Distal Digital Replantations

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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

- 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
Specific problems related to level of injury

Find the artery...

Preserve the DIP joint

Find a vein (palmar ?)

Find the artery…
Mechanism

Avulsion

Sharp lacerations

Crush injuries
Mechanism:

Avulsion

Crush injuries

Sharp lacerations

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

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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 spared.
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

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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-Tsaï 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

- Succes 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

![Pie chart showing success rate with sections for complete success, complete failure, and partial necrosis.]
Influencing Factors

1: Age

Adult group:
- 16 successes
- 25 failures

Children:
- 6 successes
- 13 failures
Influencing Factors

- Mechanism...

Success versus failures in avulsions

Success versus failures in clean cut amputations
Influencing factors

- Anastomosis

Success versus failures: «artery only»
- Success: 23
- Failures: 20

Success versus failures: «artery + vein»
- Success: 13
- Failures: 10
Influencing factors

- Anastomosis + Age

Success versus failures: « artery only » in children

- 15 successes
- 12 failures

Success versus failures: « artery only » in adults

- 29 successes
- 7 failures
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