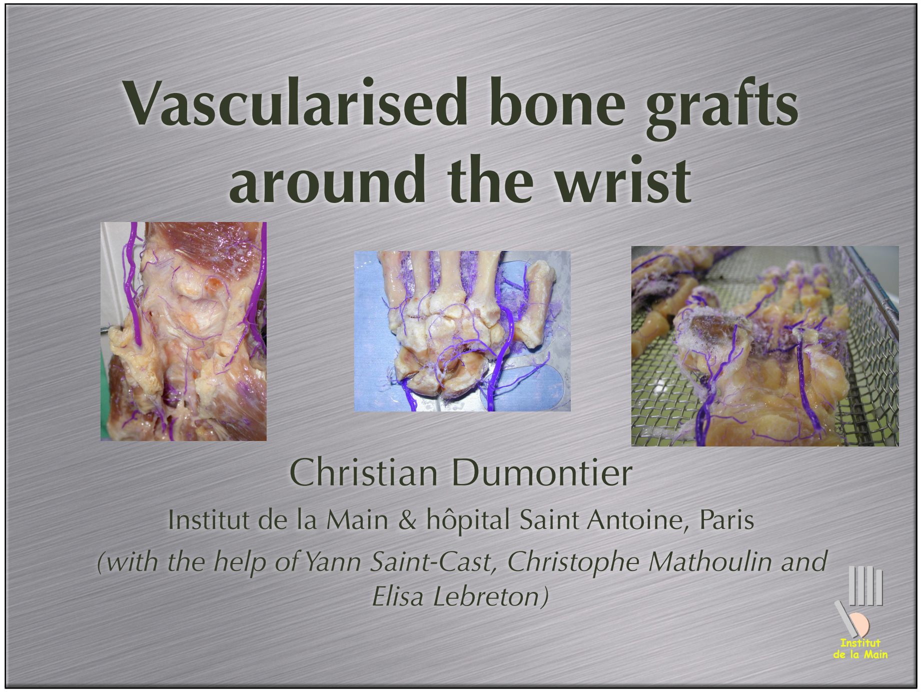
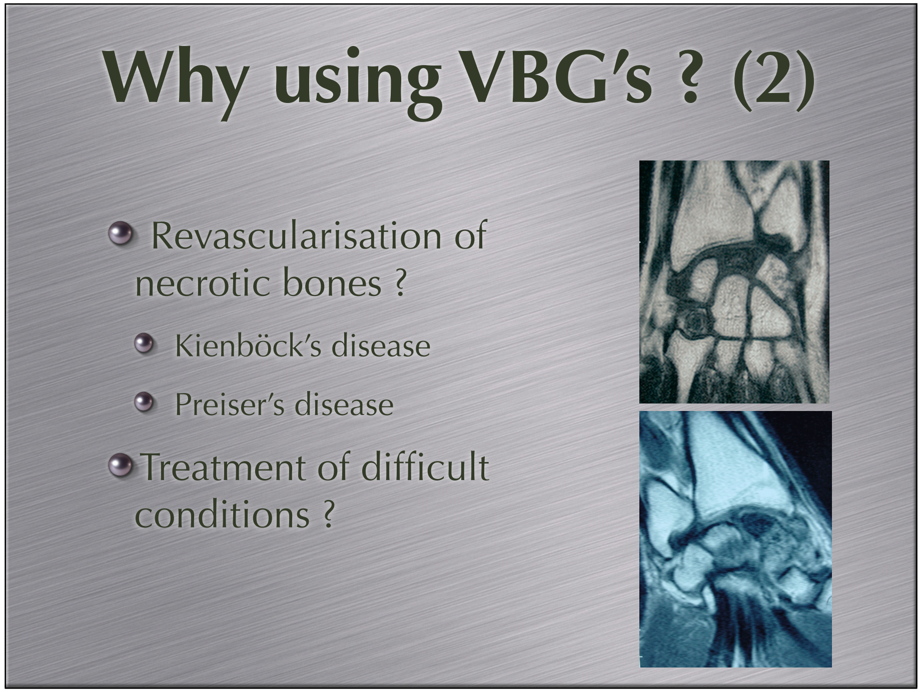


Mister chairman, dear colleagues
I would like to thank the colleagues who provided me with some of their anatomical pictures.

Why using VBG's ?

Authors	Non union rate	Graft source
Cooney	24%	Iliac
Barton	27%	Radius/iliac
Daly	5%	Iliac
Warren Smith	30%	Iliac
Christodoulou	15-45%	Radius/iliac
Davis	25-34%	Iliac

Why using VBG's in wrist surgery ? According to literature review, non union rate is high with conventional bone grafts in the treatment of scaphoid pseudarthrosis which is the most frequently reported indication

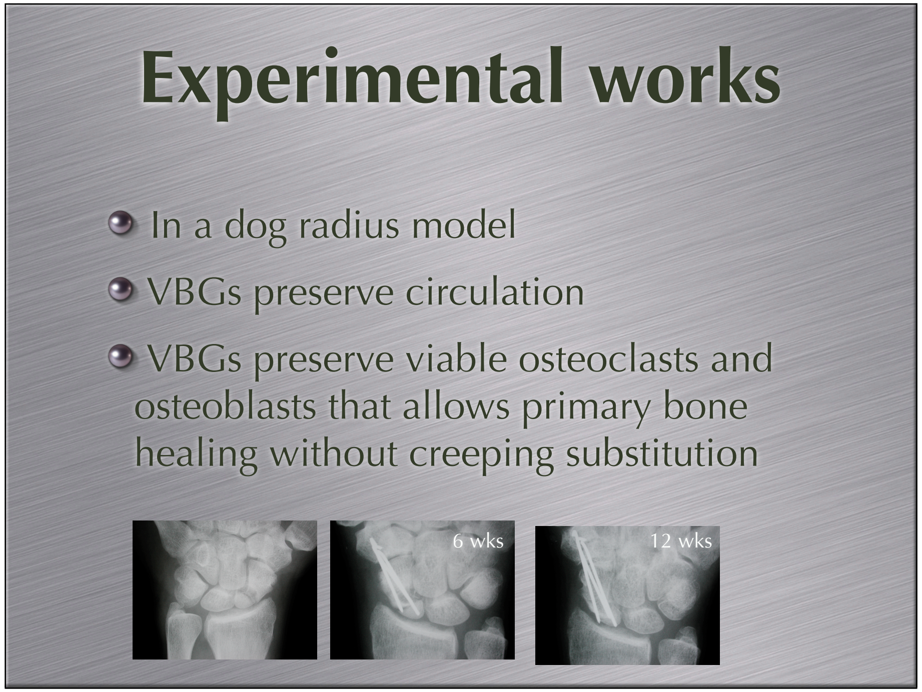


There are also rare diseases with compromised vascularisation whose treatment may be improved by VBG's.

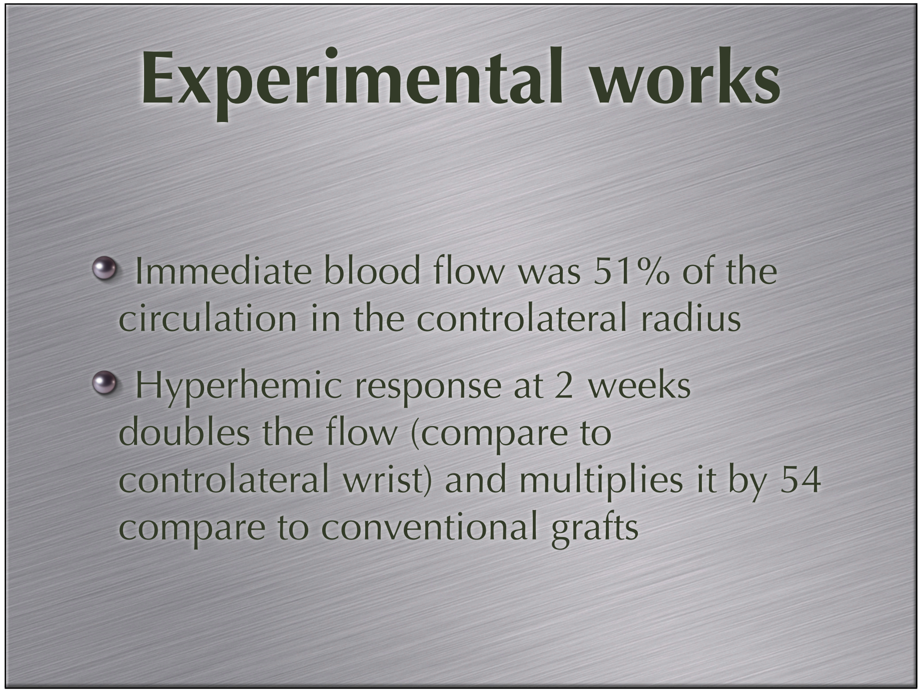
Is there any rationale for VBG's ?

- Conventional bone grafts loose a significant part of their solidity in the process of "creeping substitution" and only recover it very slowly, in one year or two
- Conservation of the endostal vascularisation authorizes an osseous healing of first intention by osteogenesis

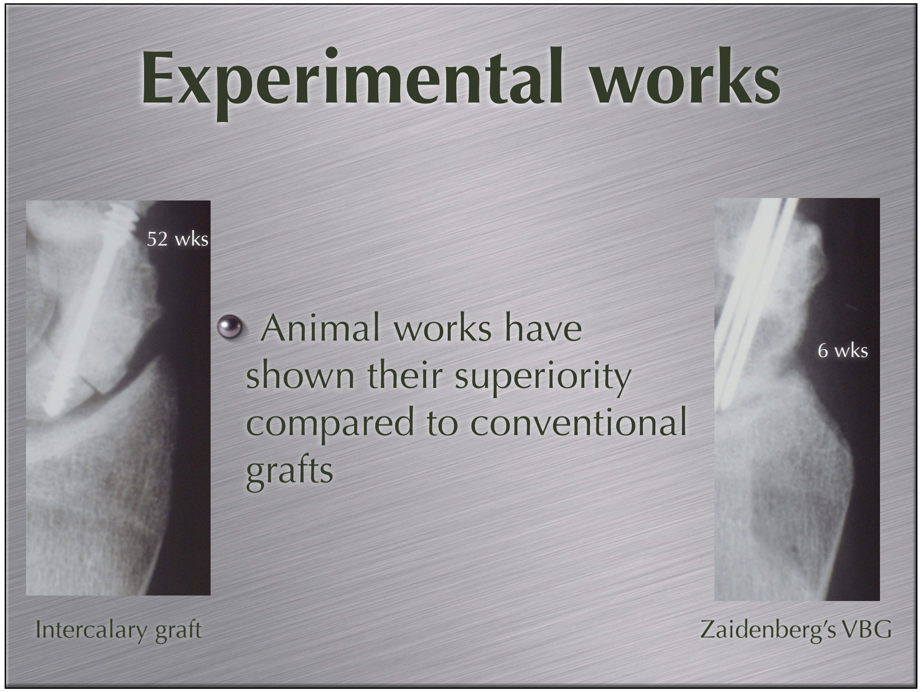
Why using VBG's ? Normal healing with conventional bone graft is associated with a long period of bone fragility while vascularized bone grafts may heal by normal osteogenesis. Experimental works support these hypothesis



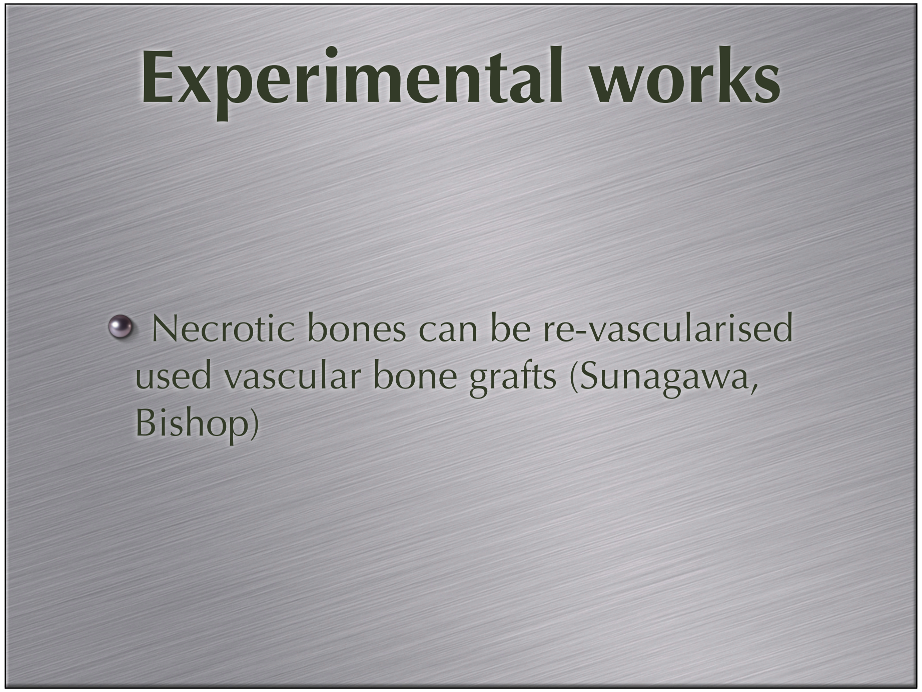
The experimental works done by the Mayo team have shown that VBGs maintain their vascularisation and were able to deliver blood in the recipient area. VBGs also maintain viable cells that can promote “normal” healing.



The vascular inflow was maintained and even increased during evolution and was largely superior to the arterial inflow observed in conventional grafts



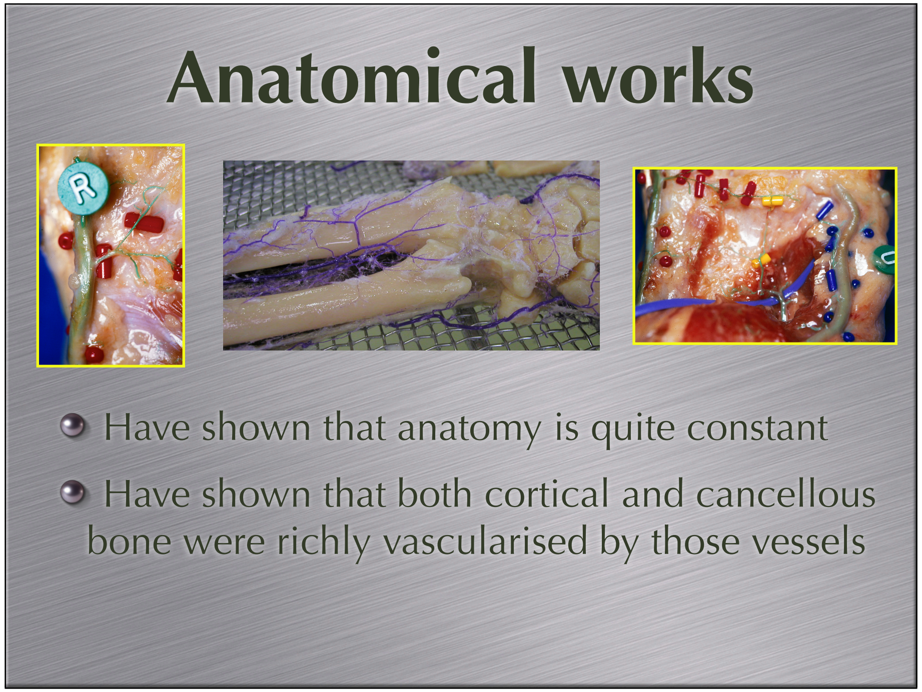
and in the experimental models, vascularised bone grafts prooved to be superior to conventional



Experimental works have also shown that necrotic bone can be re-vascularised used VBGs.

What are the VBGs available to us ?

Since first description of a vascularised bone graft pedicled on the pronator quadratus by Raymond Roy-Camille, a famous spine surgeon, little has been published until the 90's.
Anatomical works of Kuhlman on the vascularisation of the volar radius, of Zaidenberg on the vascularisation of the dorsal radius, and of various authors of the metacarpals are the basis of the surgical techniques.



One main advance in the use of vascularised bone graft have been the anatomical works. They have shown us that arterial anatomy was rather constant and that both cortical and cancellous bone were irrigated through those vessels

Anatomical works

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

If precise and reproducible anatomical landmarks exist, it is then possible to raise vascularised bone grafts with some confidence on their vascularity and if the pedicle of the graft is long enough, to reach the carpal bones.

Available VBGs (1)

- Autogenous bone graft + free pedicles (Hori, Fernandez)
- Pronator quadratus based (Kawai)

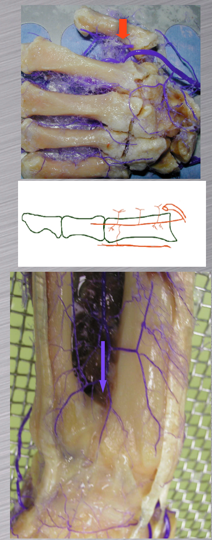
Available VBGs (2)

- Transverse carpal artery (Kuhlman, Mathoulin)
- I-II intercompartimental (supraretinacular) artery (Zaidemberg)
- IV-V intercompartimental artery (Sheetz)

The most used VBG's are based either on the transverse carpal artery on the volar side of the wrist, either on intercompartimental arteries localised on the dorsal wrist.

Available VBGs (3)

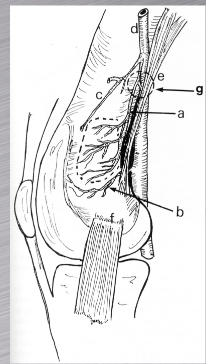
- First dorsal intermetacarpal artery
  - 1st metacarpal bone (Yuceturk)
  - 2nd metacarpal bone (Bertelli, Brunelli,
- Joint transfer (radio-ulnar, Trapezio-metacarpal joint) (Roux)
- Ulnar artery (Guimberteau)



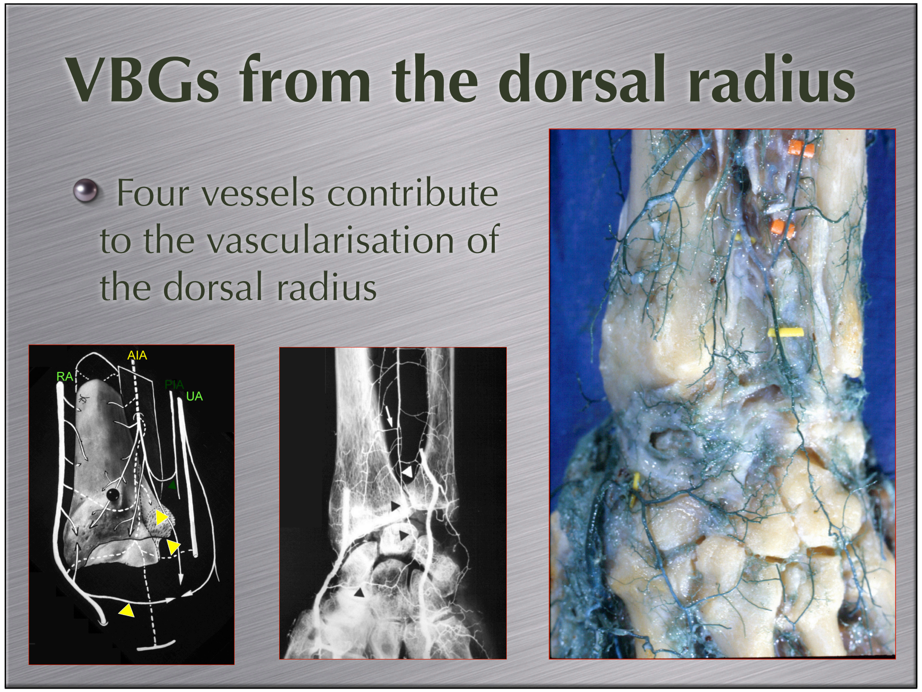
Metacarpal bones are less frequently used. Other VBGs are scarcely reported.

Available VBGs (4)

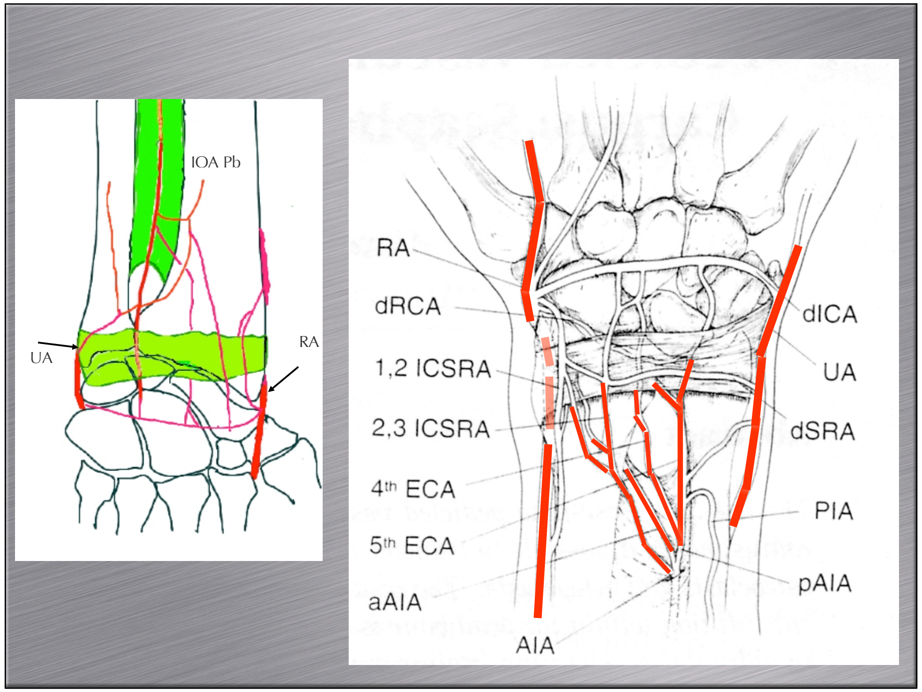
- Free vascularised bone grafts
  - Iliac Crest (Gabl 1999)
    - 27 cases, 85% union (9 yrs FU)
  - Supracondylar ridge (Doi, 2000)
    - 10 cases, 100% union (3,2 yrs FU)



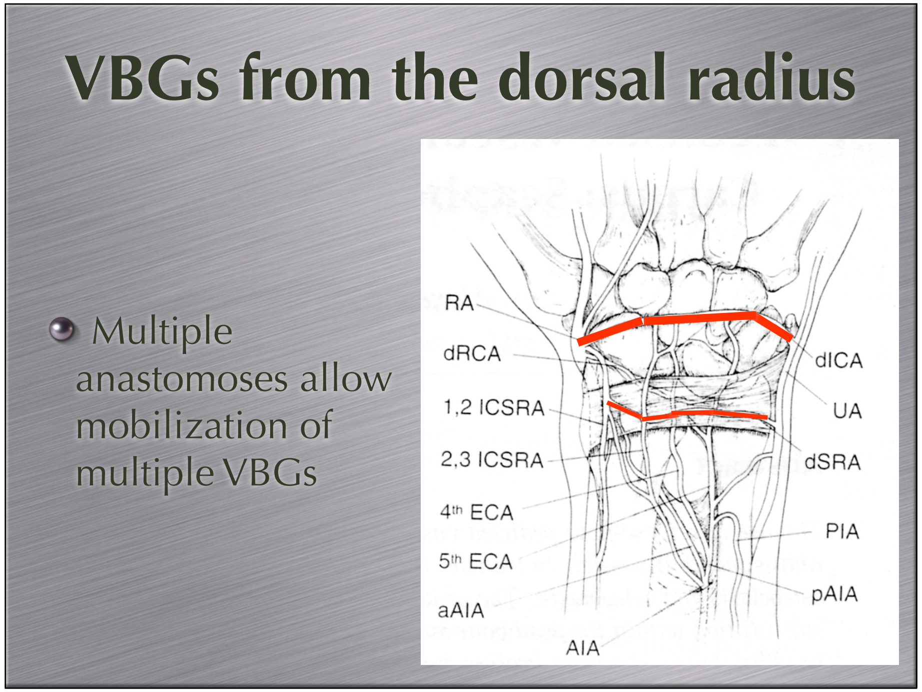
Free vascularised bone grafts have also been reported but I have no experience and won’t discuss their use.



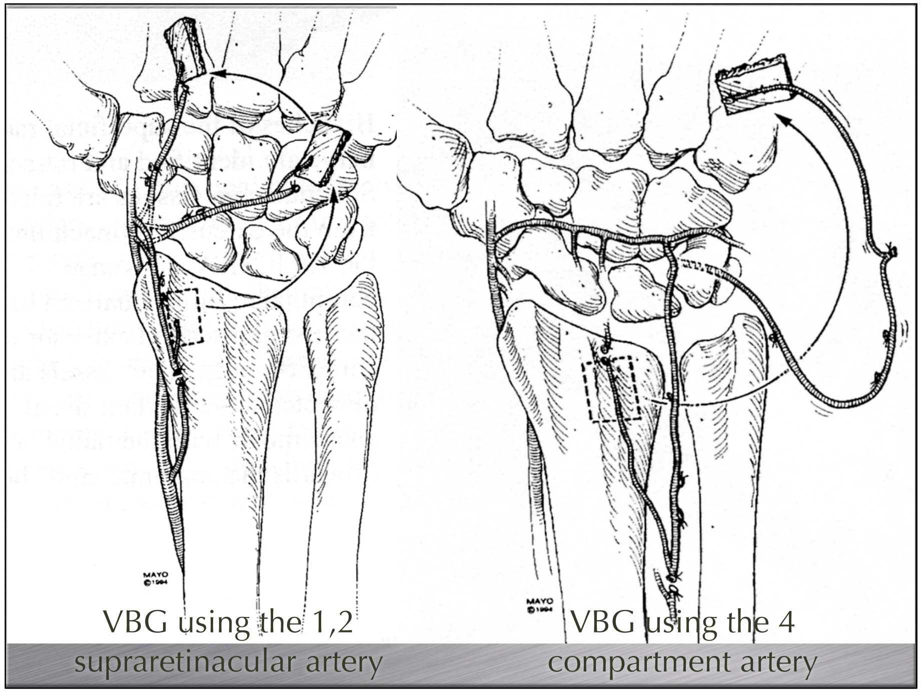
4 vessels contribute to the vascularisation of the dorsal radius:



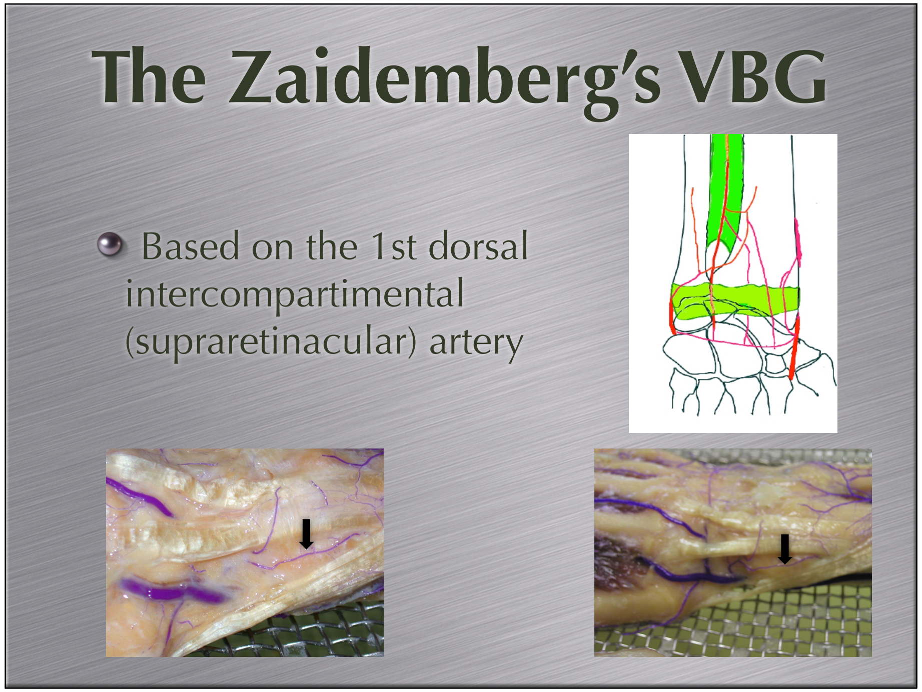
- radial artery
- ulnar artery
- the dorsal branches of the anterior interosseous artery
- the posterior interosseous artery



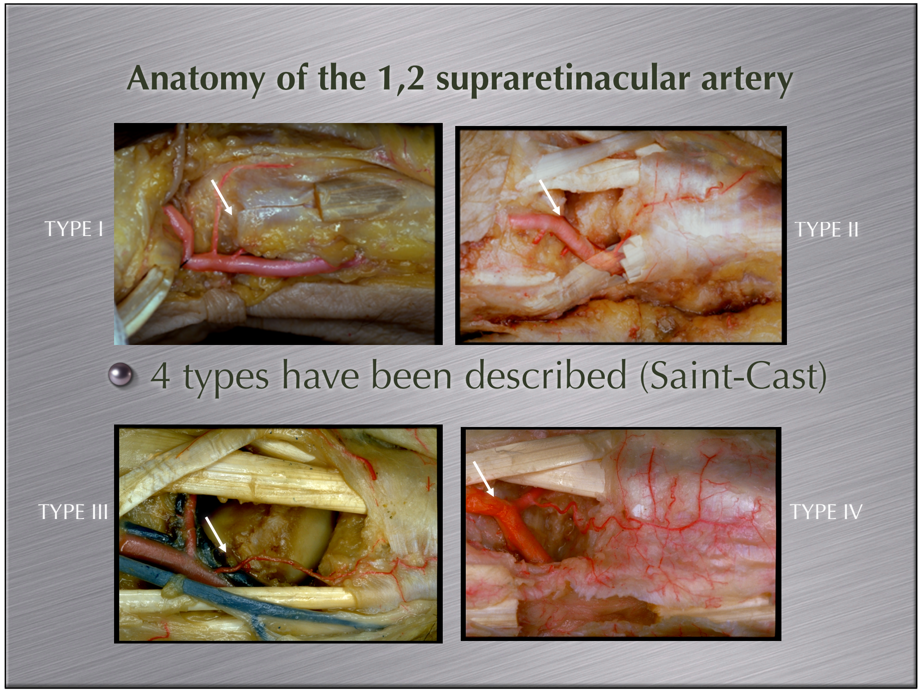
All those vessels are joined together through multiple anastomoses which permit the mobilization of multiple vascularised bone grafts.



From the dorsal radius, two main vascularised bone grafts have been used. One is based on the 1,2 supraretinacular artery, the other on the artery of the 4th extensor compartment



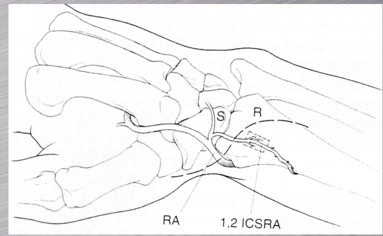
The mostly used VBG has been described by Zaidemberg and is based on the first I/II intercompartimental or supraretinacular artery



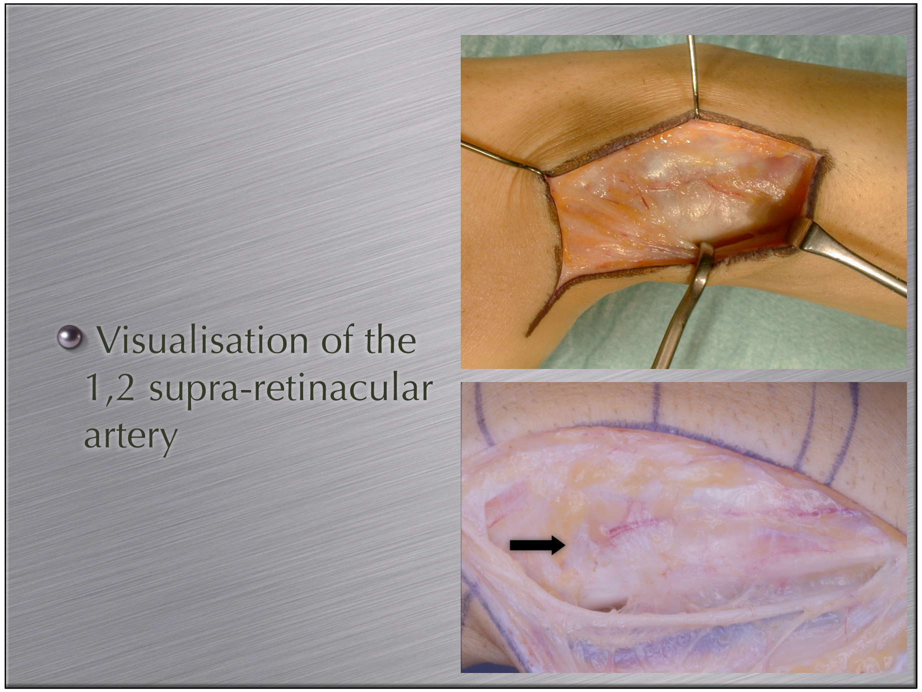
The 1,2 supraretinacular artery arise from the radial artery at the level of the anatomical snuffbox and 4 types of origin have been described.

Surgical technique

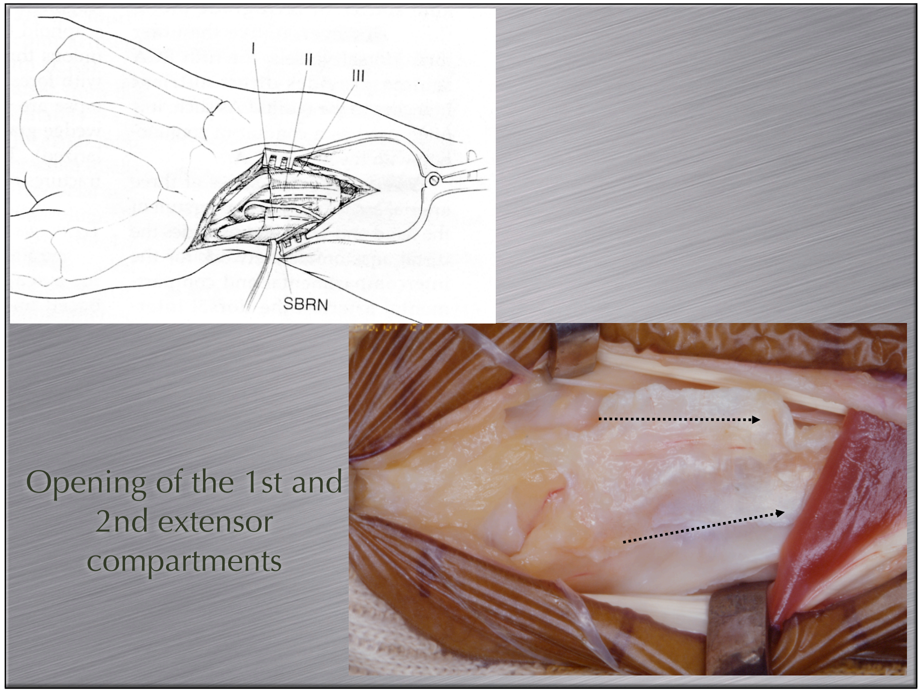
- Lazy S incision
- Protection of the radial nerve



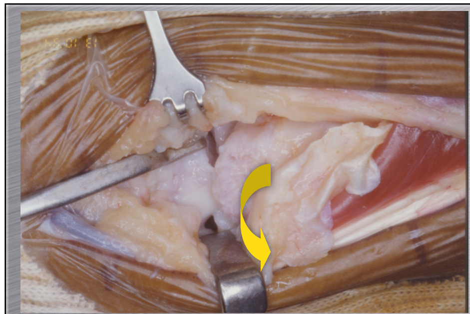
To reach the scaphoid, a lazy S incision is preferred



To reach the scaphoid, a lazy S incision is preferred

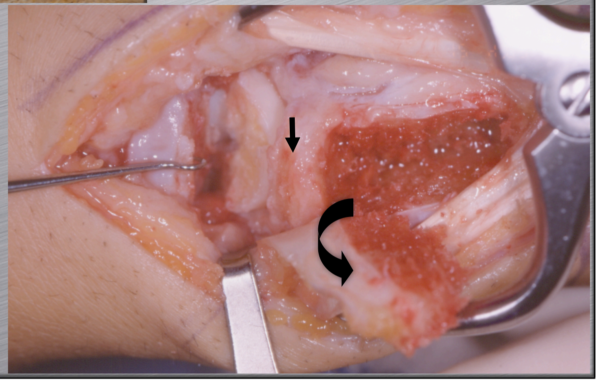


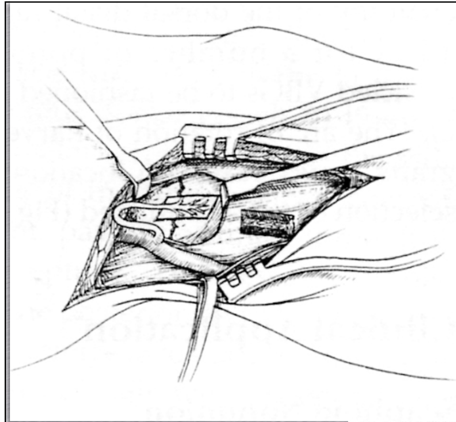
Then the two compartments are opened



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

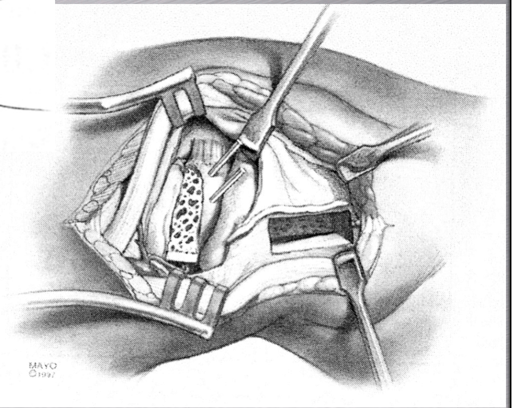
The VBG is raised from the radius
A styloidectomy is performed

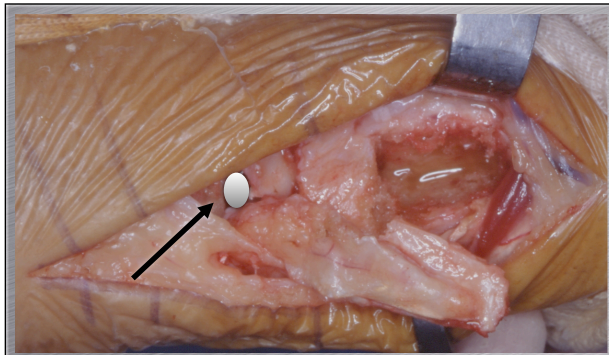




Graft is placed longitudinally if there is no bone loss

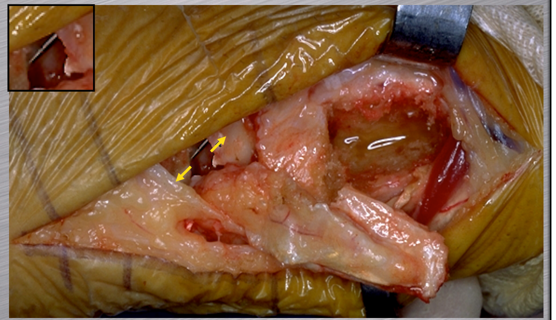
And introduced, transversally into a defect

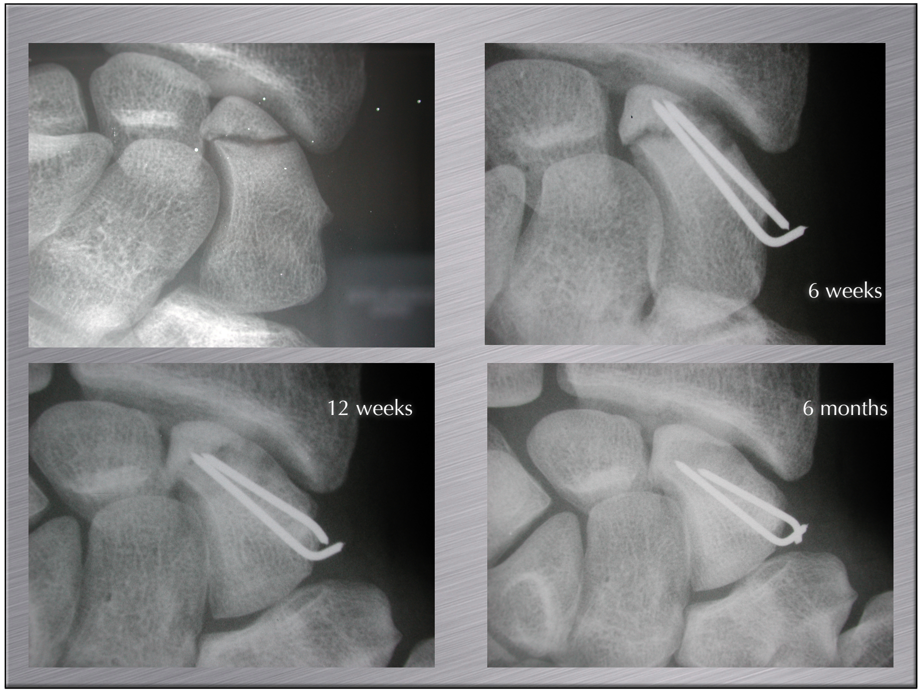




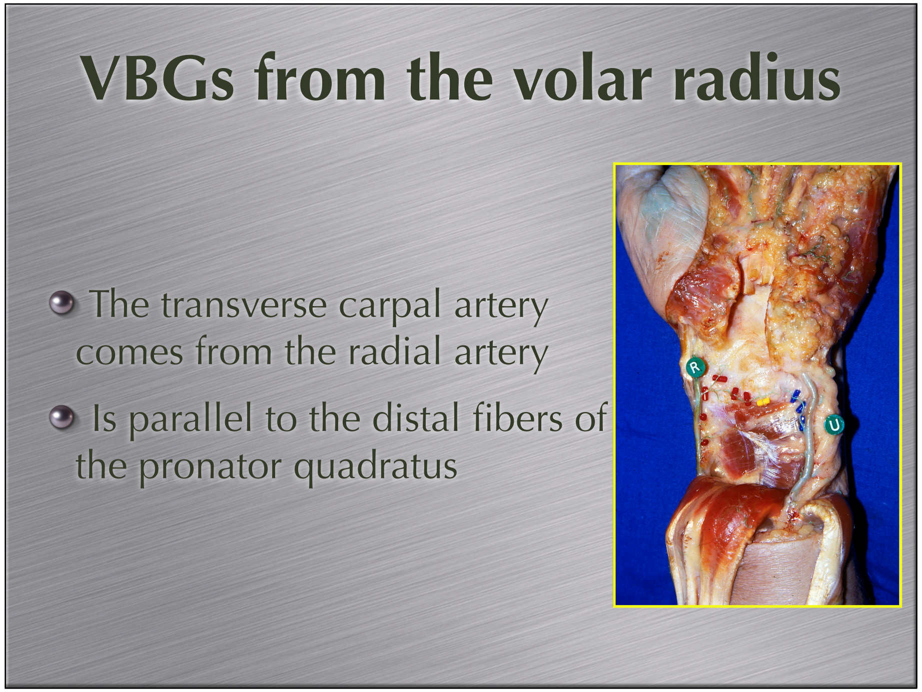
K-wires are then introduced

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

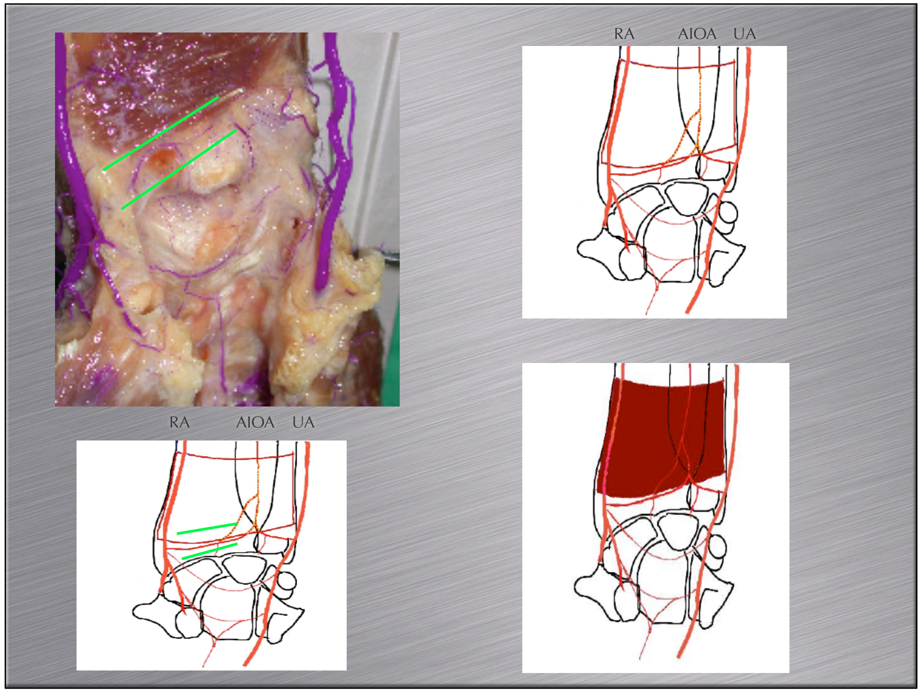




6 weeks
12 weeks
6 months

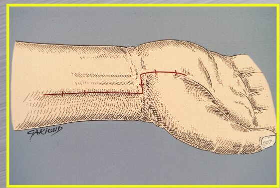


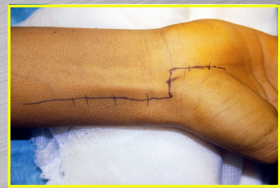
VBG from the volar radius are based on the transverse carpal artery that comes from the radial artery.



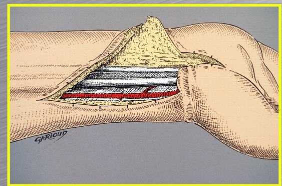
and anastomoses with branches from the ulnar artery and from the anterior interosseous artery.

Technique

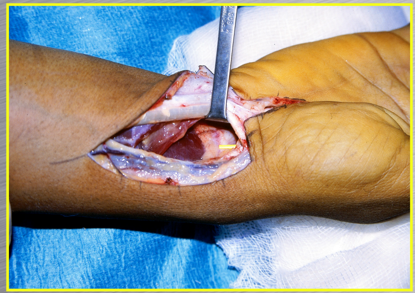




Volar Henry's approach



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



QuickTime™ et un
décompresseur codec YUV420
sont requis pour visionner cette image.

QuickTime™ et un
décompresseur codec YUV420
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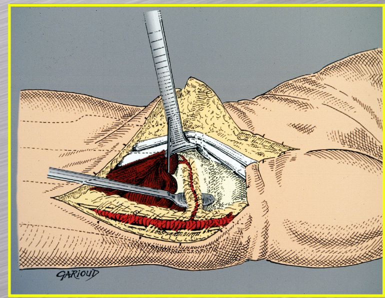

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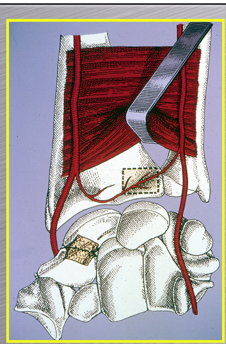

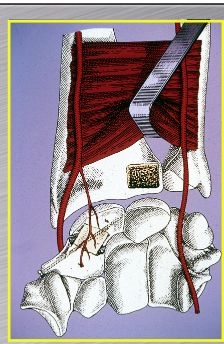

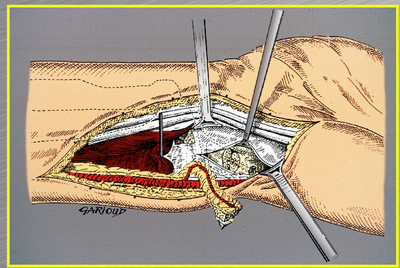

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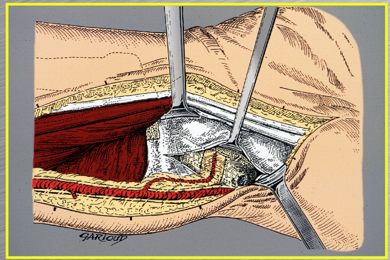

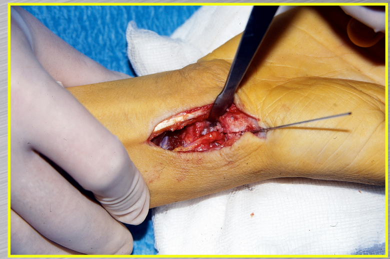

The graft is fixed by a K-wire, parallel to the scaphoid screw that is removed at 3 weeks

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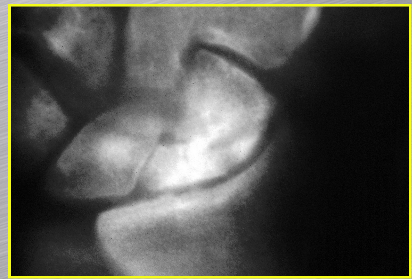
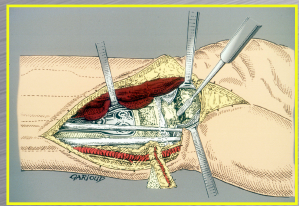
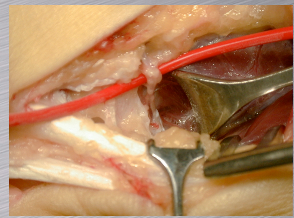
décompresseur codec YUV420
sont requis pour visionner cette image.

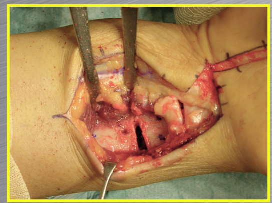
VBG from the volar radius for scaphoid non-union after failed conventional technique

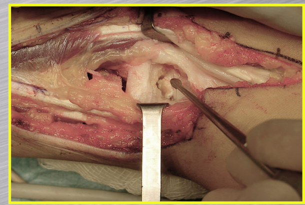


Technique



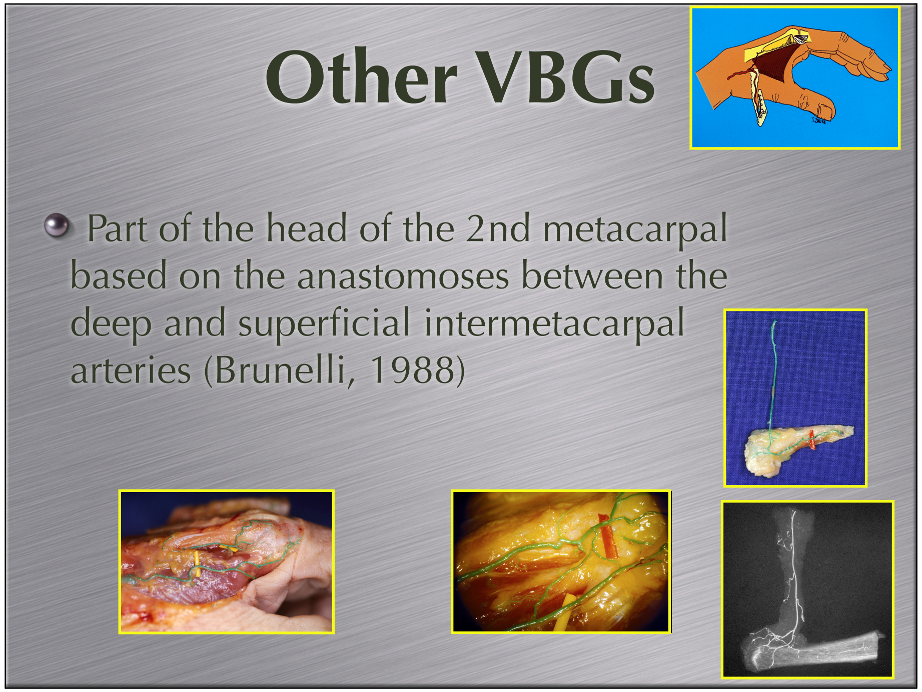




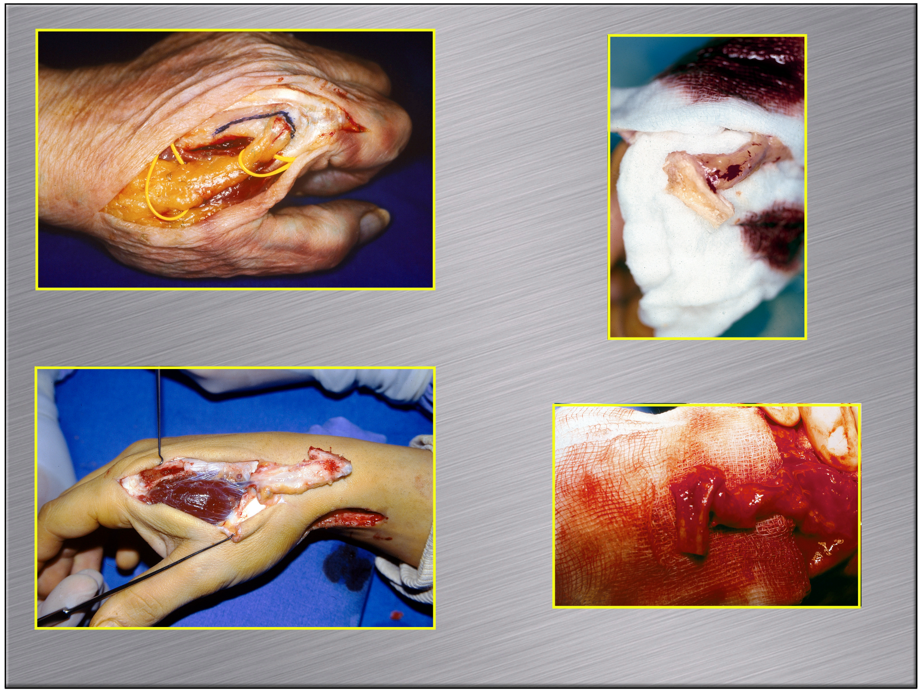


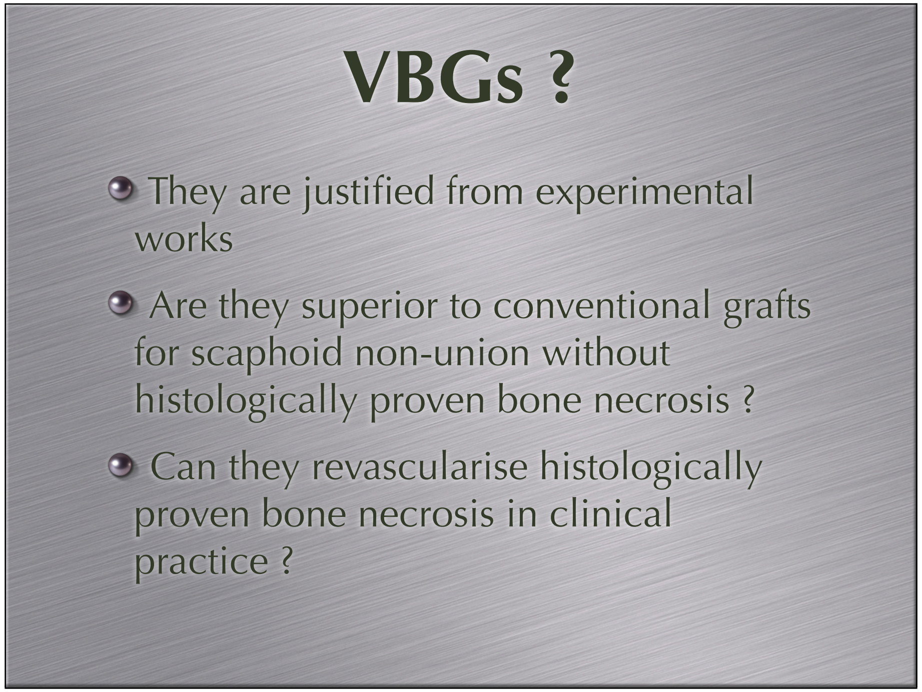
- Identical for Kienböck's disease



Other VBG's have been used from the second metacarpal and are based on the anastomoses between the deep and superficial intermetacarpal arteries.





VBGs are justified from experimental works. They are available from the anatomical works. However their real usefulness has yet to be proven in the clinical settings.

Thank you for attention