



Distal Digital Replantations

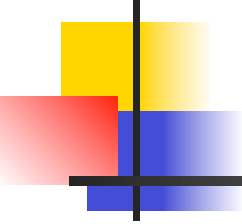
G. Dautel
SOS Mains
CHU Nancy





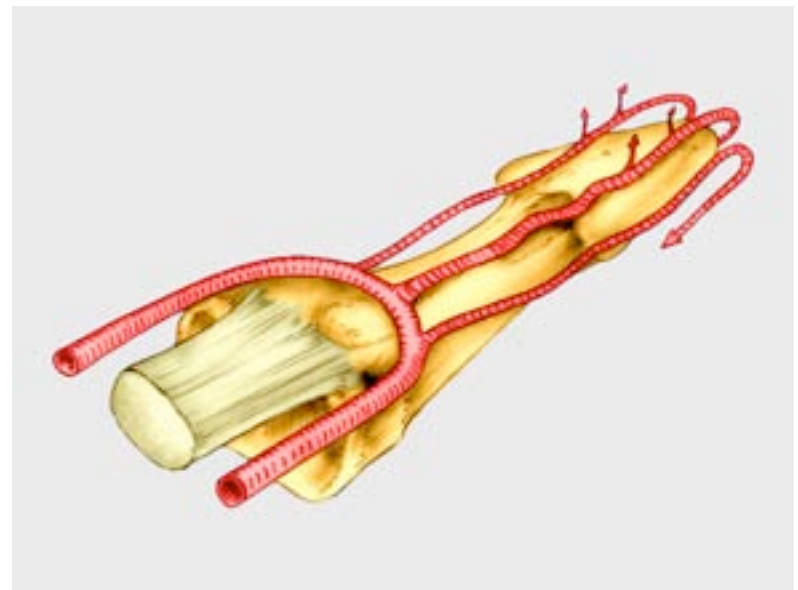
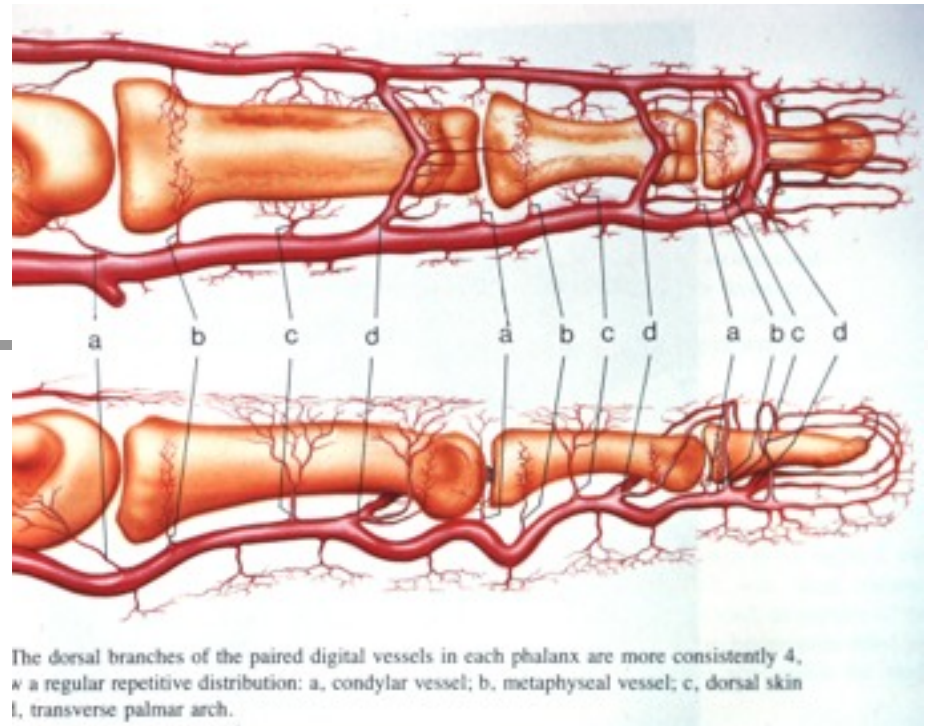
Definitions

- Complete amputations
- Through or distal to the DIP joint

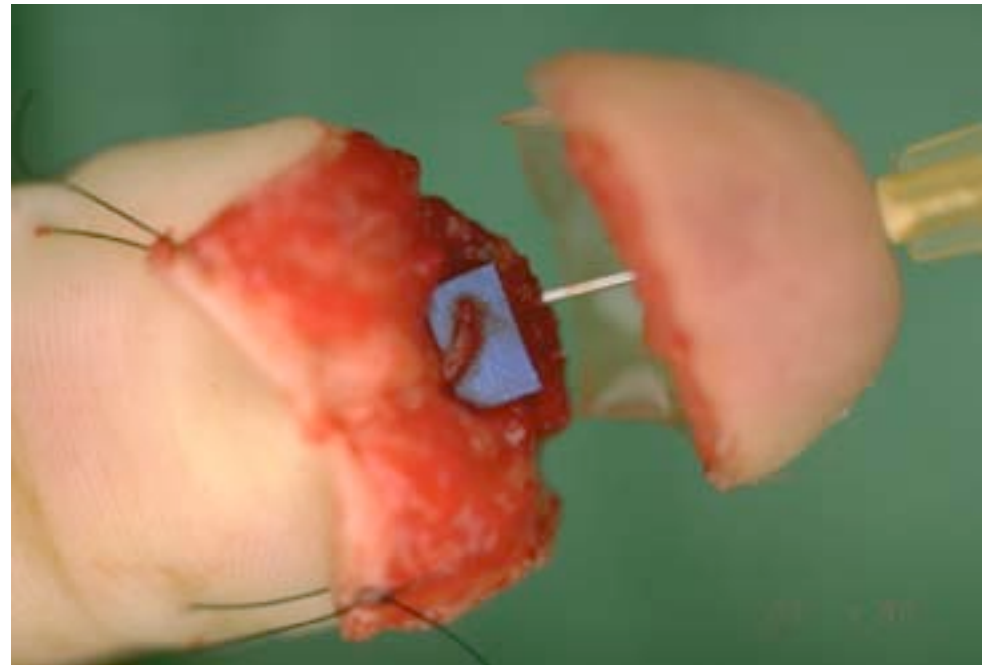
- 
-
- Anatomy
 - Aetiology
 - Level of amputation
 - Surgical Technique
 - Results in our series
 - Prognosis factors
 - Sensory recovery
 - Cosmetic results

Anatomy

- Collateral and terminal branches of the palmar digital arteries
 - Pulp arcade
 - Central artery of the pulp



Anatomy :terminal branches of the collateral arteries : suitable for anastomosis ?



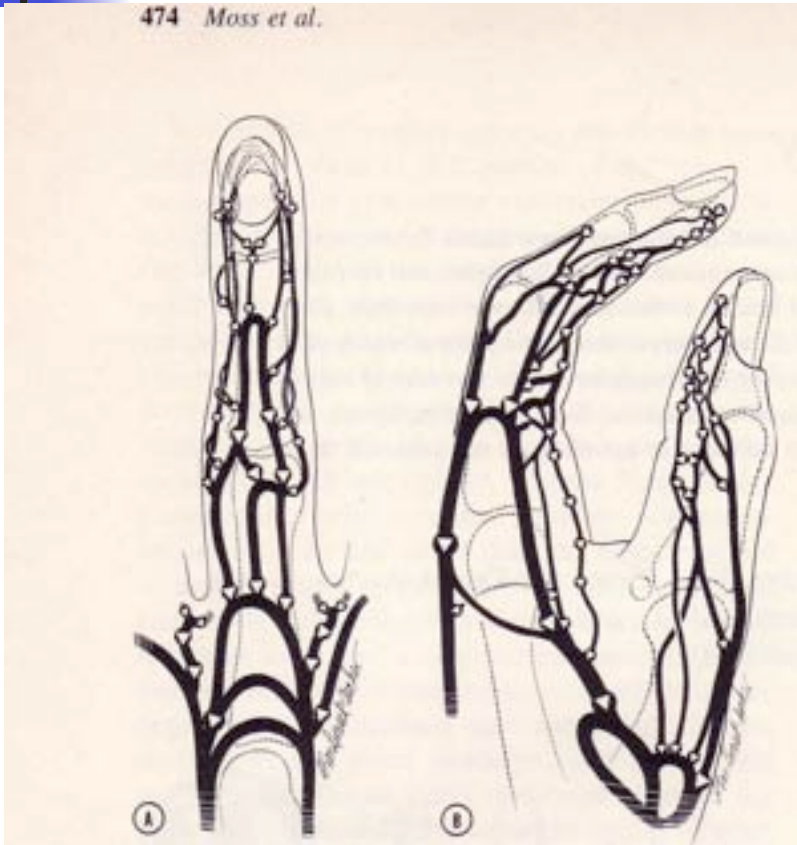
Anatomy : Palmar arteries

- Diameter
 - Collateral artery
 - Terminal branches
- Flexuosity



Anatomy : Dorsal veins

474 Moss et al.



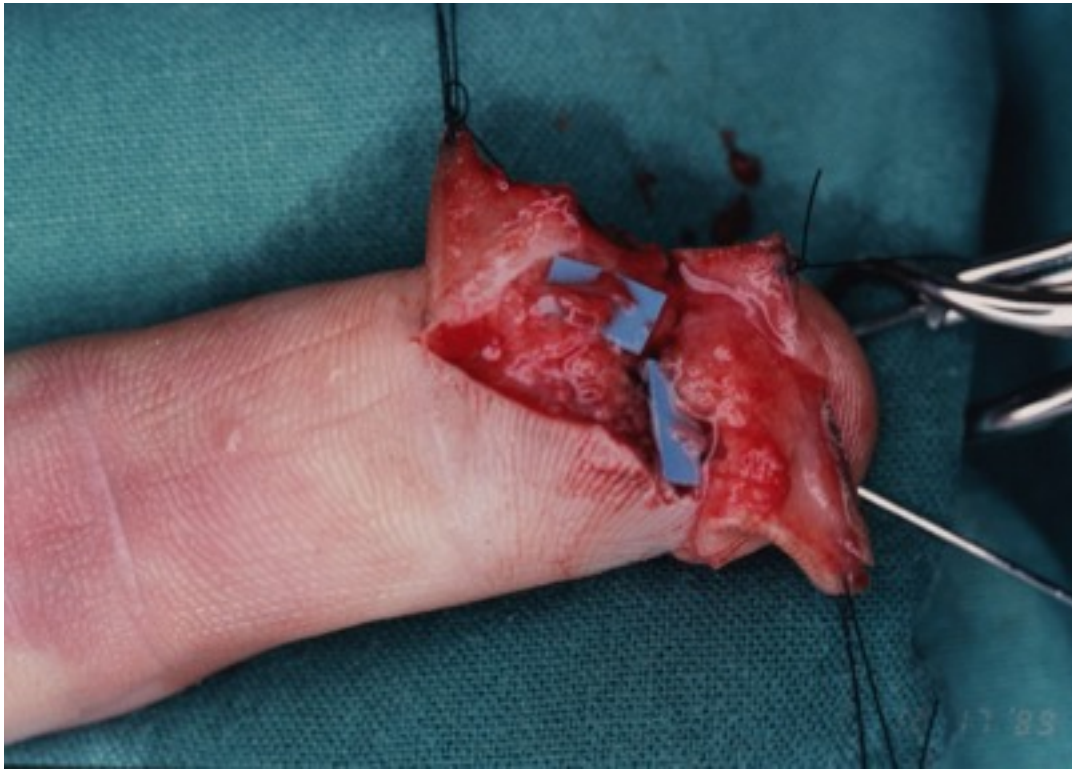
- Dorsal veins are available close to the proximal nail fold

Anatomy : Palmar veins



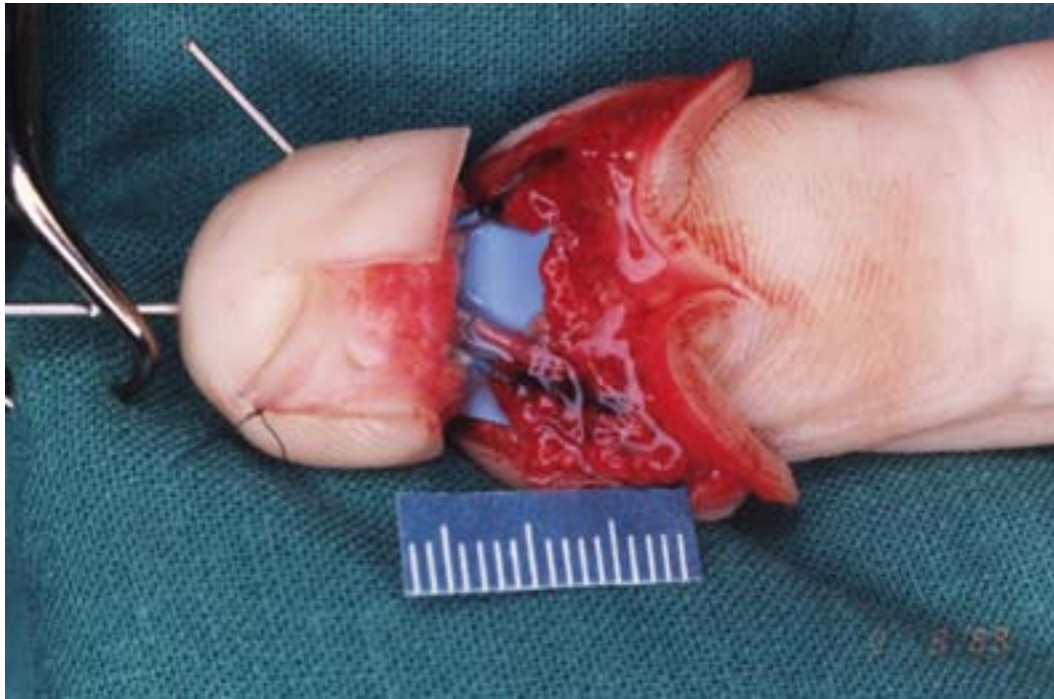
- Small diameter vessels (less than 0.5mm)
- Complex anastomotic network
- High density of valves

Anatomy : palmar veins : suitable for anastomosis ?



- Technically demanding...

Anatomy : *Palmar nerves*



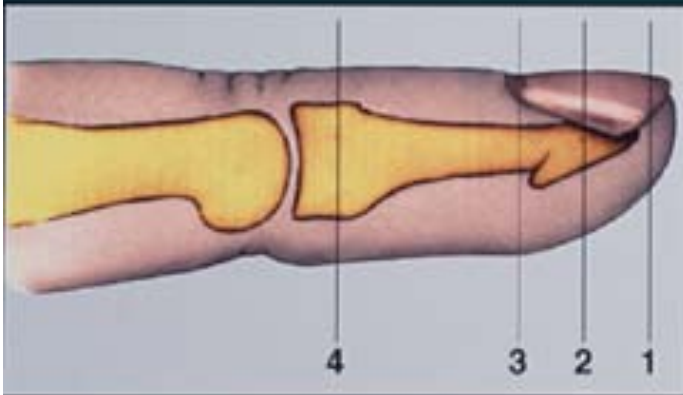
Terminal trifurcation of the palmar digital nerves :

Distal digital palmar crease...

Replantation without nerve repair : worth it ?

Adjacent and spontaneous neurotization after distal digital replantation in children; Faivre, Dautel et al, PRS, 2003

Level of injury



55%



31%



13%



Specific problems related to level of injury



Preserve the DIP joint

Find a vein (palmar ?)

Find the artery...

Mechanism



Mechanism :



Any

- YES !
 - Surgical strategy
 - Indications
 - Prognosis



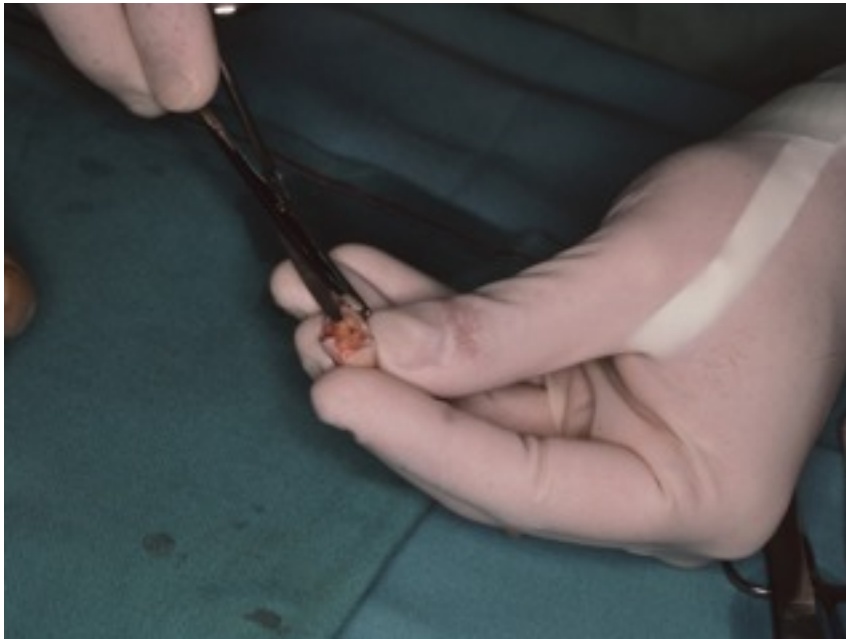
Surgical Technique

How to deal with a
distal replant
(Once indication is
established...)



1/ Preparation of the distal part

- Look to the fragment through optical magnification



- Check for mechanism of amputation
 - Avulsion or Crush : be prepared to bone shortening of vein grafting

1/ Preparation of the distal part

- Look to the fragment through optical magnification

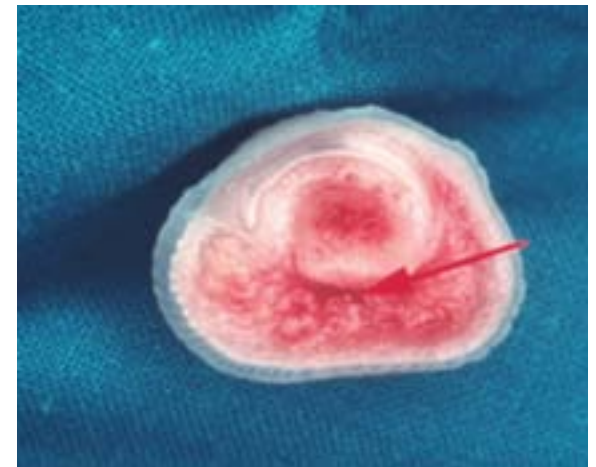


- Check for mechanism of amputation
 - Avulsion or Crush : be prepared to bone shortening of vein grafting



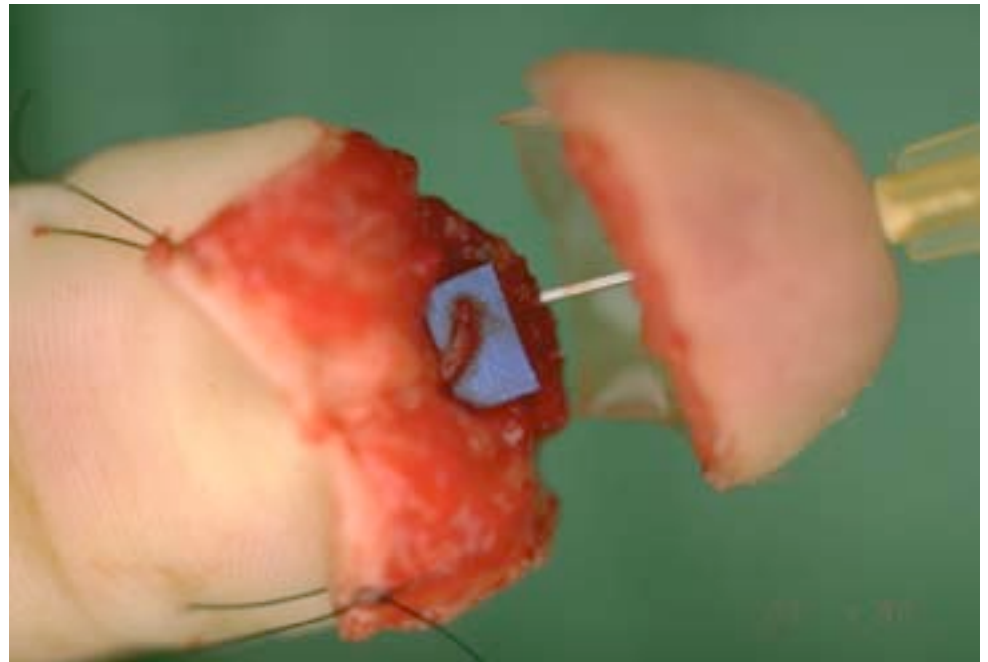
1/ Preparation of the distal part

- Spend time on exposure (skin retraction)
- Surgical approach
 - Midline palmar approach
 - Tsu min Tsai zig-zag approach
 - None...
- Tag the vessels and nerves



Preparation of the proximal

- Dissect and tag the vessels and nerves
- Adequate exposure using stitches for skin retraction

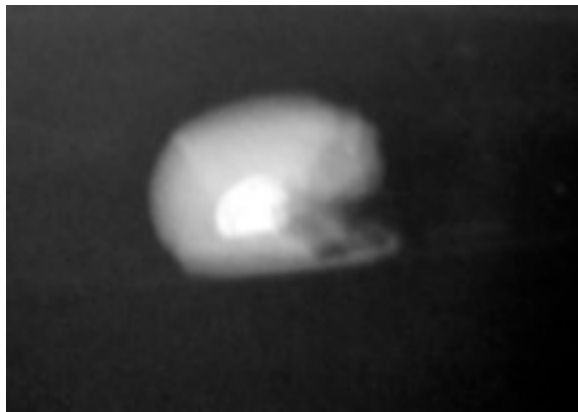


Bone shortening and Osteosynthesis

- Minimal bone shortening
- Kwires or hypodermic needles
 - Caution with power drills



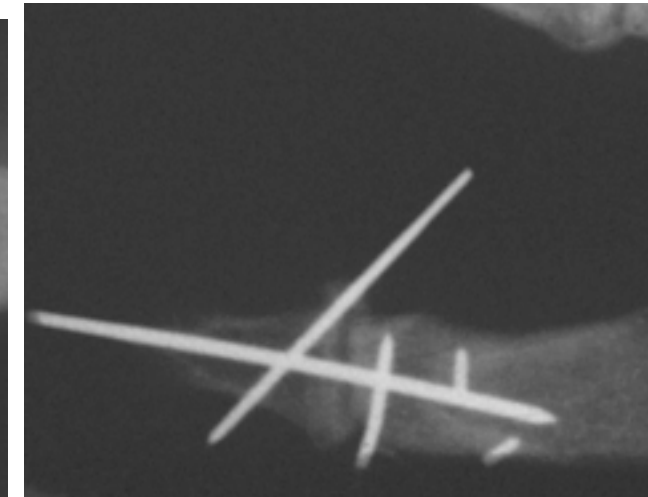
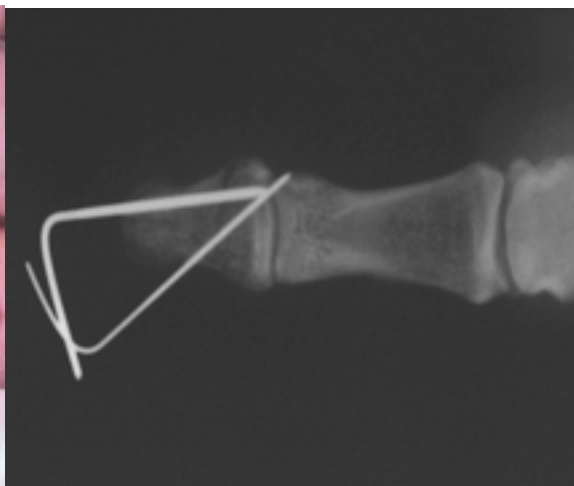
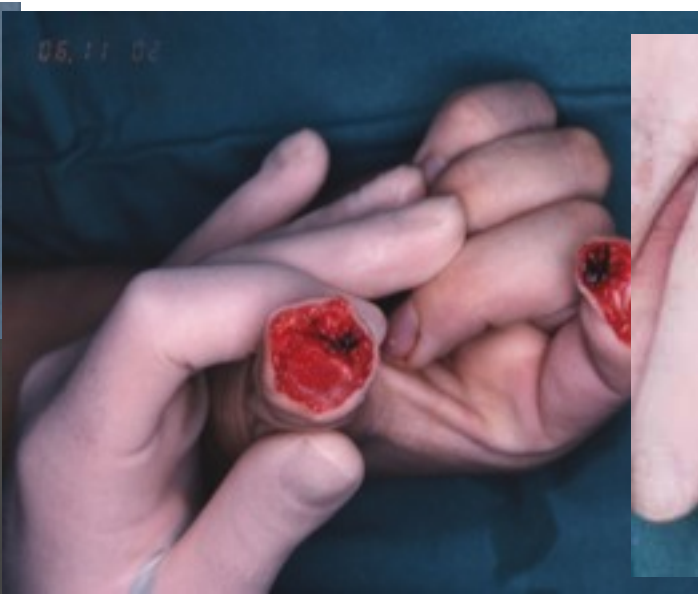
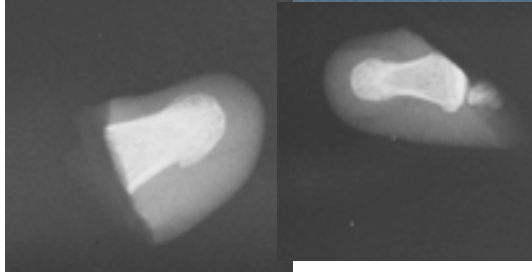
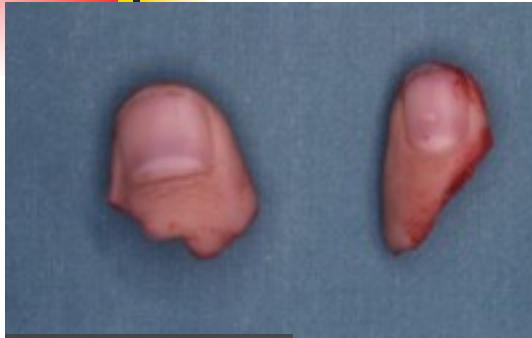
Do not fuse the DIP joint unless it is necessary



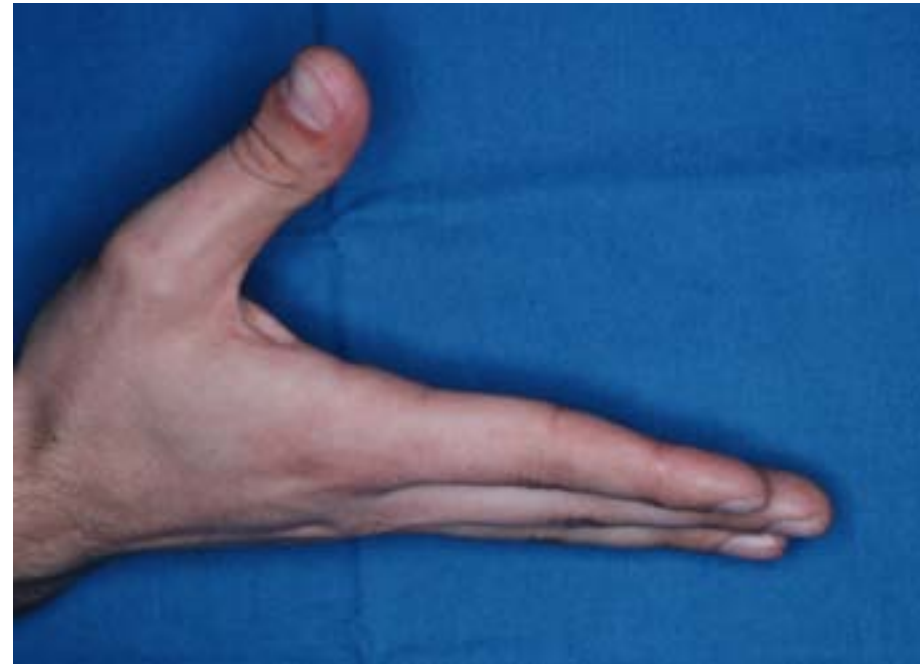
- Transient DIP fusion is not required for fixation of small distal fragments



When the level of section is close to the DIP, this joint can still be sparred



When the level of section is close to the DIP, this joint can still be sparred



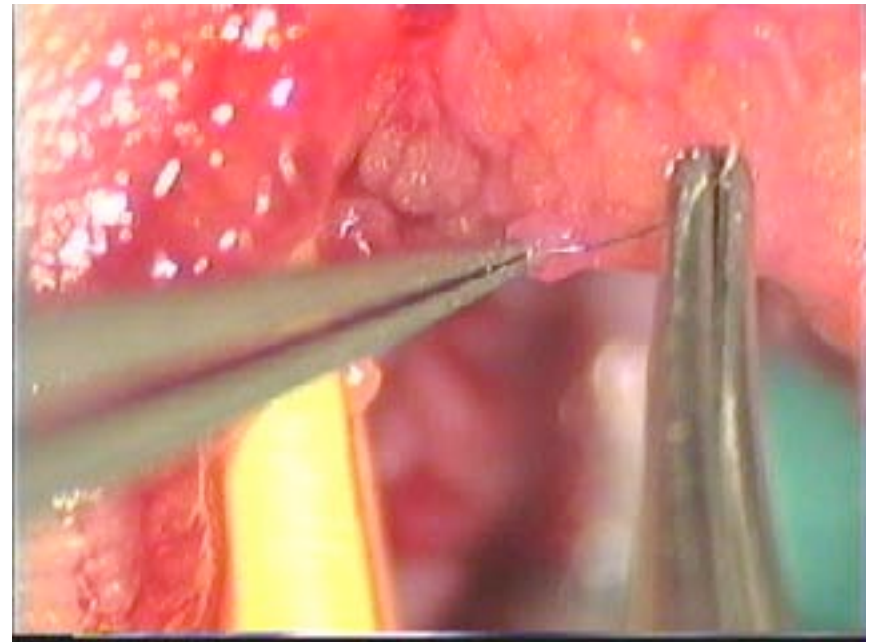
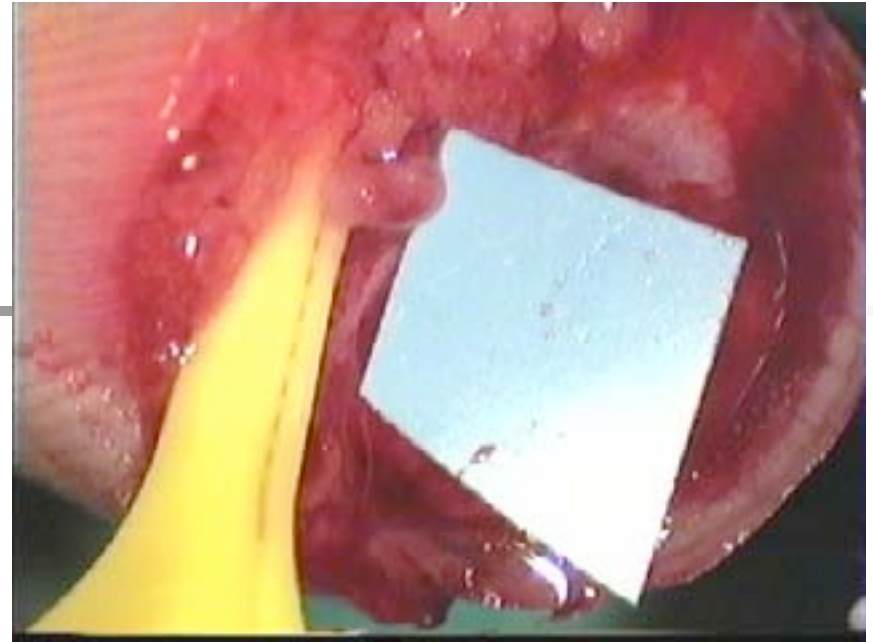


Reestablish arterial inflow

- Repair the selected artery
- Check arterial inflow prior to suture by releasing the tourniquet if required
- End to end suture :
10/0 or 11/0 nylon

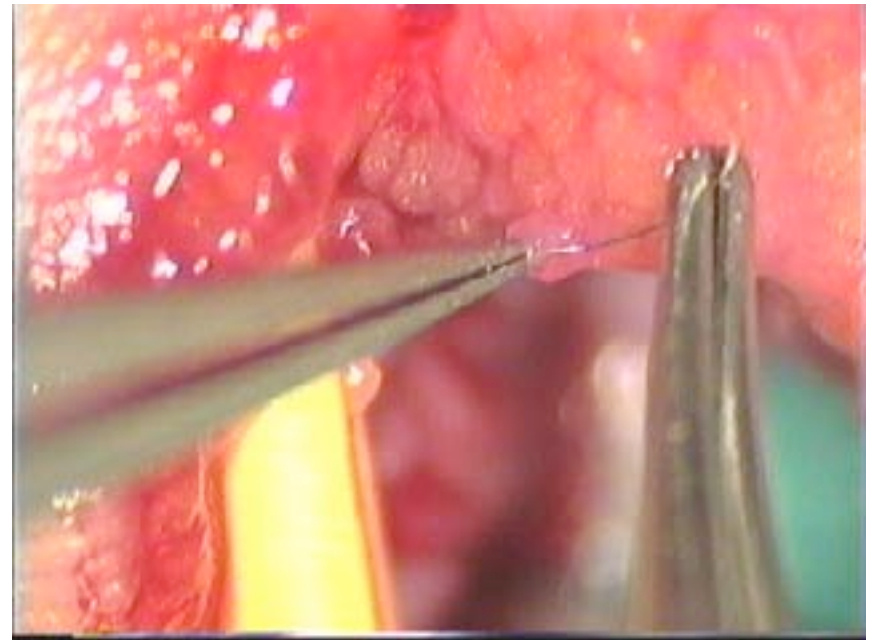
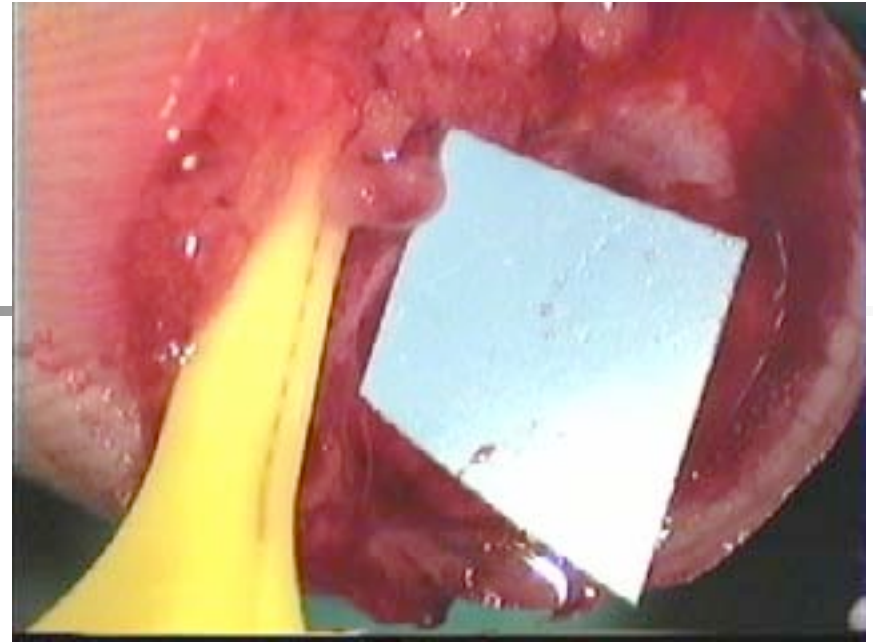
Reestablish arterial inflow

- Repair the selected artery
- Check arterial inflow prior to suture by releasing the tourniquet if required
- End to end suture : 10/0 or 11/0 nylon



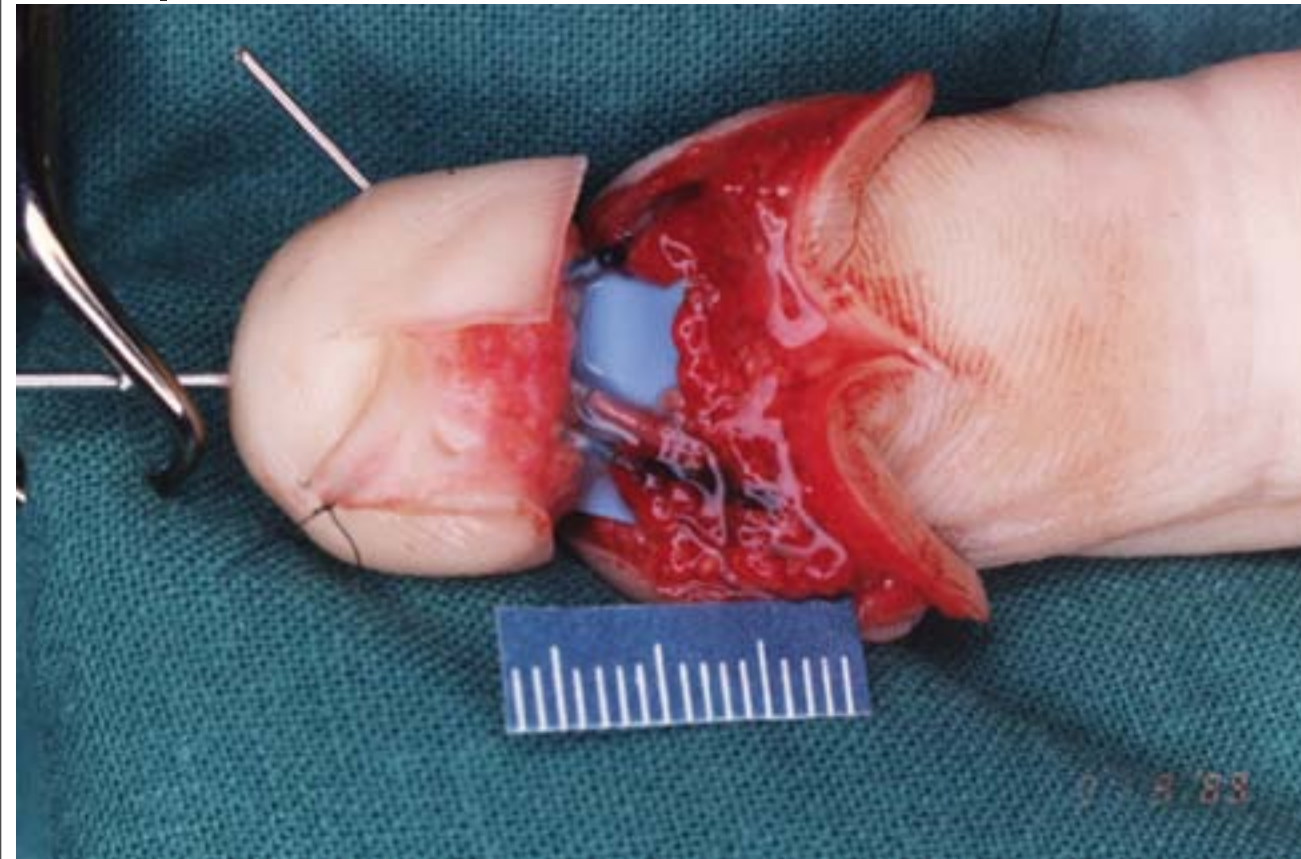
Reestablish arterial inflow

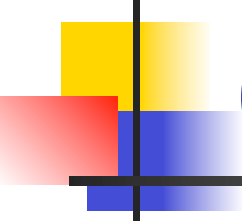
- Repair the selected artery
- Check arterial inflow prior to suture by releasing the tourniquet if required
- End to end suture :
10/0 or 11/0 nylon



Nerves Repair

- End to end repair of the collateral nerve
- Repair of the terminal branches of the collateral nerve



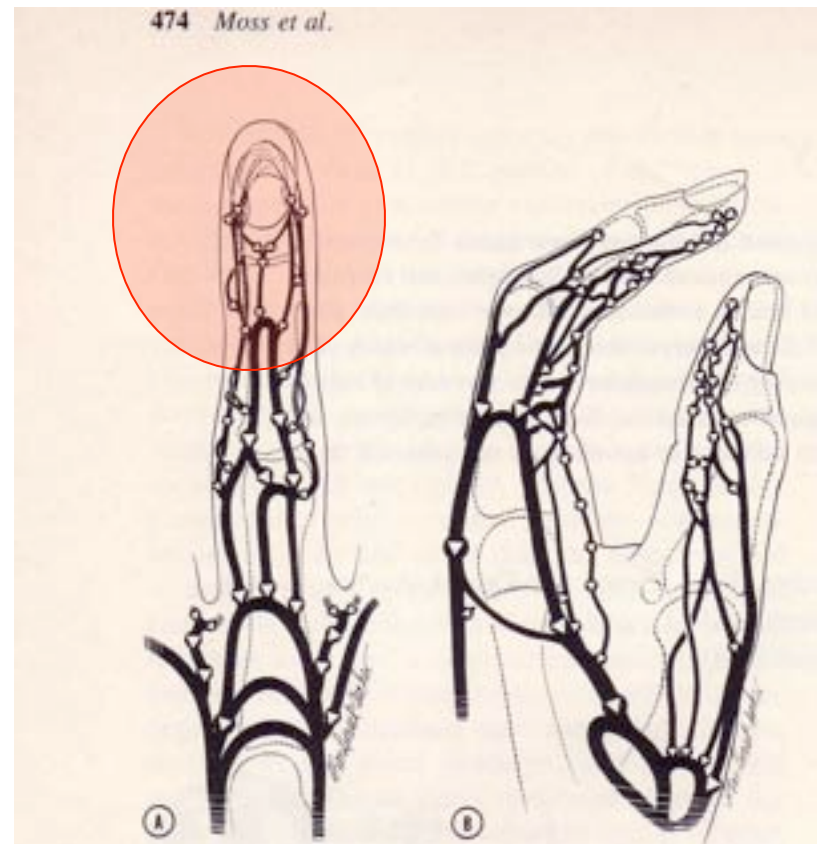


Perform venous anastomosis (when feasible)

- First option : Dorsal vein repair
- Second option : Palmar vein repair
- Third option : controlled bleeding of the replanted part

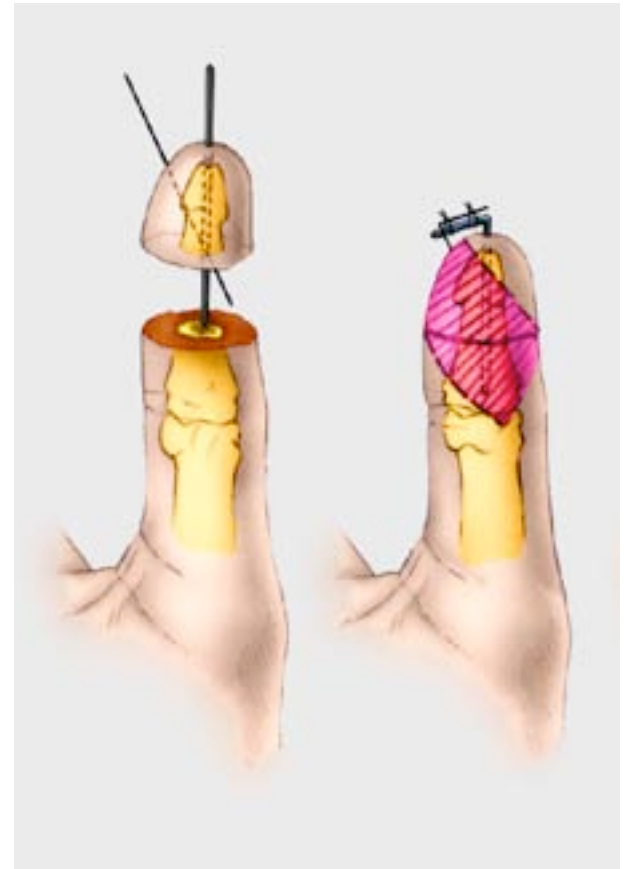
Venous outflow

- Dorsal vein repair
 - One or two veins ?
- Bipolar coagulation of all other draining veins...



Venous Outflow : palmar vein Repair

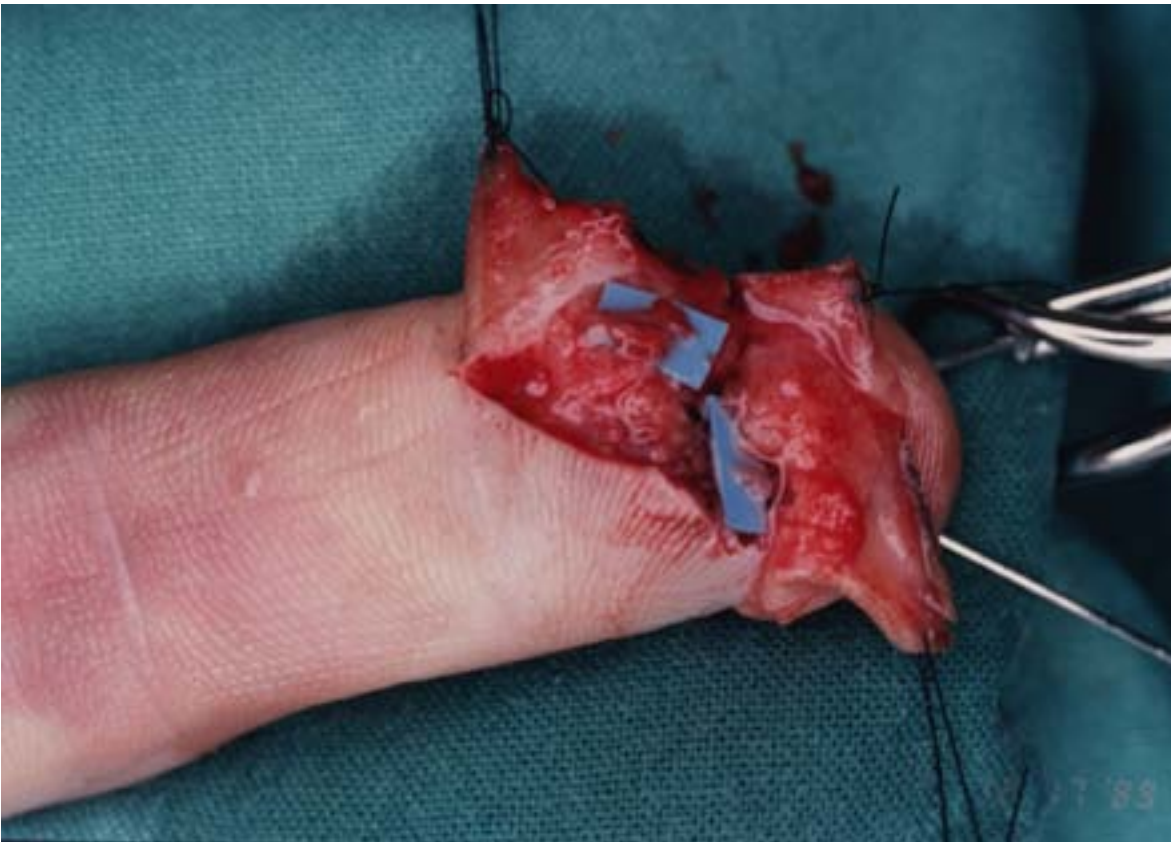
- Tsu-Min-Tsai approach



Raise the triangular flaps in the subdermal plane

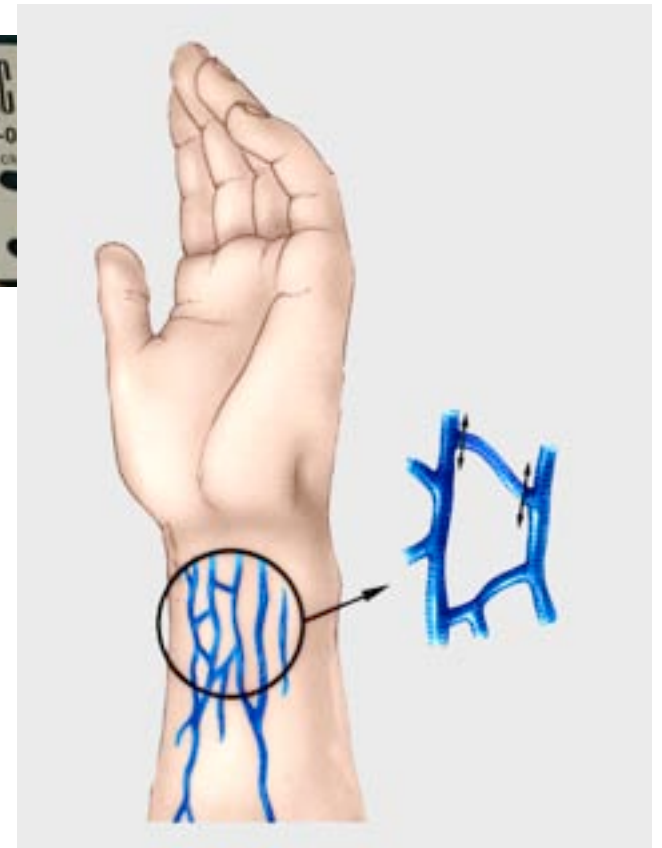
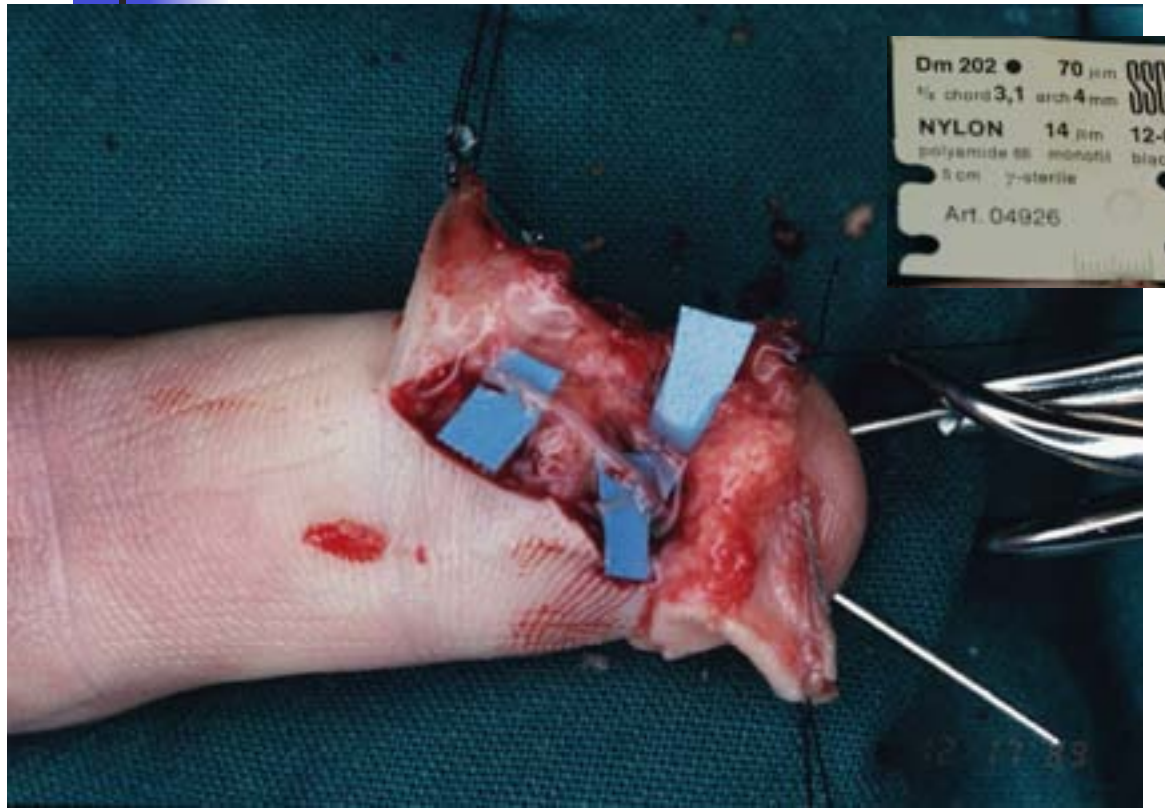


Palmar vein repair



- Release the tourniquet for a few seconds to « refill » the palmar venous network

Palmar vein repair

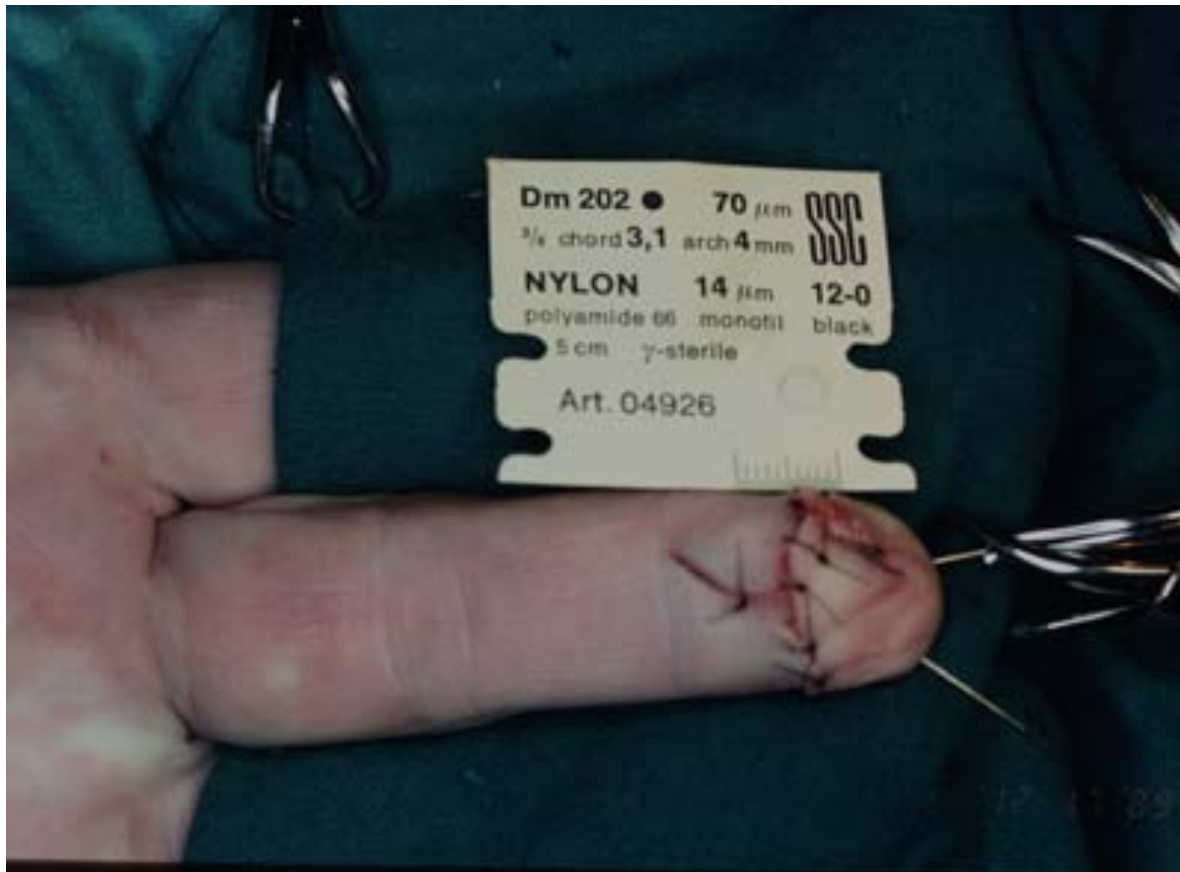


- Perform either a direct suture or use a vein graft

Release the tourniquet and check the replanted part for evidence of capillary refill



Skin closure should avoid



- Excessive tension
- Useless « deadspace »

Post-op regimen

- Bulky dressing
- Constant room temperature
- Prevent pain
- Aspirin
- Low weight heparin



Be prepared to vascular spasms...

- « Second look » or Revision surgery in distal replants ??



Controlled bleeding of the replanted part (replantation without venous suture)

- Every hours on day 1
- Every 2-3 hours on day 2
- Every 4-6 hours on day 3...
- Stop : D4-D6



Monitor the replanted part to adapt bleeding



Too slow...



About fair...



Too late...

Dressing : Never remove the « deep layers » of the dressing before D 15



Superficial necrosis doesn't mean complete failure of the replant...



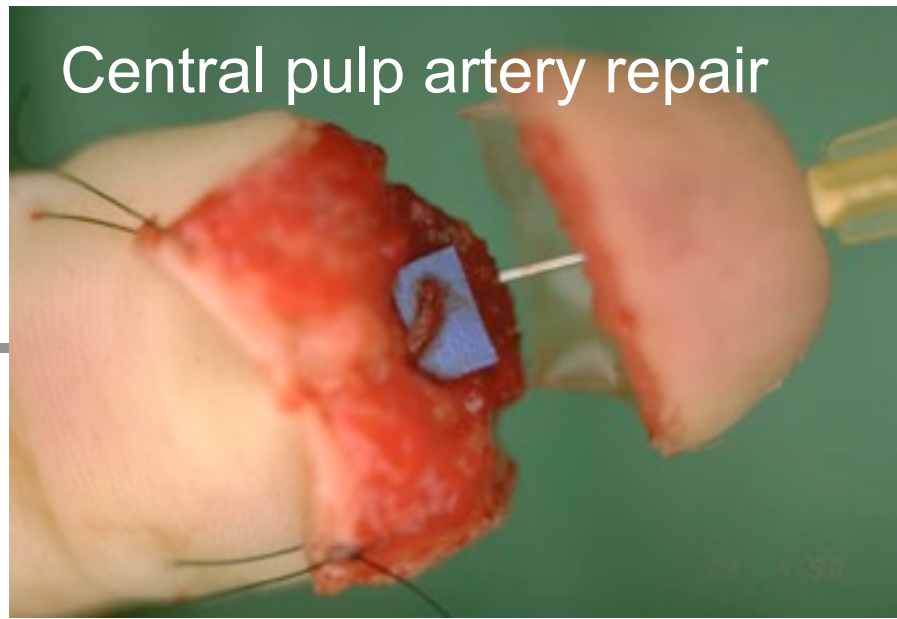


Clinical Cases...

7 y.o. crush injury

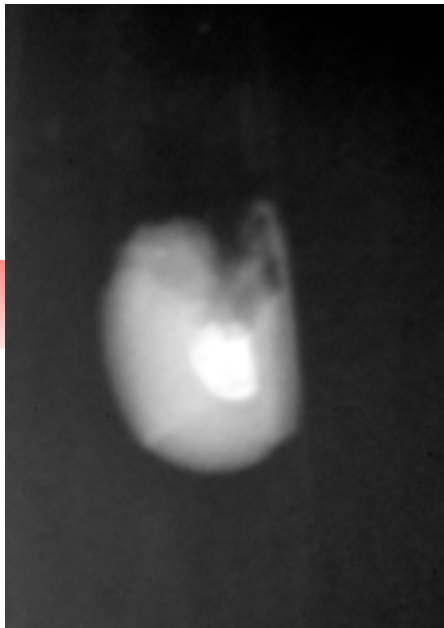


Central pulp artery repair



10 years follow-up



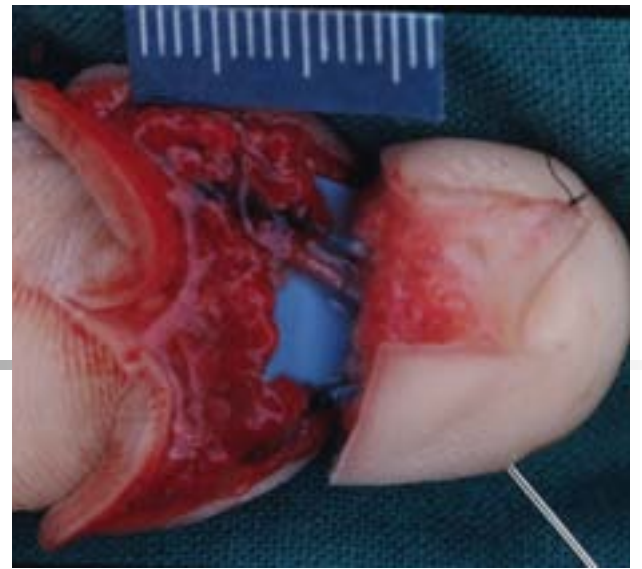


52 yo male
patient,
smoker,
crush injury



6 yo, sharp section right middle finger,
« artery+vein replant »







Results

- Success Rate
- Cosmetic results
- Sensory Result

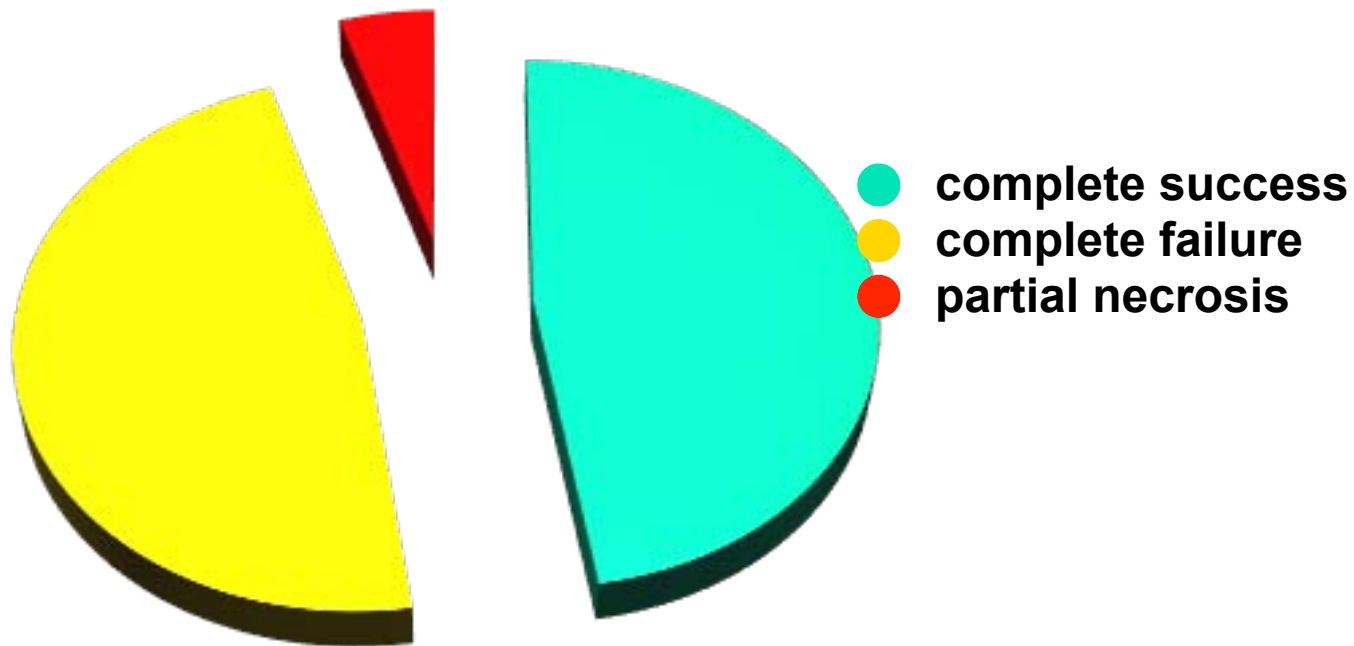
Fingertip replantation in children : G. Dautel, Hand Clinics, 2000, 16 (4), 541-546

Replantations digitales distales . A propos d'une série de 61 cas.
G. DAUTEL, A.P. FERREIRA, D. CORCELLA, M. MERLE.. *La Main*, 1997,2,329-335



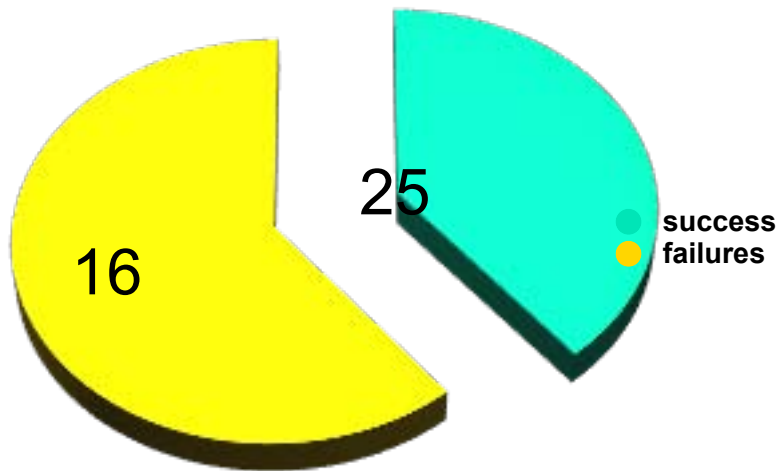
Overall Success Rate

- Clinical series :
 - 61 attempted fingertip replantations
 - 7 hand surgeons involved

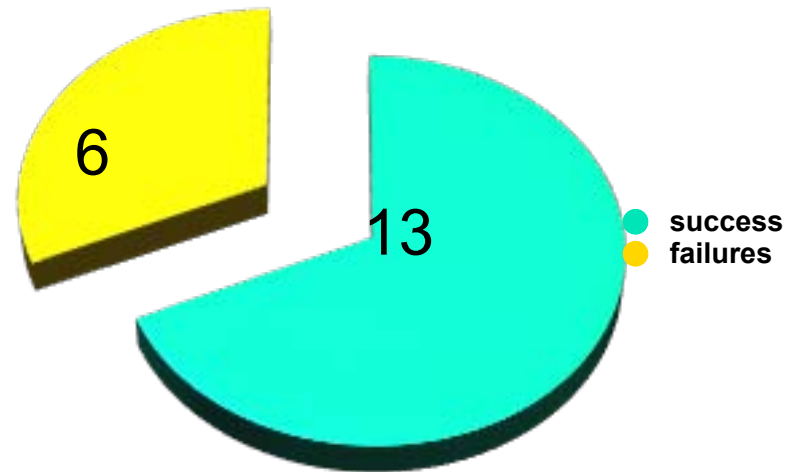


Influencing Factors

- 1 : Age



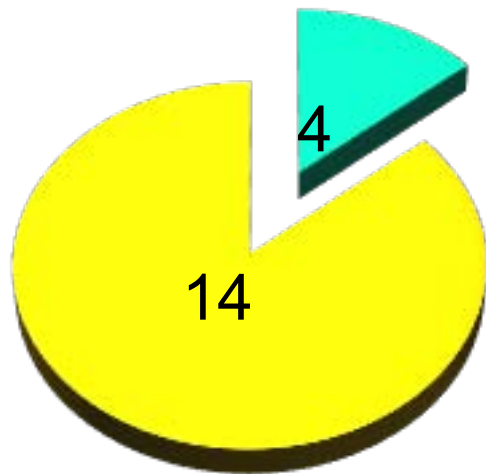
Adult group



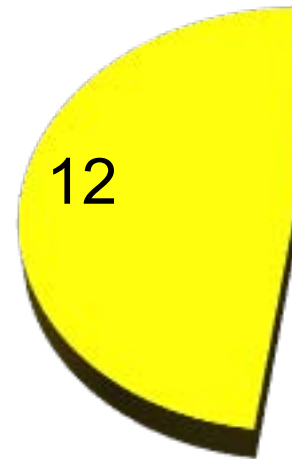
Children

Influencing Factors

- Mechanism...



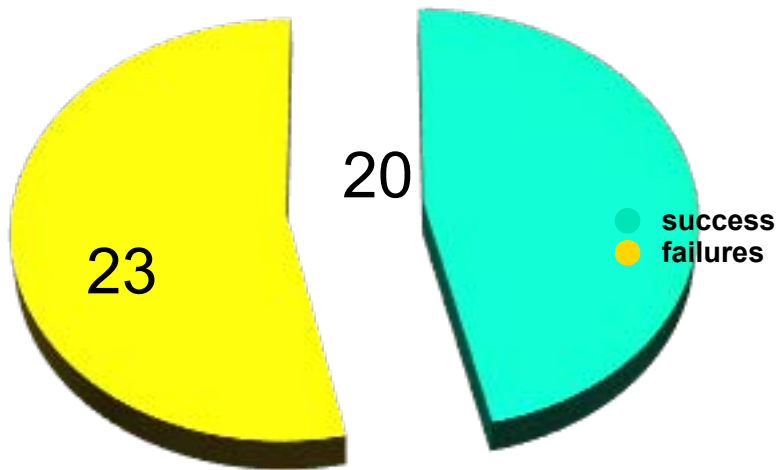
Success versus failures in avulsions



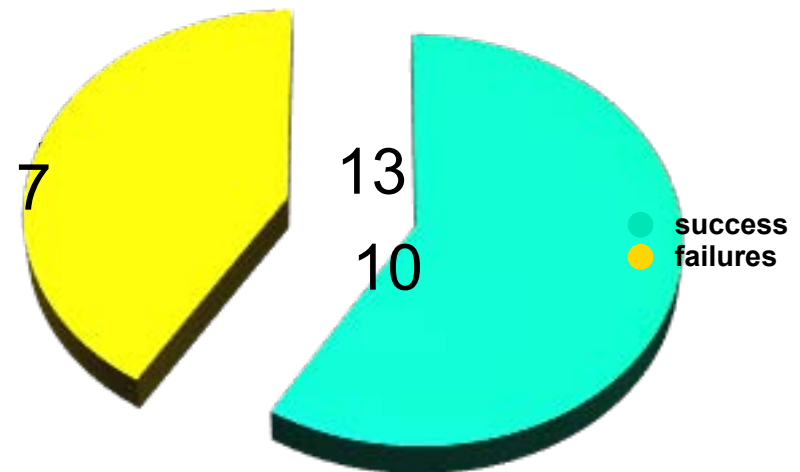
Success versus failures in clean cut amputations

Influencing factors

- Anastomosis



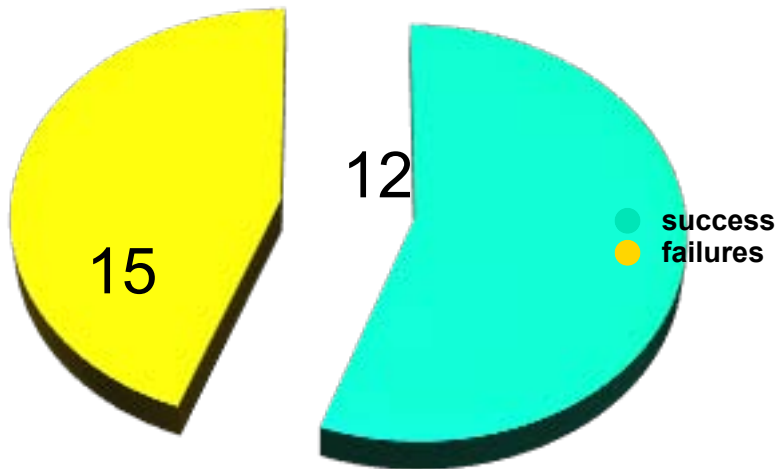
Success versus failures « artery only »



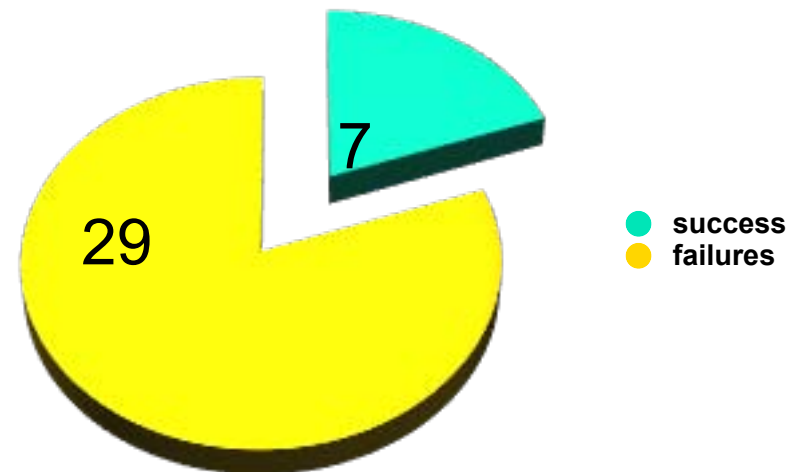
Success versus failures: « artery + vein »

Influencing factors

- Anastomosis + Age



Success versus failures « artery only » in children



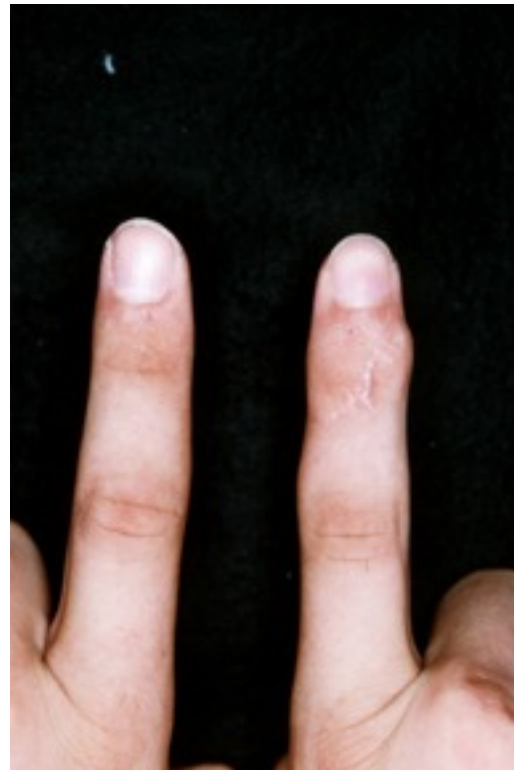
Success versus failures: « artery only » in adults

Cosmetic Results



Slight pulp atrophy is expected when controlled bleeding of the replanted part has been used.

Cosmetic Results



Close to normal contour can be obtained after distal replantation with venous

Cosmetic Results



Replantation will always be superior to local flaps or composite grafts to prevent hook nail deformity



Sensory Results



Sensory Reinnervation is more related to age than to type of neural repair...



Sensory Reinnervation

- Group 1 : 8 patients, paediatric group, no nerve suture
 - Age 8-16 years
 - Follow-up : 8-40 months
 - 7 patients with s2PD between 3 and 7 mm



Sensory Reinnervation

- Adult group : 13 patients
 - Age = 18-57 years
 - Follow-up : 4-72 months
 - 2PD : 8-15 mm



Conclusions

- Fingertip replant is a rewarding procedure
- Technically demanding
- Results are superior to those obtained by local flaps