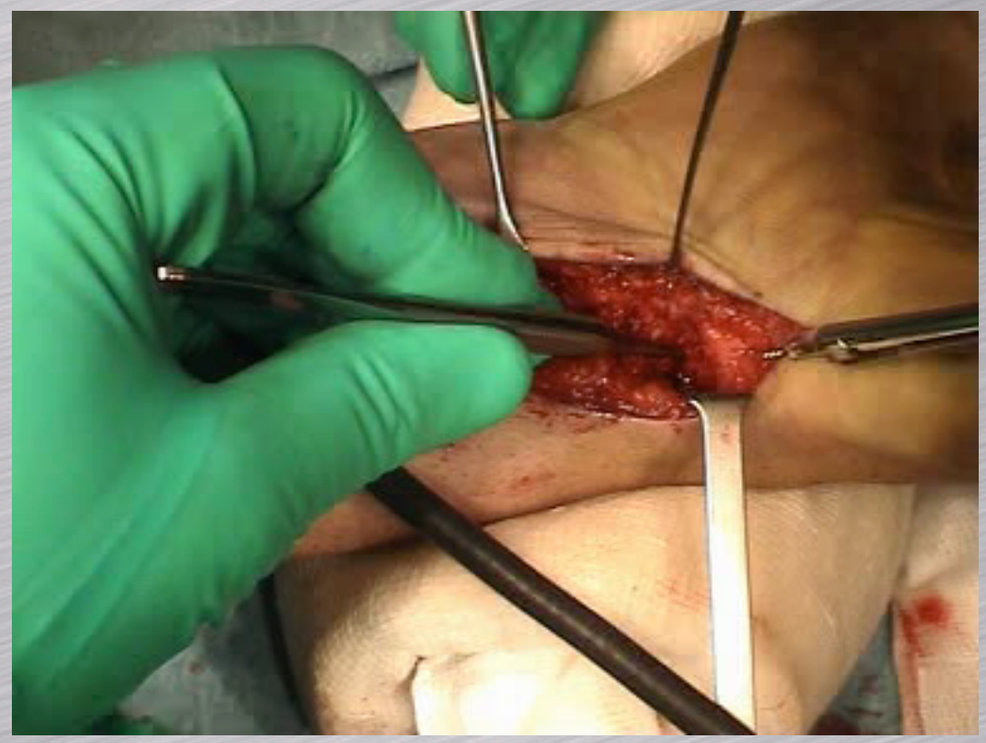

GARIOUD



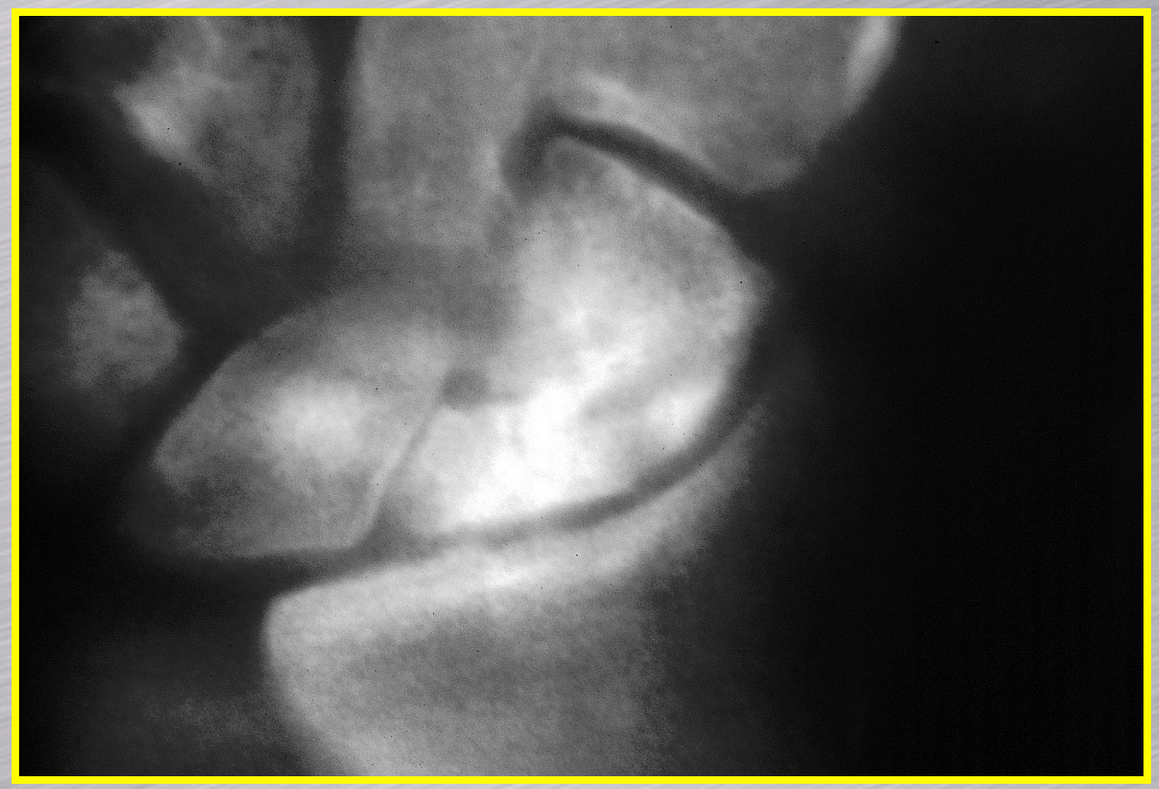




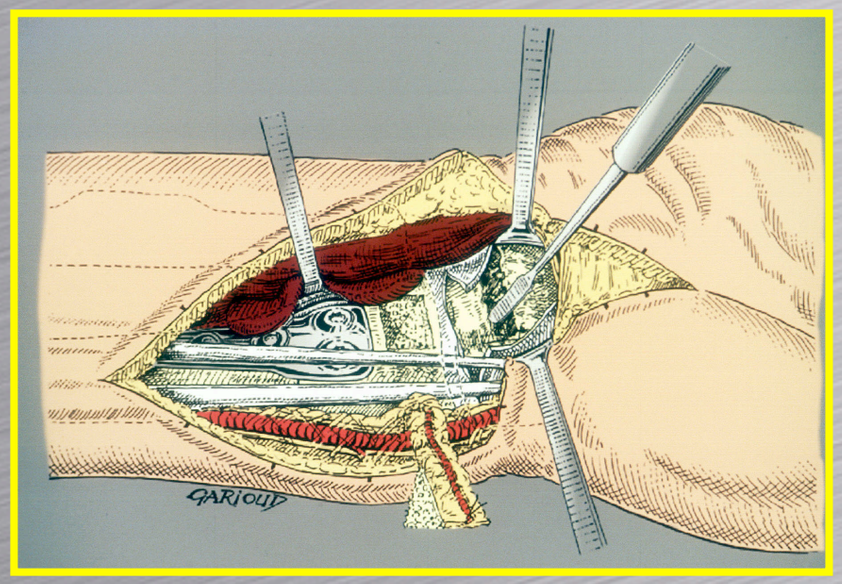
The graft is fixed by a K-wire, parallel to the scaphoid screw that is removed at 3 weeks

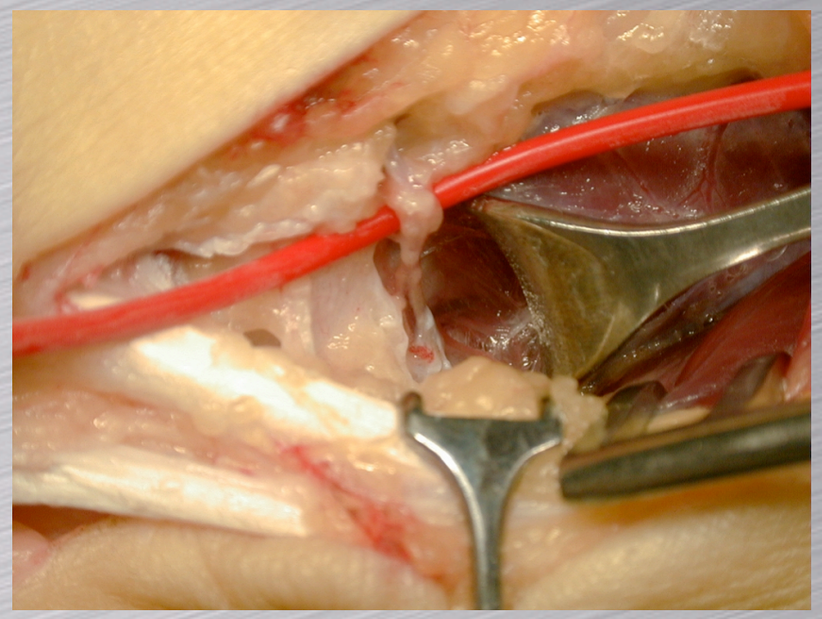


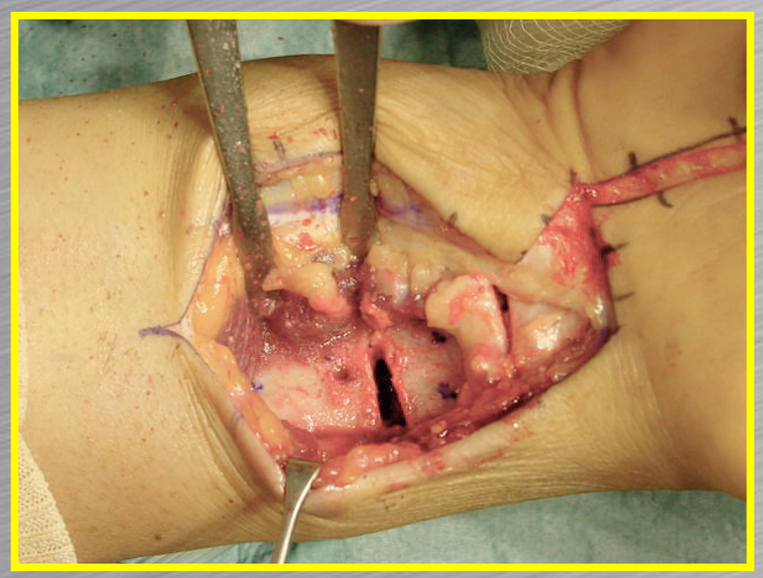
VBG from the volar radius for scaphoid non-union after failed conventional technique

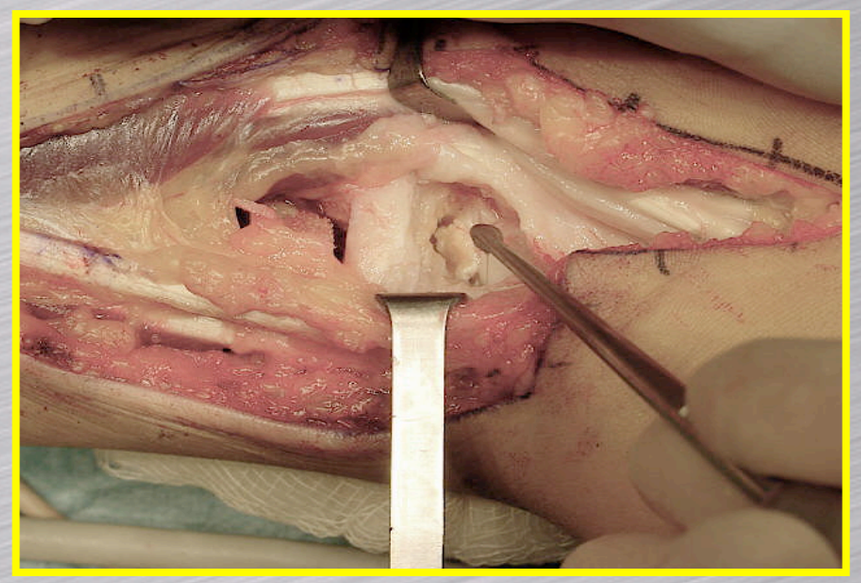


Technique









Identical for Kienböck's disease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RADIE SOUDAMANY
M 53 DR BUSSON
Dec 13 97


IRM HARTMANN
RADIE SOUDAMANY DROIT
GE MEDICAL SYSTEMS

Scaphoid non-union

	Number of cases	% healing	
Mathoulin	87	93%	3 Südeck's
Saint-Cast	38	95% 87% < 12w	2 temporary paresthesiae
Steinman	14	100% (11 w)	2/3 good results
Malizos	22	100%	All improved

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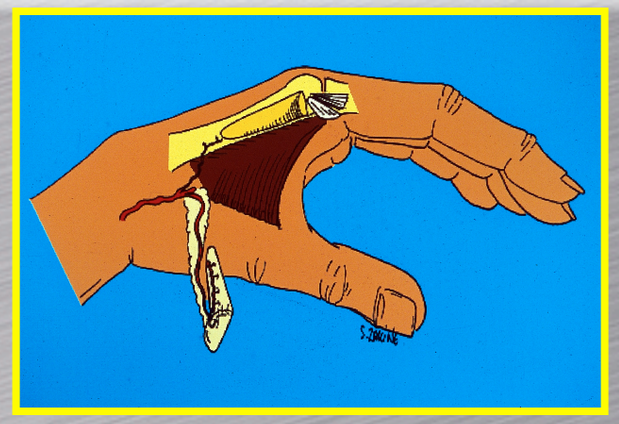
Steinman	14	100% (11 w)	2/3 good results
Malizos	22	100%	All improved
Straw	22	27%	12% if AVN proximal pole

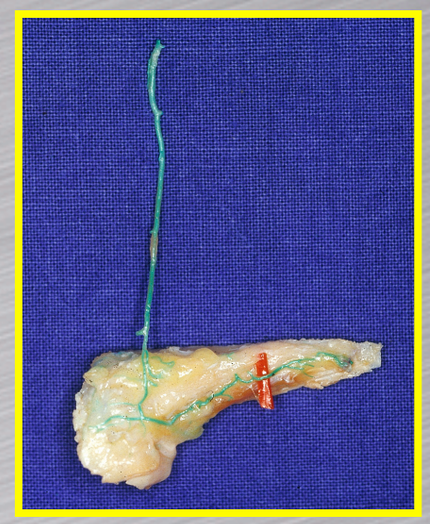
Kienböck's disease

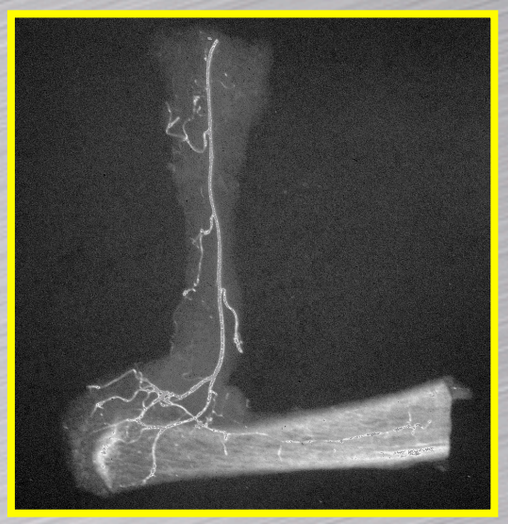
	Number of cases	% Painfree	% "healing"	
Mathoulin	22	91%	72%	23% stabilized, 5% failure
Mazur	9	?	100% at 36 months	

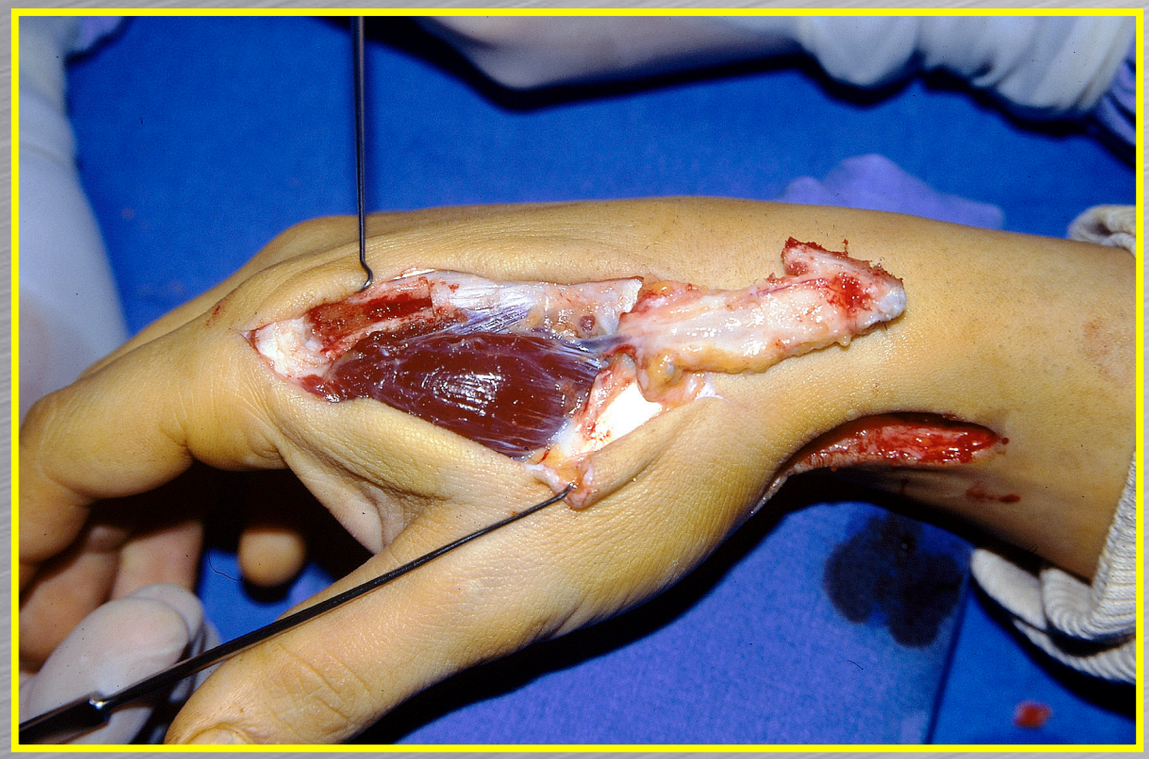
Other VBGs



- Part of the head of the 2nd metacarpal based on the anastomoses between the deep and superficial intermetacarpal arteries (Brunelli, 1988)







Material

- 17 patients (1988-1999), 10 males
- Mean age : 34 y.o. (26 - 44)
- Union obtained in 16 cases (1 failure)
- Average delay of union : 3 months (range 2 to 6 months)

Complications

- No problem with IInd métacarpal
- Radio-scaphoid arthritis : 2 cases
- Lesion of radial nerve : 2 cases
- Secondary fracture : 1 case