Microsurgical Coverage in Soft Tissue Injuries of the Hand

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It took centuries until the last step……

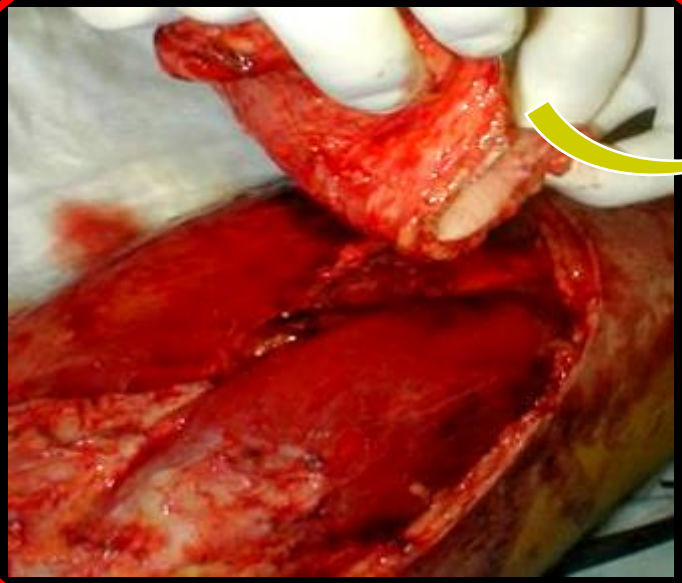
Perforator flaps

(return to the subdermal blood supply, but by identification and isolation of perforators, what ensure a better design and survival rate of flaps)

Skin flaps

Random flaps
(subdermal vascular network)

Axial flaps



Fasciocutaneous flaps

Muscle/musculocutaneous flaps

Major prerequisites for good results

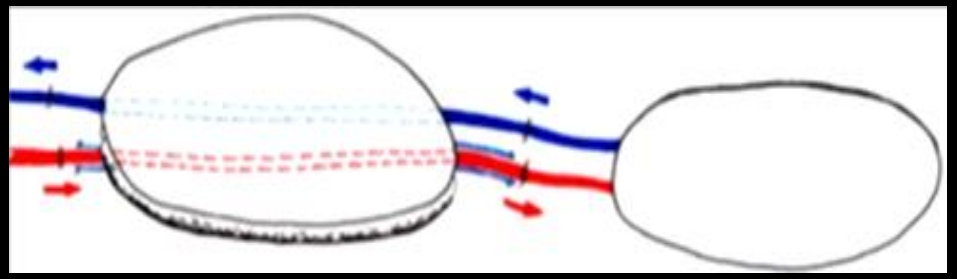
- *Top-quality tissue to cover tissue loss*
- *Precocity in reconstructing injuries and restoring function*

Crush injury in a 4 years old boy

- thumb amputation

- 4th finger destruction

- forearm soft tissue defect with rupture of the cubital VN pedicle



Microsurgery allows the obtaining of these demands, especially because makes possible the emergency all-in-one reconstruction

The use of both conventional or perforator free flaps is recognized as the gold standard procedure in such cases

Microsurgical reconstruction

- *According to the type and complexity of the lesions*
- *The functional reconstruction represents the priority*

It is no doubt that microsurgery is mandatory for

- missing amputated fingers

- very complex injuries with large tissue defects

- complex injuries with bone defects

The indication is depending to the complexity of the lesion and to what about we are expecting to obtain:

- *Skin coverage alone*
- *Skin coverage + revascularization*
- *Skin coverage + revascularization + functional reconstruction*
- *Complex reconstructions including skin, muscles, bones, fingers*
- *Reconstruction of missing amputated fingers*

A fascial or fasciocutaneous flap represents the first option

Electrocution

ALT

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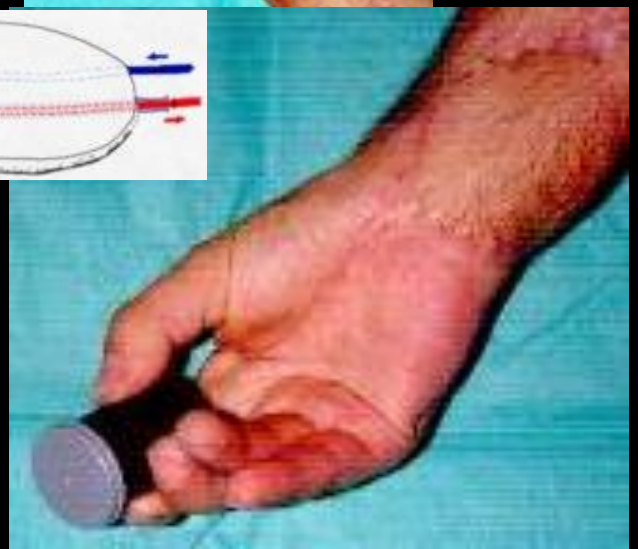
A flow-through flap represents the better indication

Amputation + skin defect

Chinese flow-through flap



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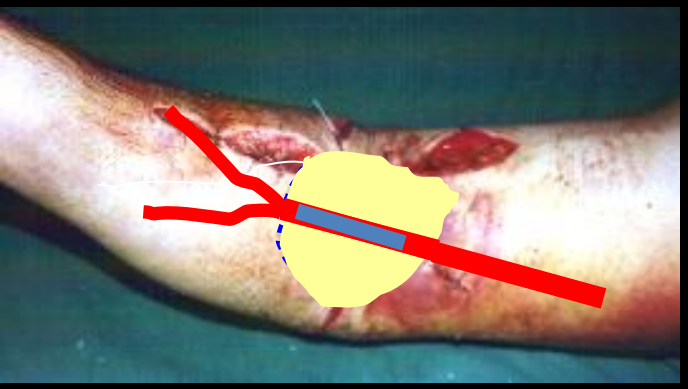
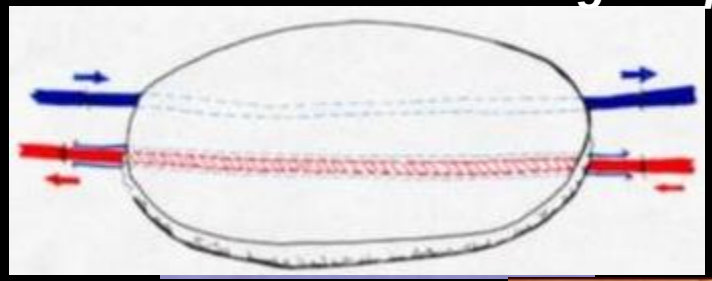
Suicidal attempt by injection with
Sodium Hydrate
Brachial Artery thrombosis



Chinese flow-through flap



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Crush amputation with large soft tissue destruction

Chinese flow-through flap with vascularised tendons

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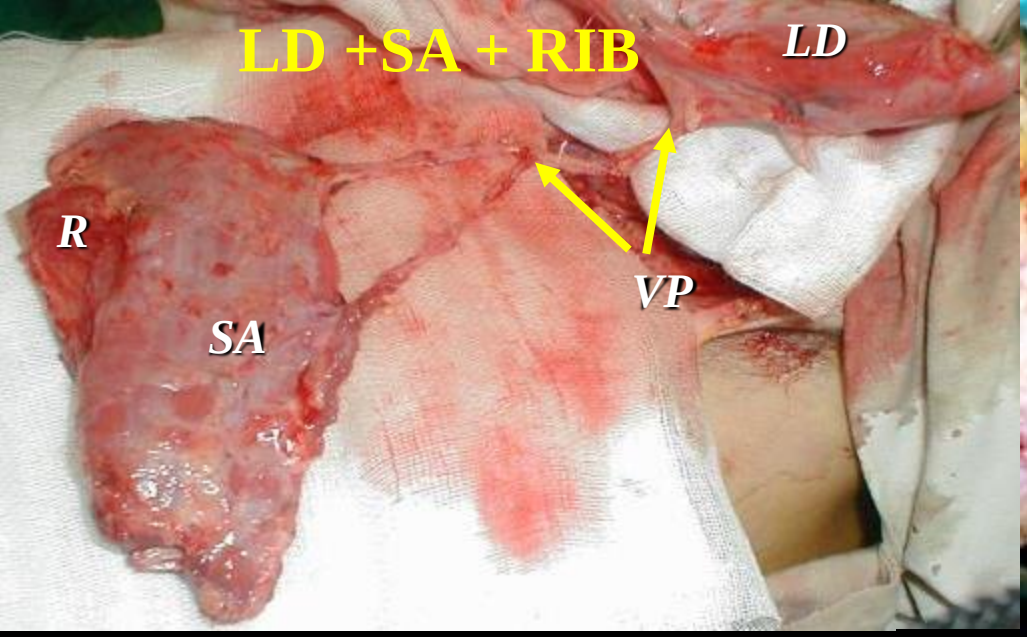
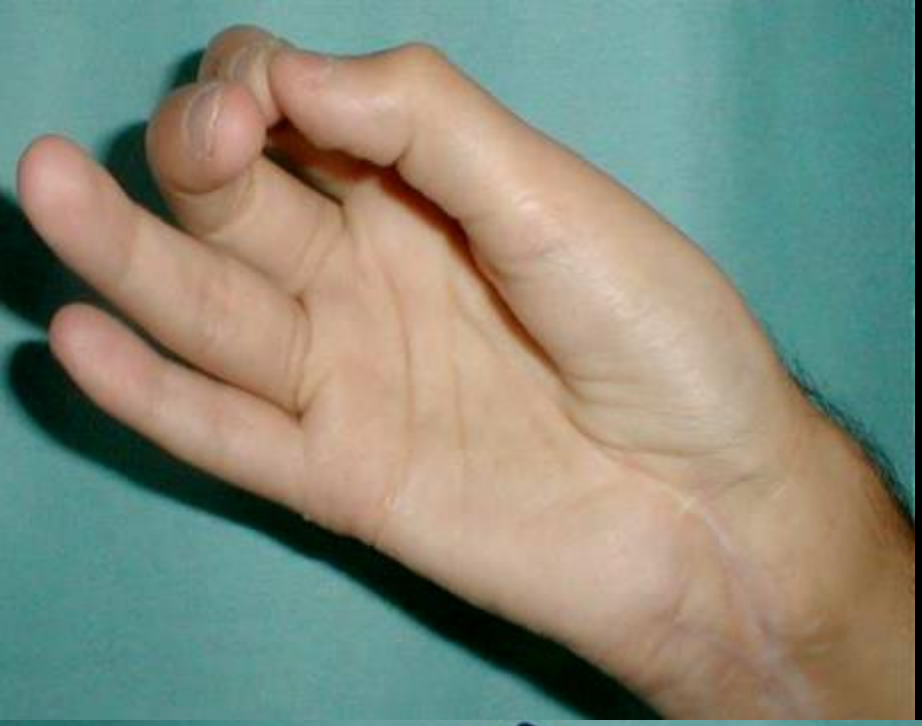
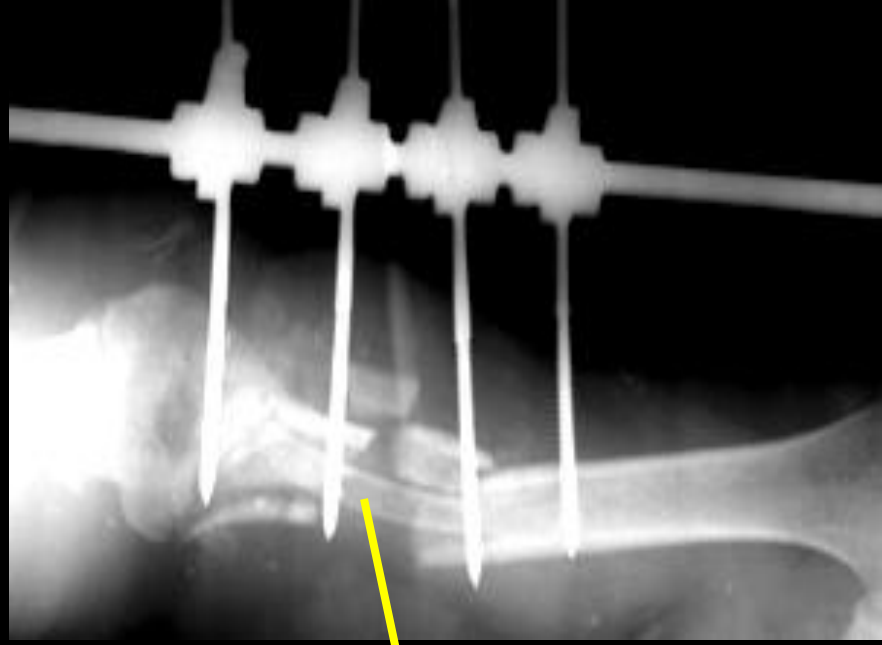
- *Skin coverage + revascularization + functional reconstruction*
- *Complex reconstructions including skin, muscles, bone*
- *Reconstruction of missing amputated fingers*

Composite flaps should be the choice

Incomplete amputation with large soft tissue and bone defect


LD +SA + RIB
LD
R
VP
SA





18 month postoperative

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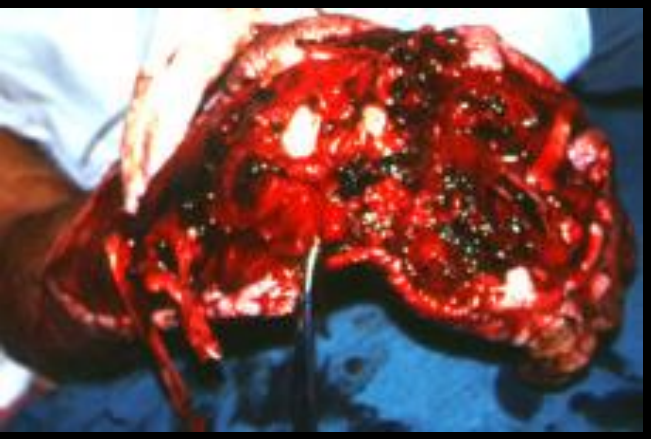
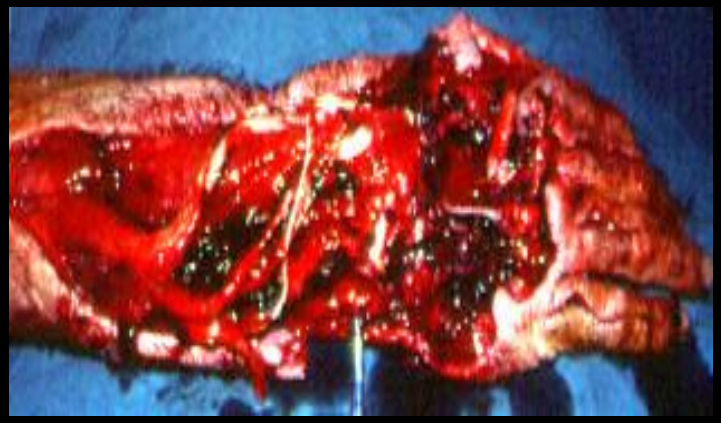
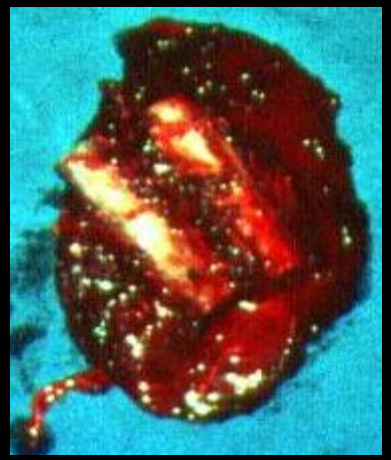


Crush injury with skin, extensor tendons defect and destruction of carpal and metacarpal bones

SA + Vascularised rib



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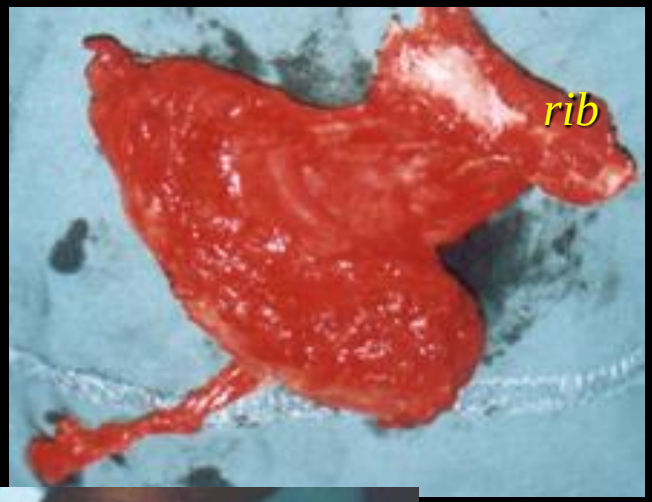

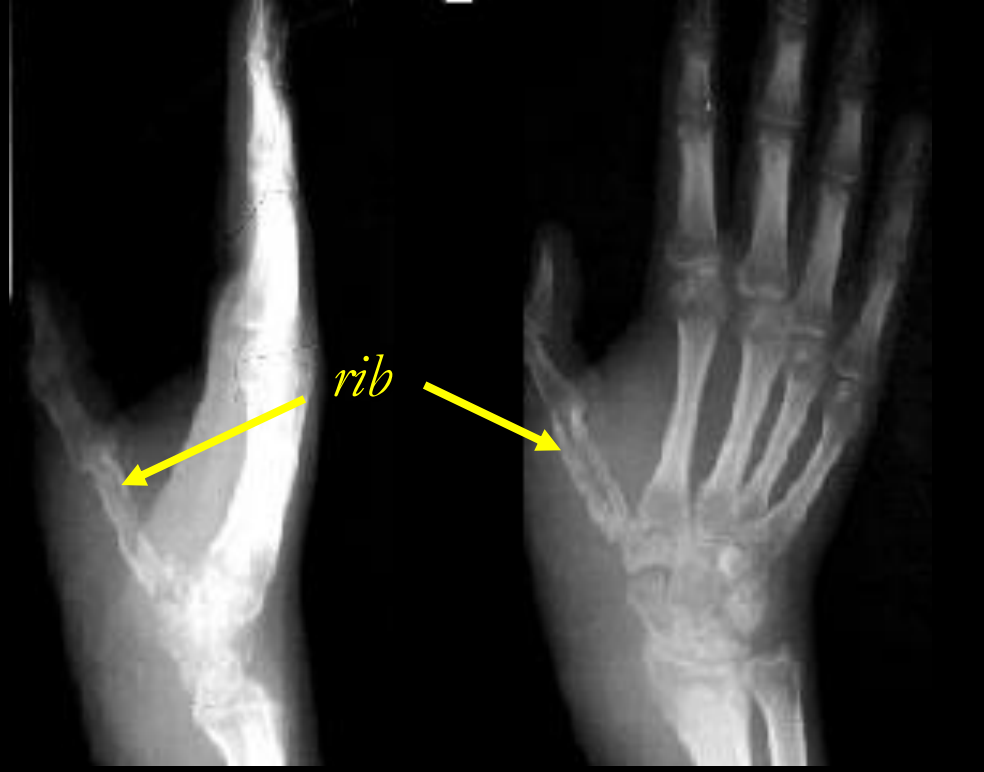

3 years p.o.

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- *Skin coverage alone*
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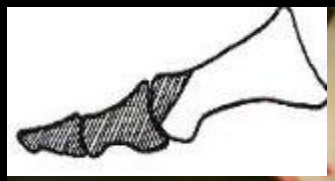
- *Skin coverage + revascularization + functional reconstruction*
- *Complex reconstructions including skin, muscles, bones*
- *Reconstruction of missing amputated fingers*

Toe (s) transfer should be the choice



Thumb, proximal to MP joint – sometimes also BIG TOE, but by respecting part of the M1 head and the sessamoides

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- *Skin coverage + revascularization*
- *Skin coverage + revascularization + functional reconstruction*
- *Complex reconstructions including skin, muscles, bones*
- *Reconstruction of missing amputated fingers in complex injuries*

Toe (s) transfer should be the choice

Circular saw trauma

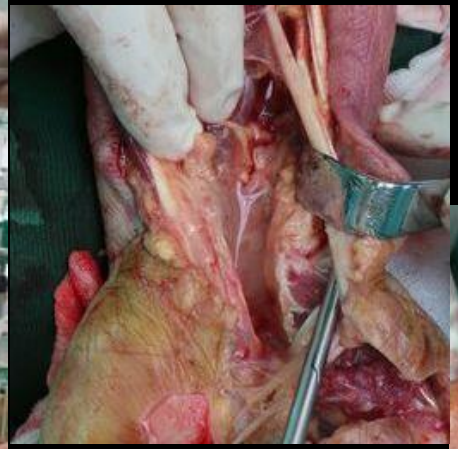
Chinese flow-through flap + big toe transfer

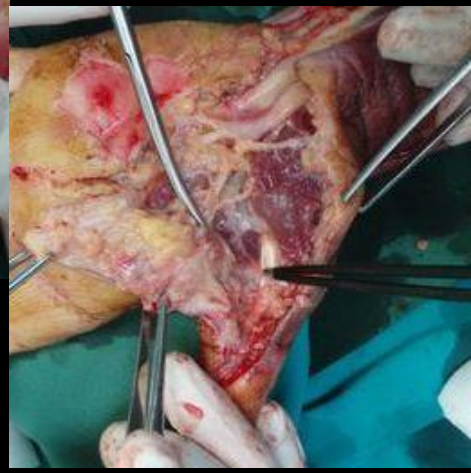
If compare with conventional free flaps, the use of free perforator flaps

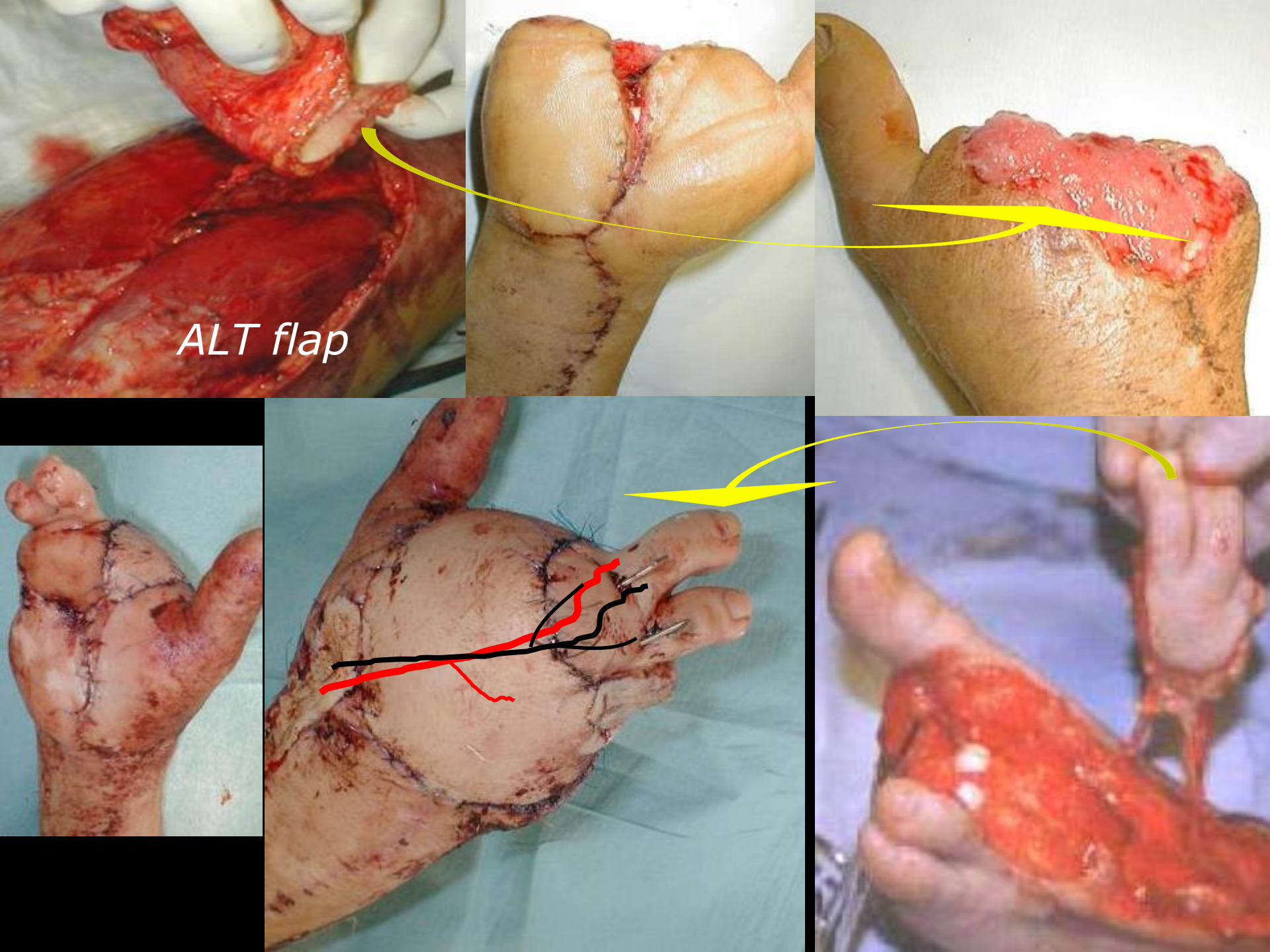
- *bring together the advantages of*
  - *a low donor site morbidity*
  - *possibility to cover large defects*

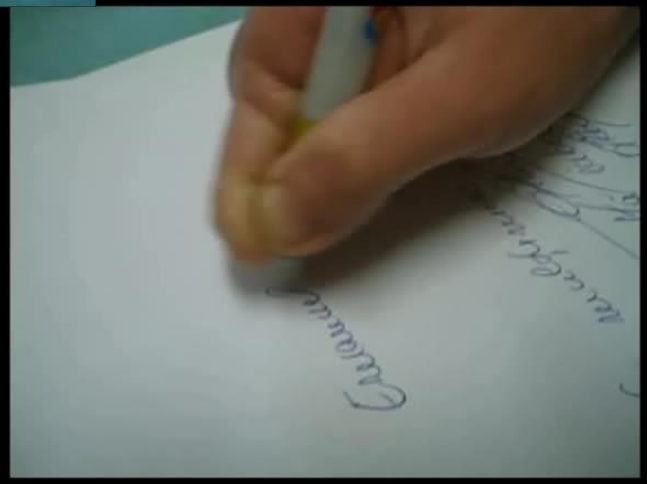
- *but also some disadvantages*
  - *DS far from the defect*
  - *microsurgical sutures*

ALT flap






ALT flap

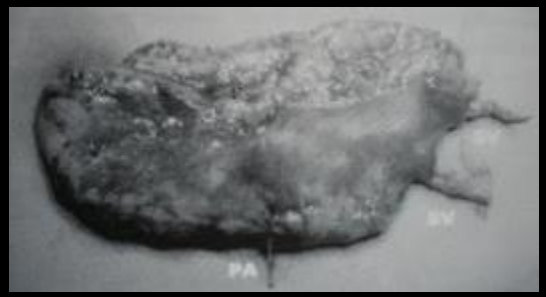


Based on the observation….

Similar cases

Various methods

Similar results


PA

Why not

– if possible –

local or regional perforator flaps ?

Moreover, free flaps means microvascular anastomoses

Sometimes could be difficult to start the early functional rehabilitation, what is essential for the hand, especially when defects over the joints are covered

Georgescu, A. V., et al(2007) - Microsurgical nonmicrovascular flaps in forearm and hand reconstruction. Microsurgery, 27: 384–394

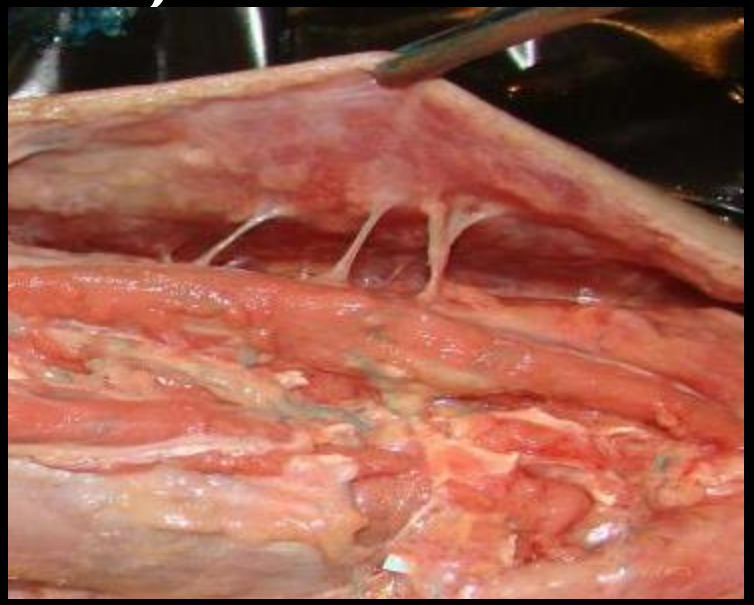
….but possible for local/regional perforator flaps

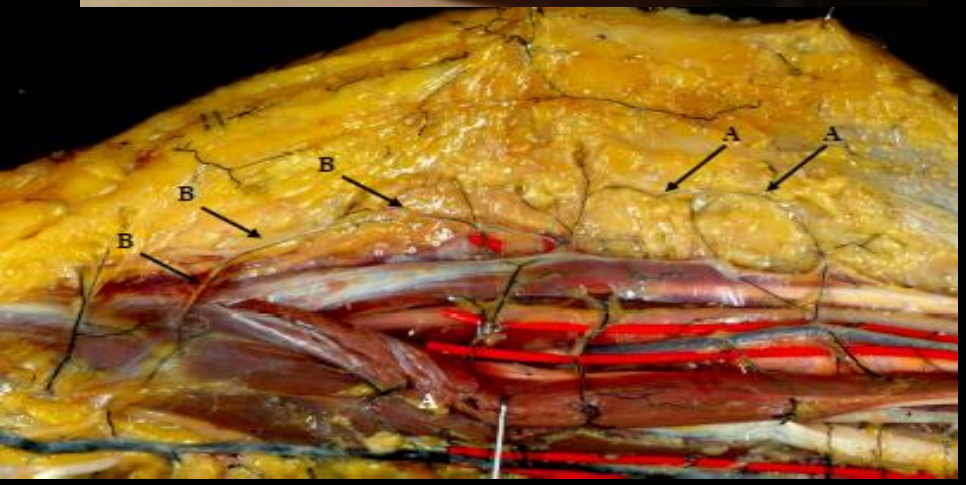
The use of local perforator flaps

- *Bring together the advantages of*
  - *- a low donor site morbidity*
  - *- same surgical field*
  - *- possibility to cover small/medium defects*
  - *- no need of microsurgical sutures*
  - *- better for covering defects over the joints*

- *But, sometimes, the disadvantage of venous congestion*

Dissections + Latex injections

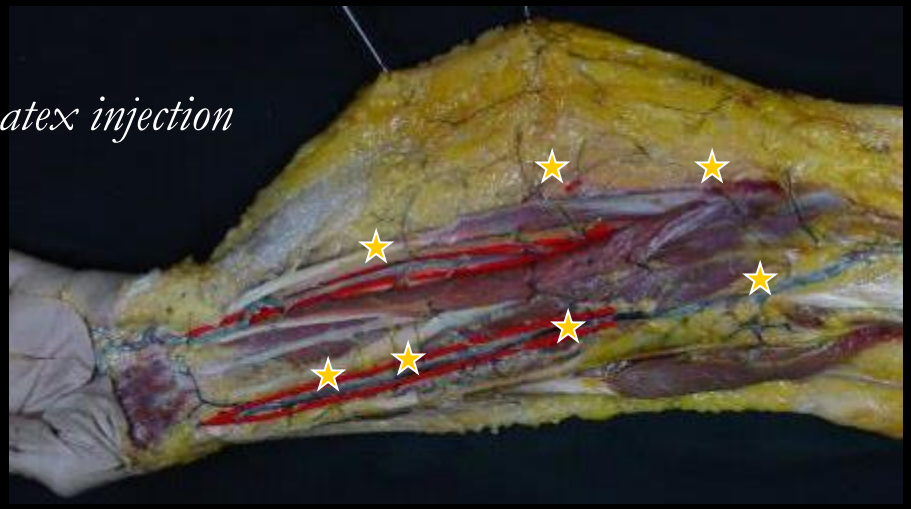


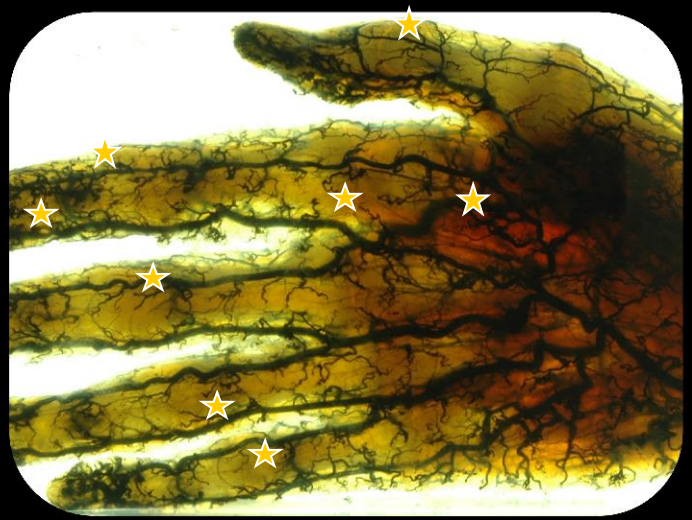


Nowadays……..

More than 400 perforators all over the body
The local perforator flaps can be successfully used all over the body

Latex injection





Transparentation

Georgescu, A. V., et al(2007) - Microsurgical nonmicrovascular flaps in forearm and hand reconstruction. Microsurgery, 27: 384–394

Local / regional perforator flaps

MICROSURGICAL NON-MICROVASCULAR FLAPS

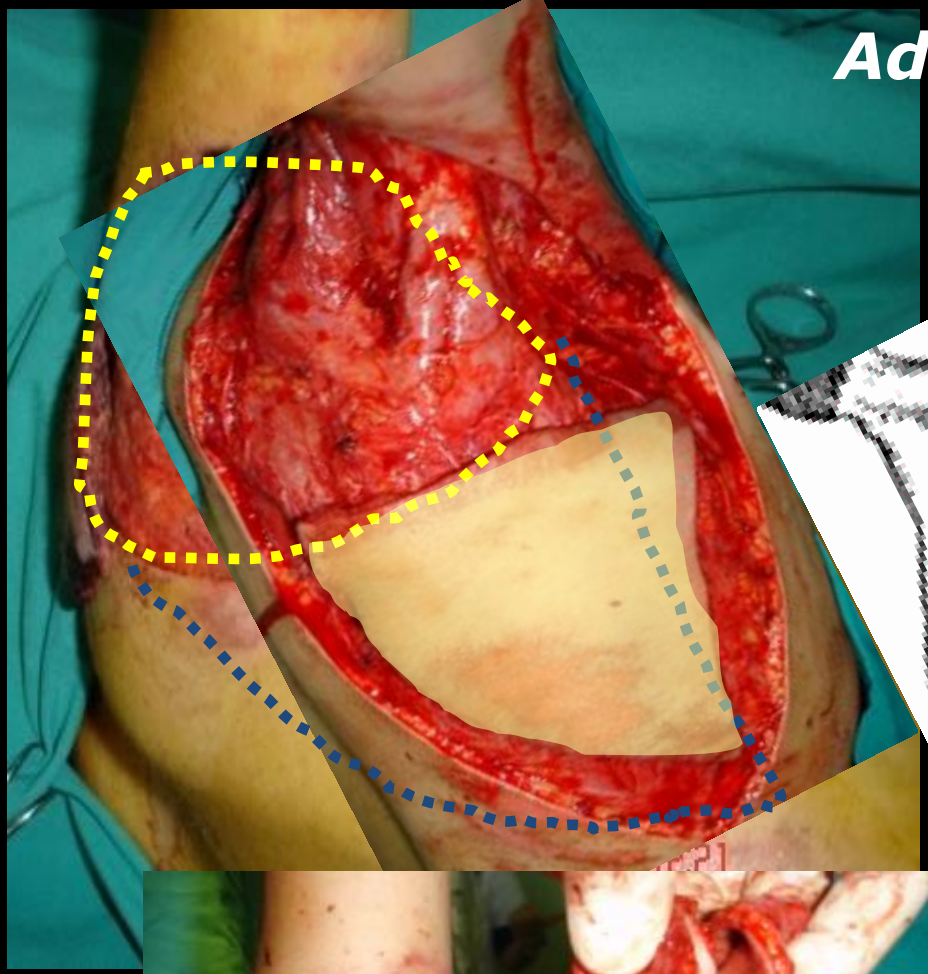
flaps blood supplied by
perforator vessels
which need to be harvested by
microsurgical dissection
but do not need
microvascular sutures

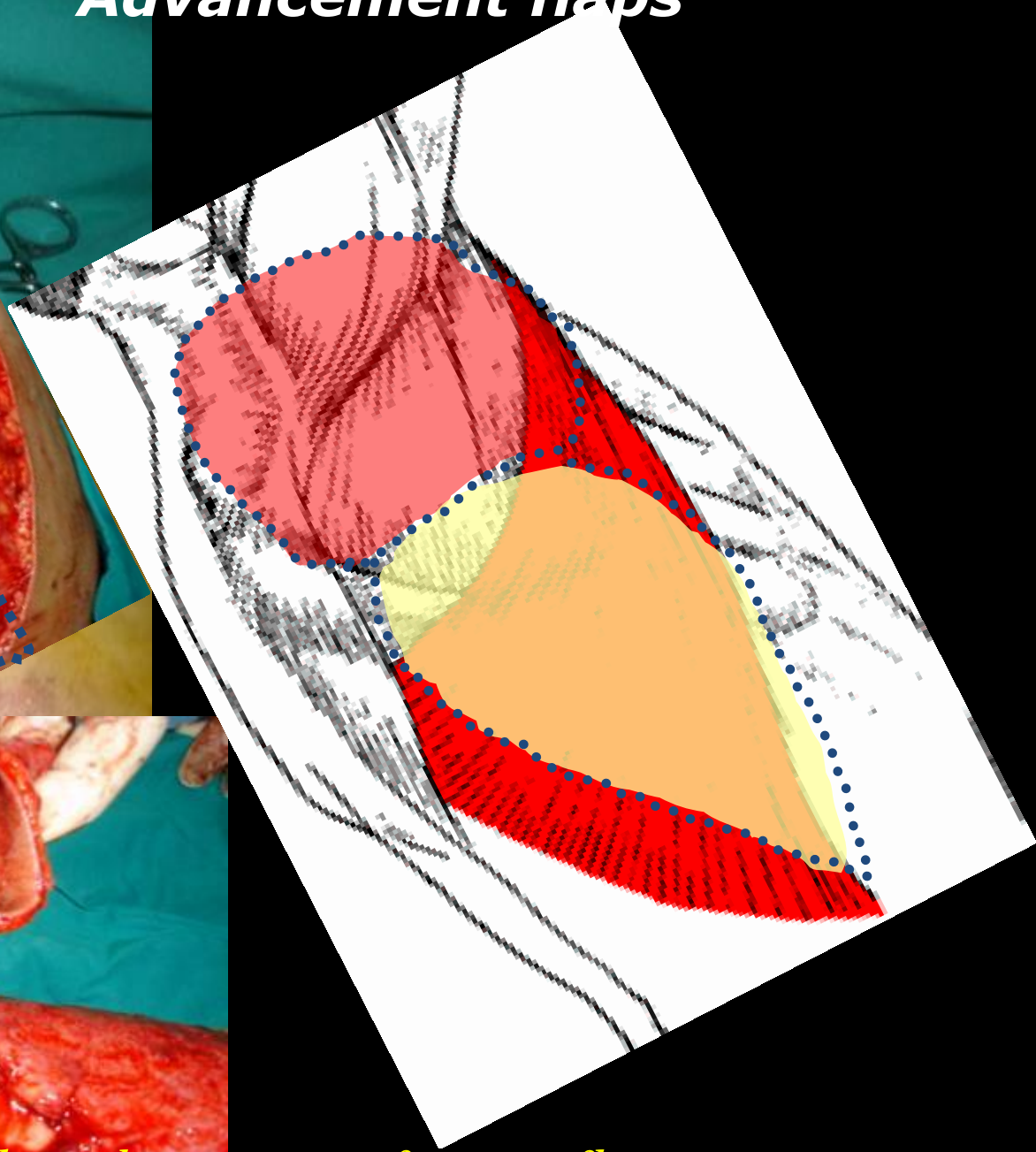
Easy to use them in not very complex injuries, both as advancement flaps or propeller flaps

Advancement flaps

AIOAPF

Advancement flaps





Toraco-dorsal artery perforator flap



The "Tokyo Consensus on Propeller Flaps.

Pignatti M, Ogawa R, Hallock GG, Mateev M, Georgescu AlV, Balakrishnan G, Ono S, Cubison TCS, D'Arpa S, Koshima I, Hyakusoku H. *Plast Reconstr Surg 2011, 127: 716-22*

Propeller Perforator Flaps


18 1 2010

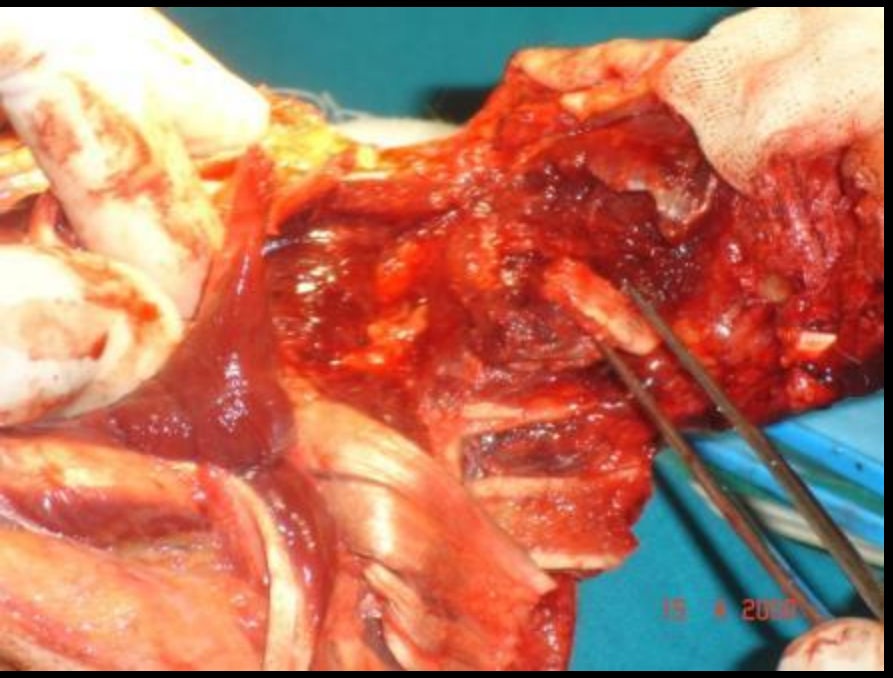

18 1 2010

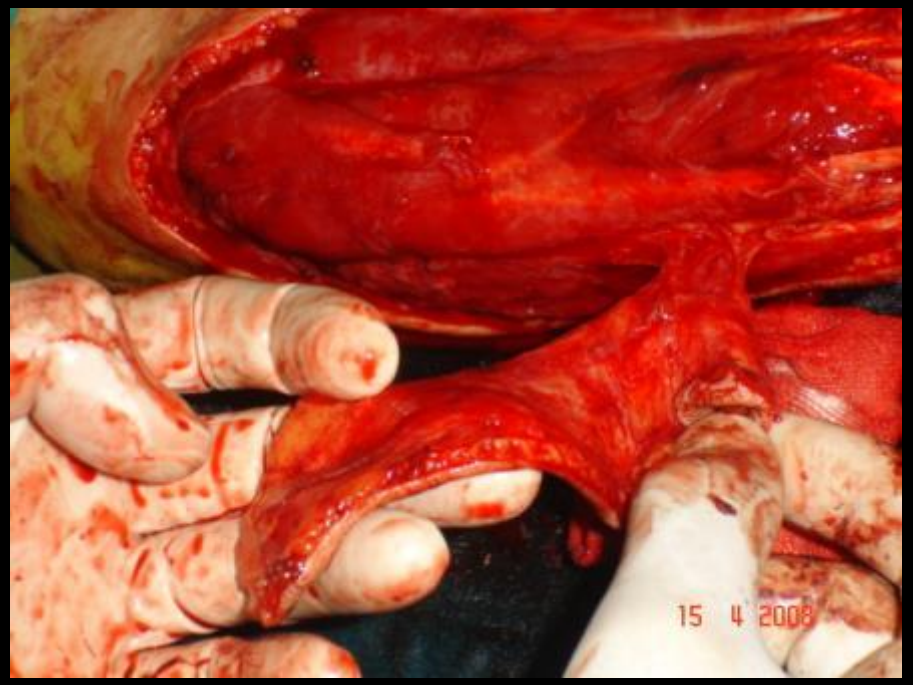
Ulnar artery propeller perforator flap

Sometimes, possible also in very complex and avulsion injuries

Radial artery propeller perforator flap
- 160 sq cm -

UAPF






18 5 2011


18 7 2011

Koshima I., et al. Digital artery perforator flaps for fingertip reconstructions. Plast Reconstr Surg, 2006, 118: 1579-1584

DAP flap

Partial pulp amputation

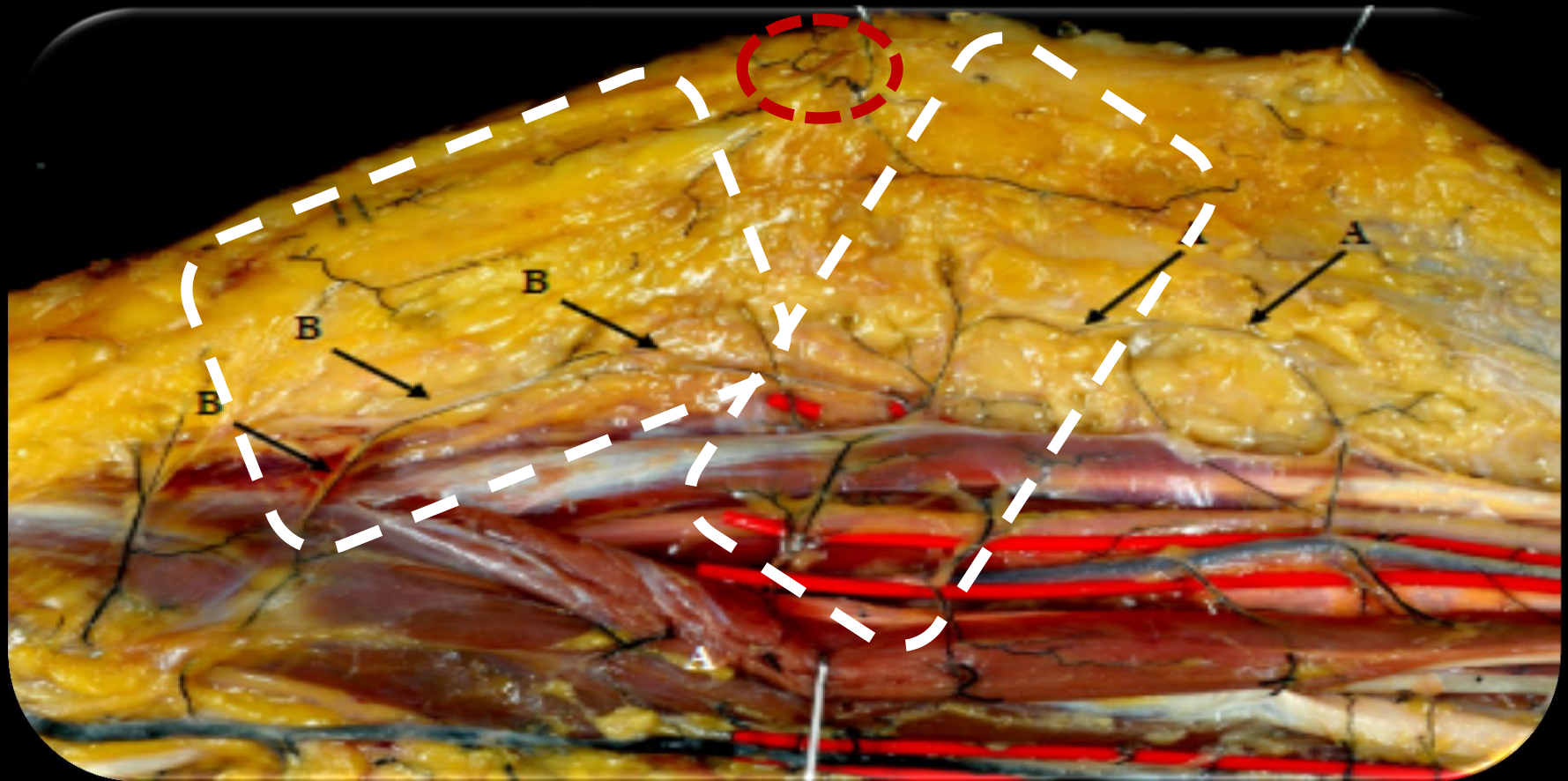
What we still do not exactly know ?

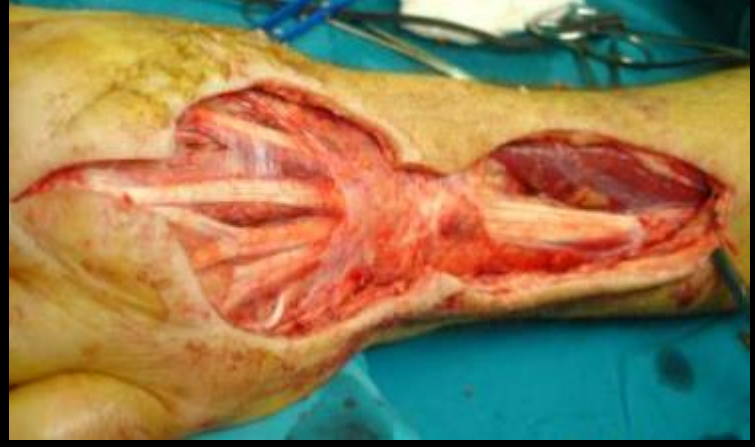
1. The real dimensions of perforator flaps

Saint-Cyr M, et al-The perforasome theory: vascular anatomy and clinical implications. Plast Reconstr Surg 2009; 124:1529-1544

Taylor GI, Palmer JH-Angiosome theory. Br J Plast Surg 1992; 45:327-328

Linking vessels = choke vessels





Ulnar artery propeller perforator flap - 170 sq cm

2. The nomenclature of perforator flaps

The septocutaneous vessels are really perforator vessels ??

Some novelties

The manner of using perforator flaps

Perforator flap on pre expanded skin

Some novelties

Bilobed perforator flaps

Same principle and blood supply as DAP, but two pedicled flaps

The angle between the two lobes could be between 45º - 180º

Last problem: the complications rate is quite the same

Generally, this problem can be solved by:

- derotation of the flap to its original position

- venous supercharging

- stitch removal

- incisions/punctures + heparin

- leeches

Summary

- ***The main advantages of free perforator flaps :***

- no/reduced donor site morbidity
- they respect the main vascular pedicles
- they can be used even in emergency complex lesions

Summary

- ***The main advantages of local perforator flaps :***

- they are ***microsurgical flaps,*** *but they* ***do not need micro-vascular anastomoses***

- they are harvested from the same surgical field

- they respect the main vascular pedicles

- they can be used even in emergency complex lesions

- they allow the earlier beginning of kinetotherapy

…could reduce, in well selected cases, the indication for free flaps, but need more research, especially regarding the venous drainage and their real dimensions


Thank you!