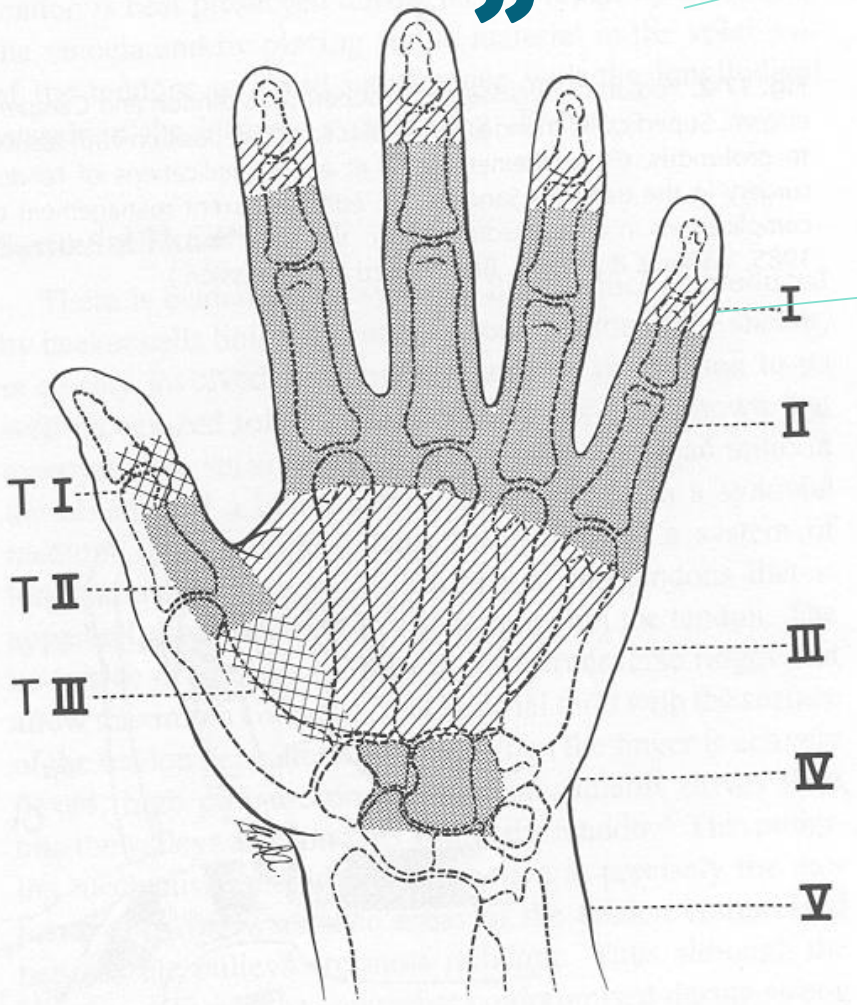
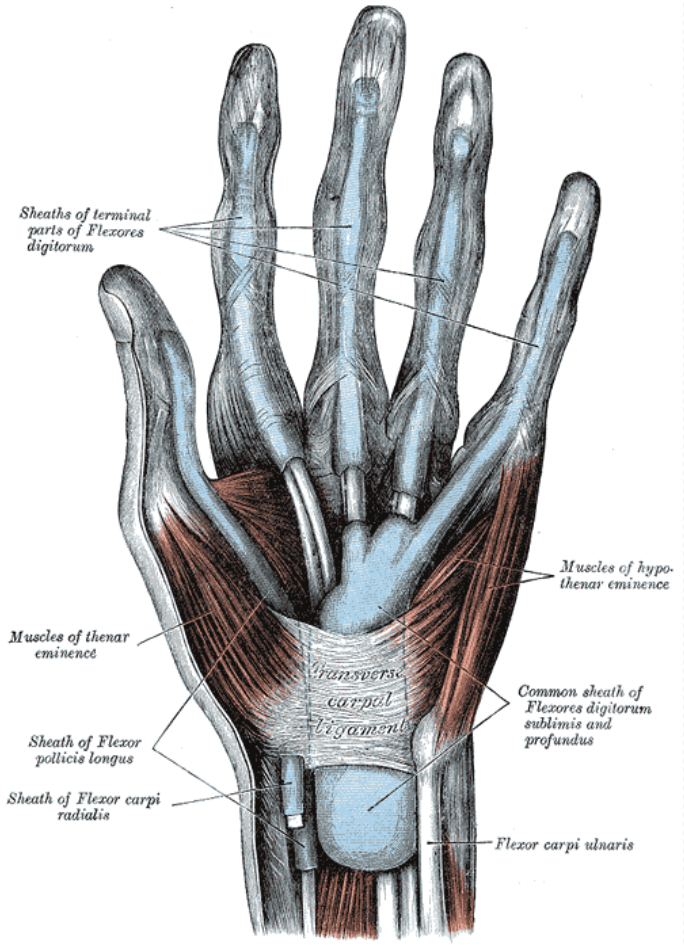
Hand Surgery

Flexor tendon injuries of the hand

„No man's land"
„Some man's land"

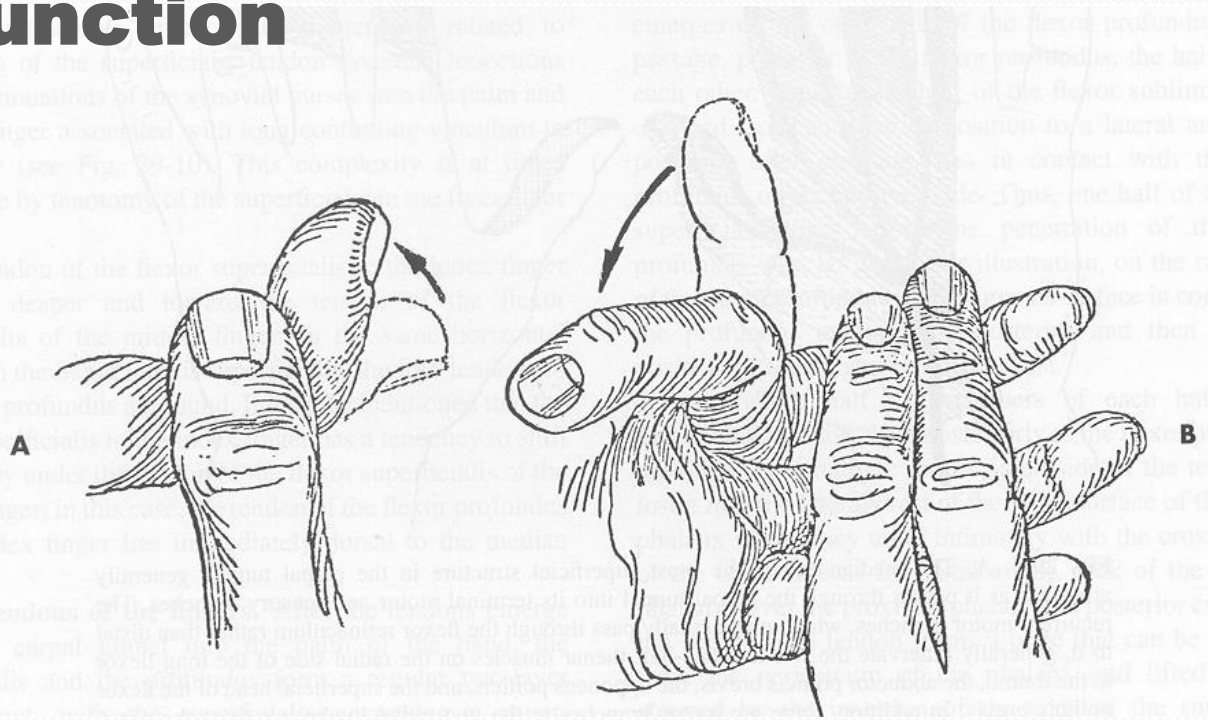


Verdan zones

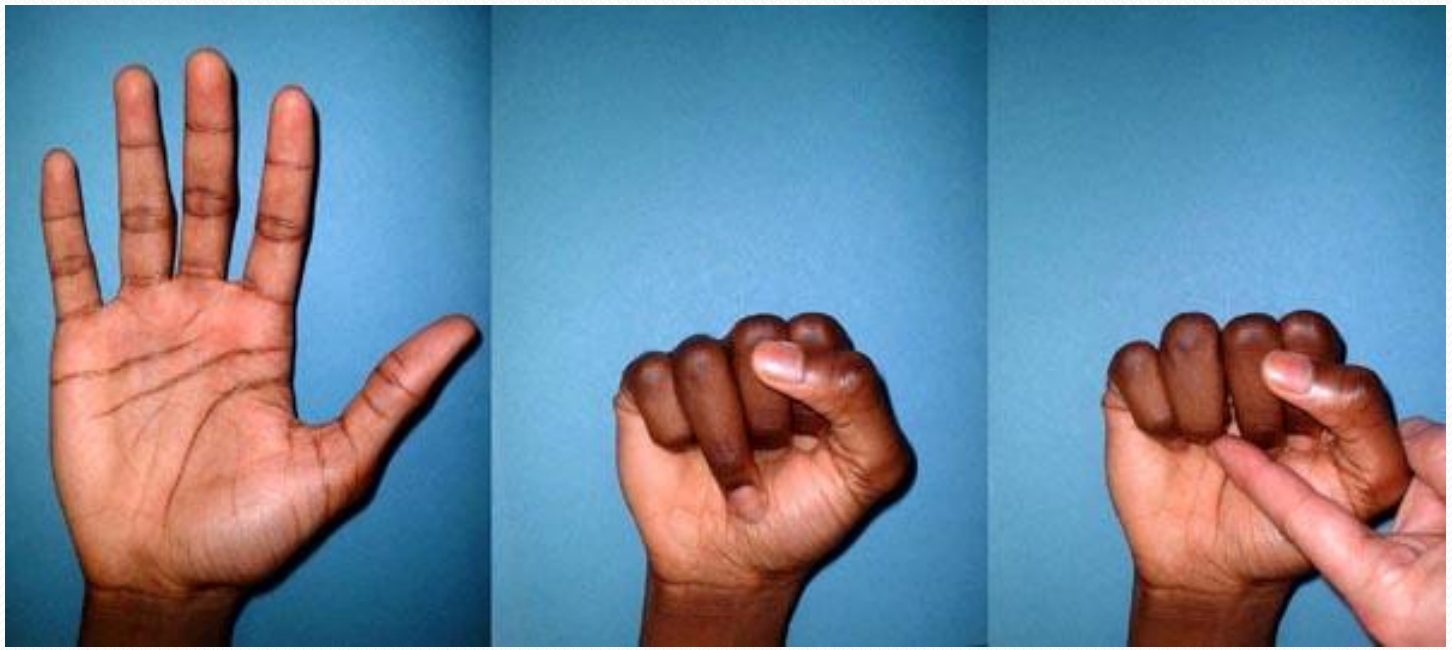


Diagnostic

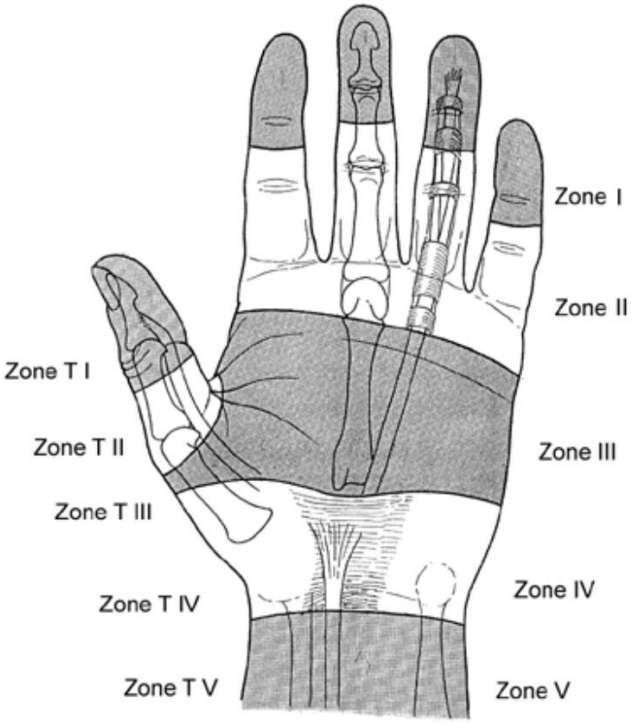
- **Checking the movement of all joints**
- **Isolated profundus and superficial function**

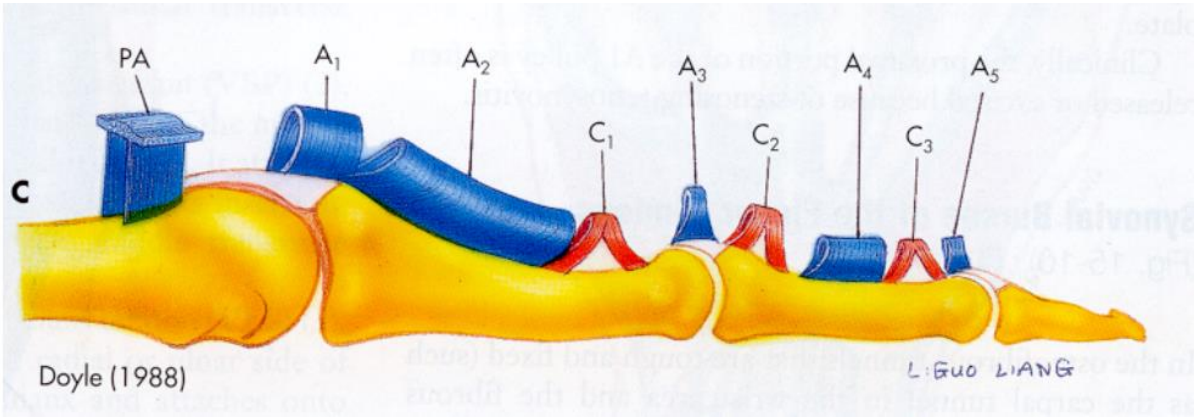


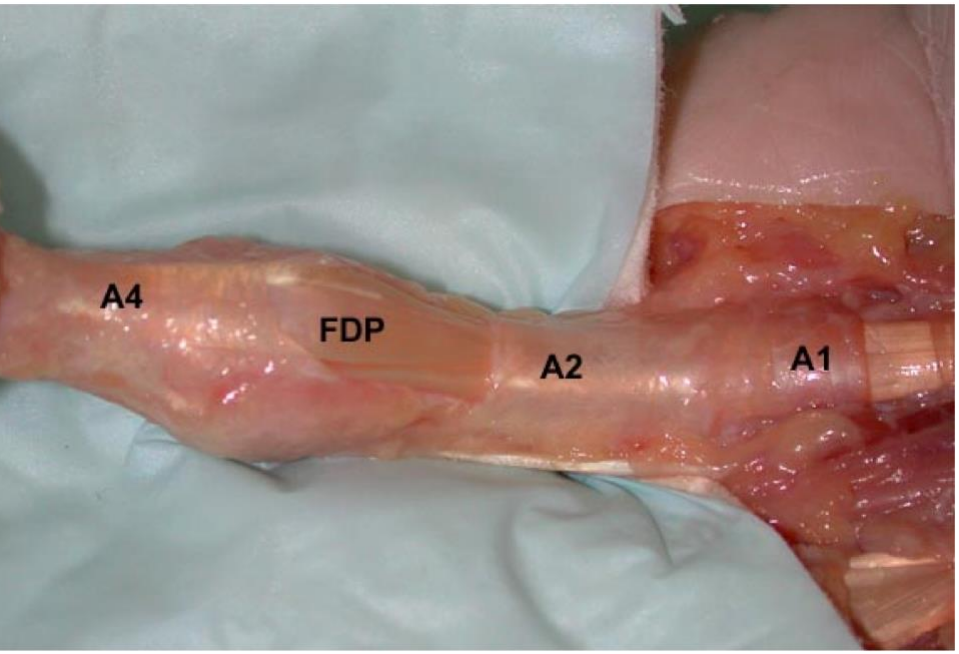
Diagnostic

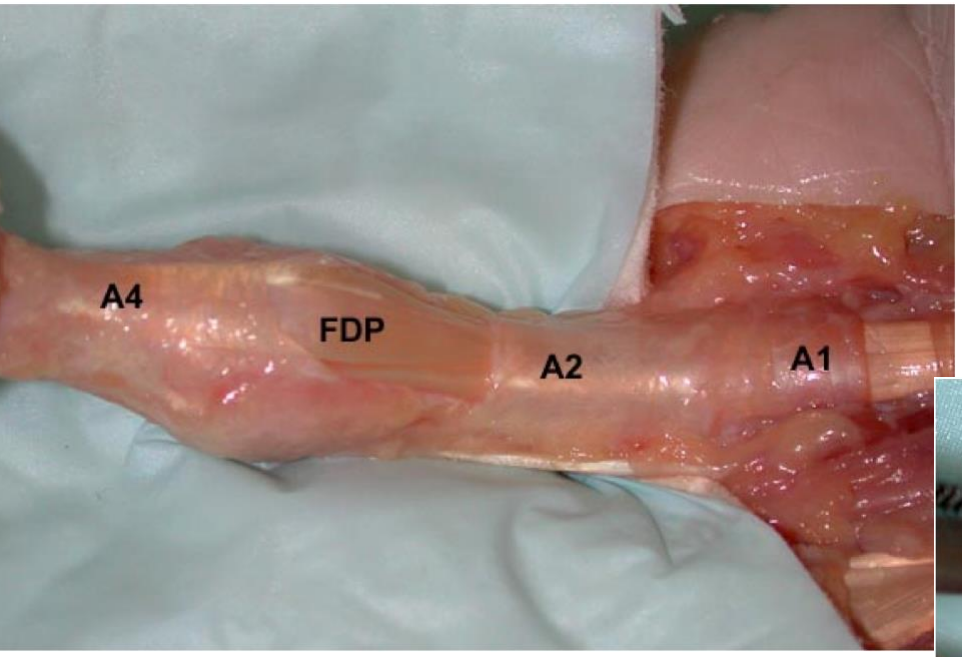


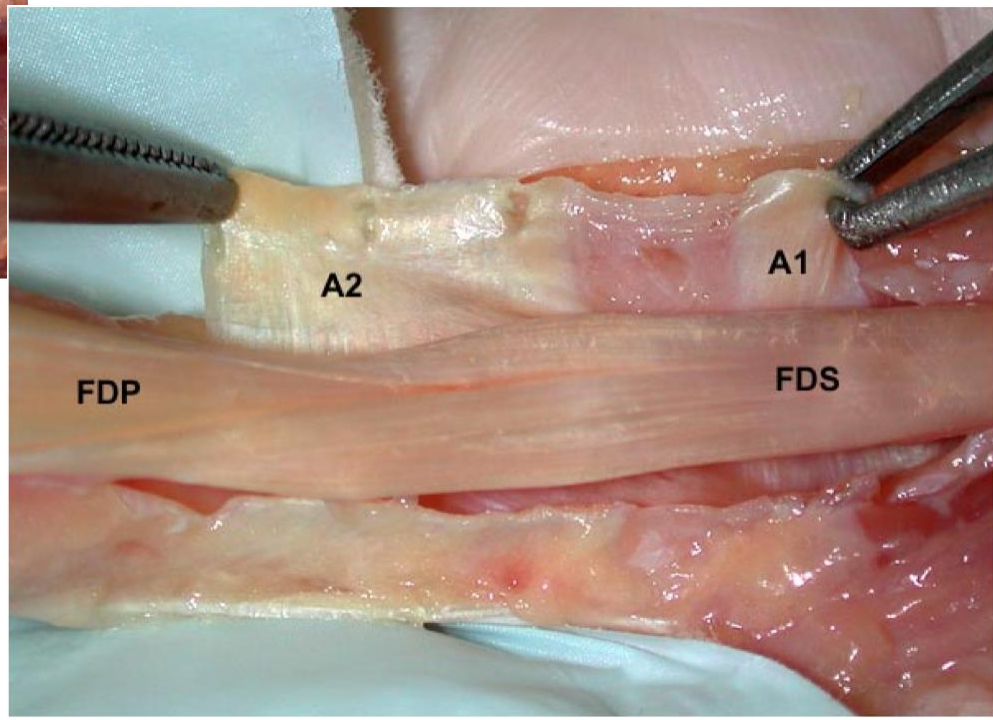
Flexor tendon injuries

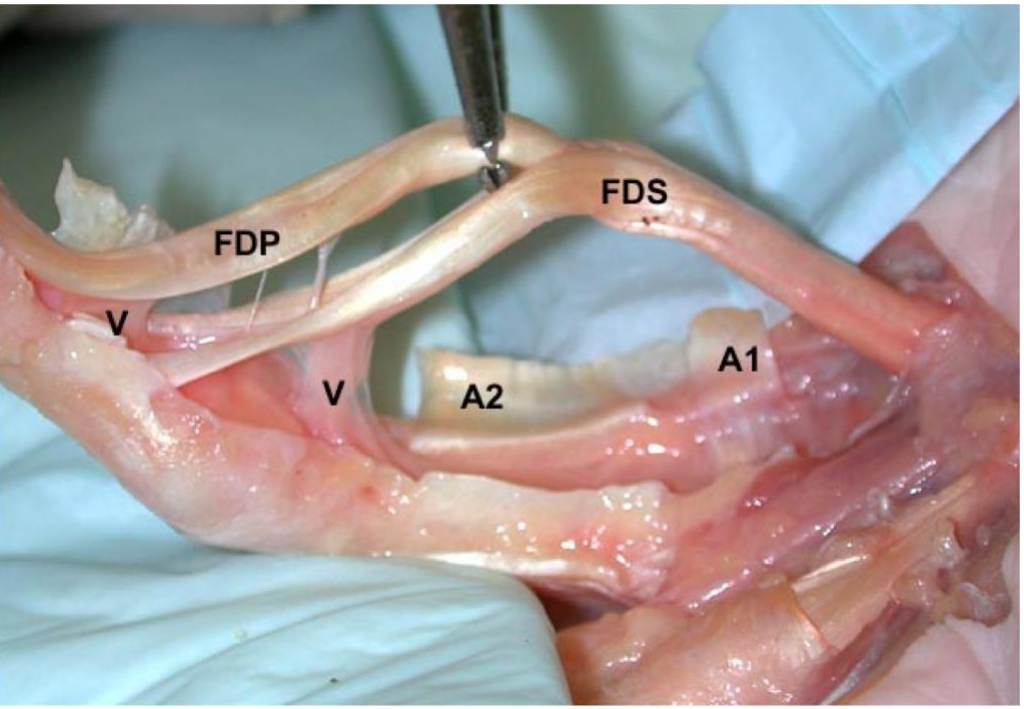


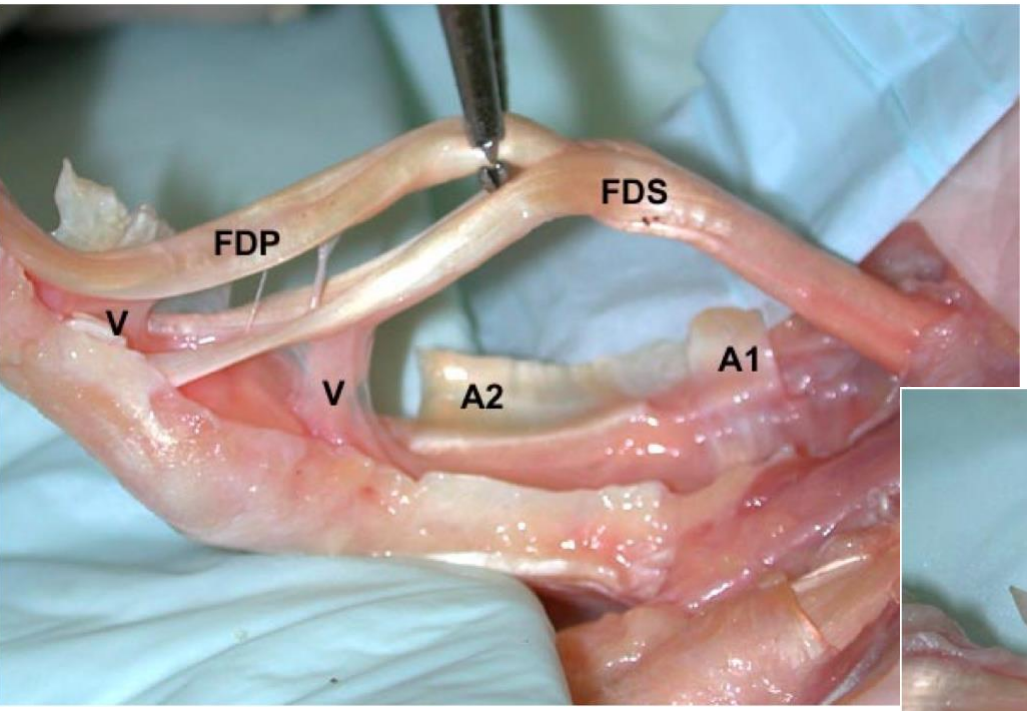


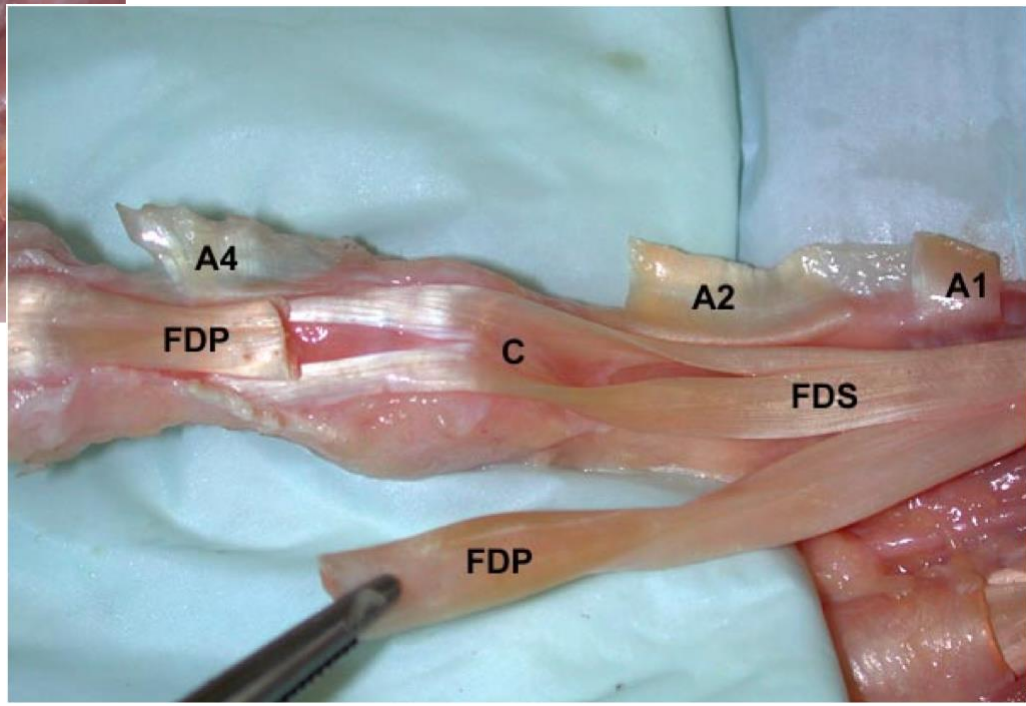

A4
FDP
A2
A1


A4
FDP
A2
A1

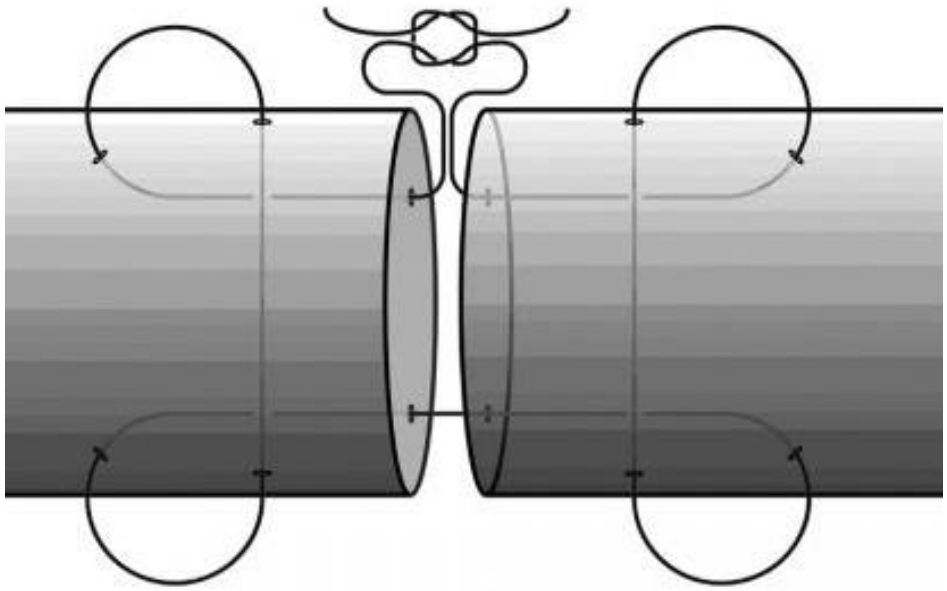

A2
A1
FDP
FDS

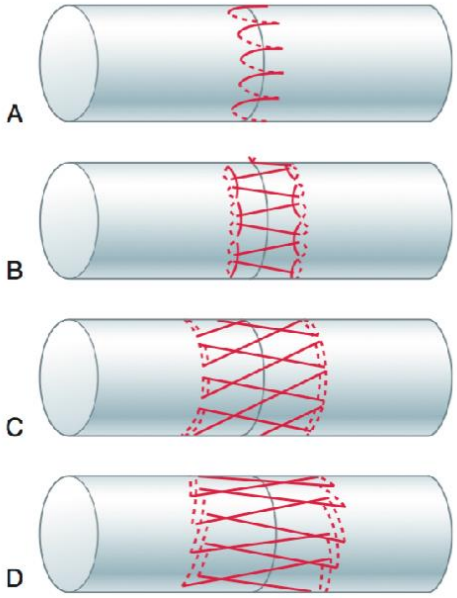

FDS
FDP
V
A1
V
A2


FDS
FDP
V
V
A2
A1


A4
A2
A1
FDP
C
FDS
FDP

How to repair them…





Suture technique

- Nicoladoni
- Bunnel
- Kirchmayer
- Kleinert
- Kessler
- Zechner
- Tsuge
- Others

Bunnell suture

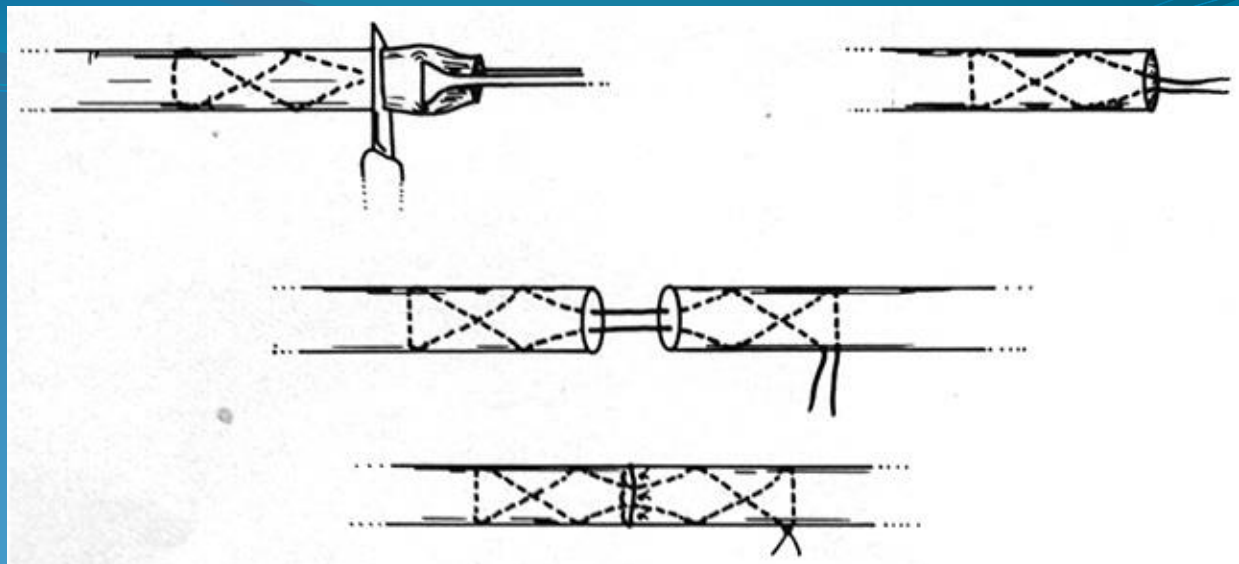
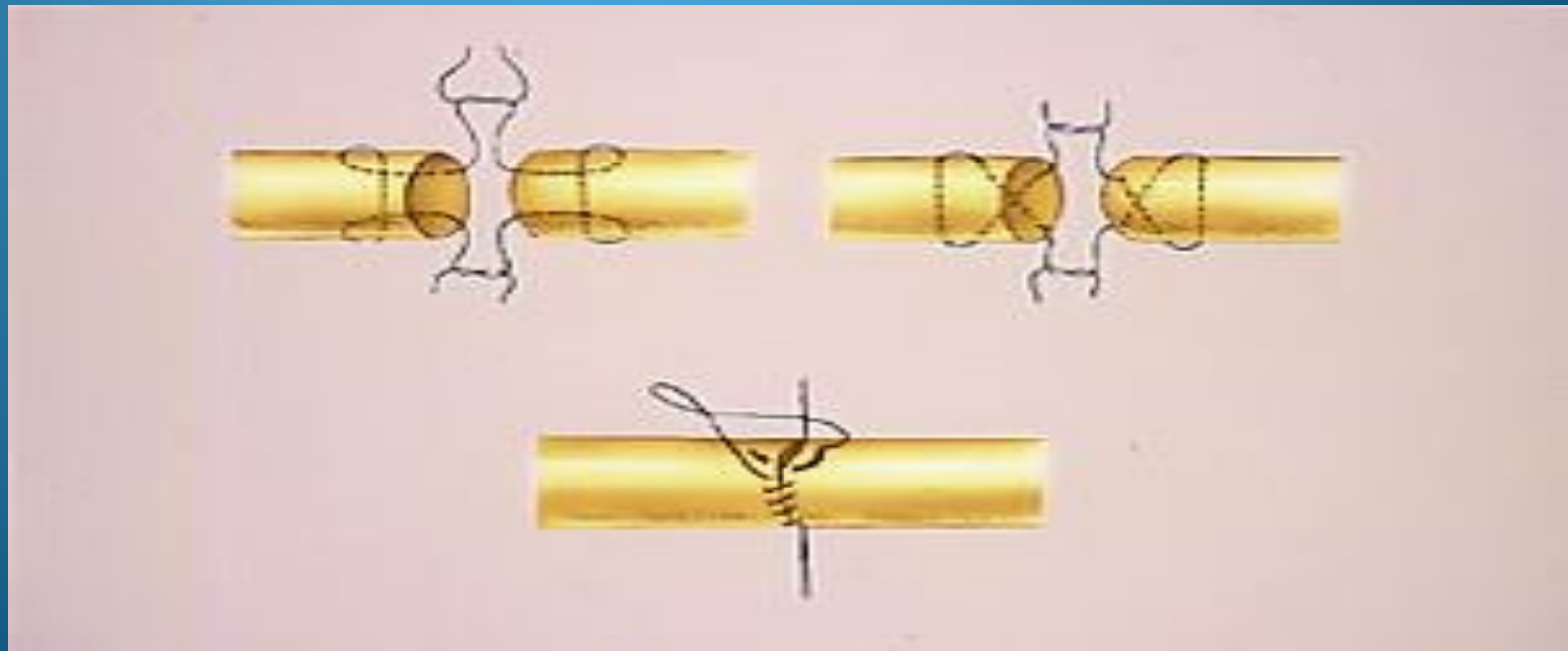
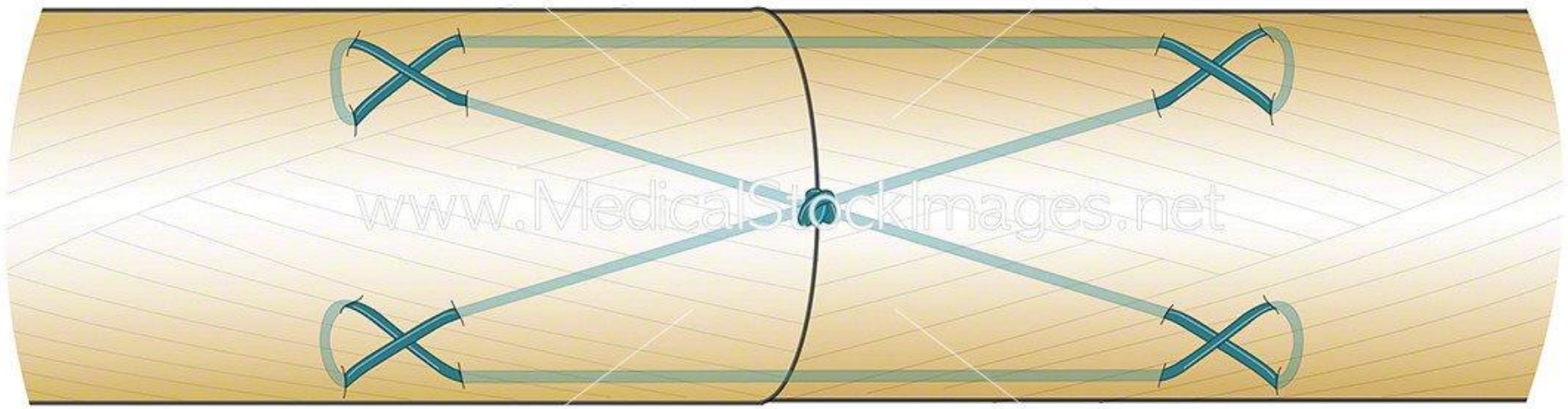


FIG. 68-2 The Bunnell–Meyer tendon suture pattern.

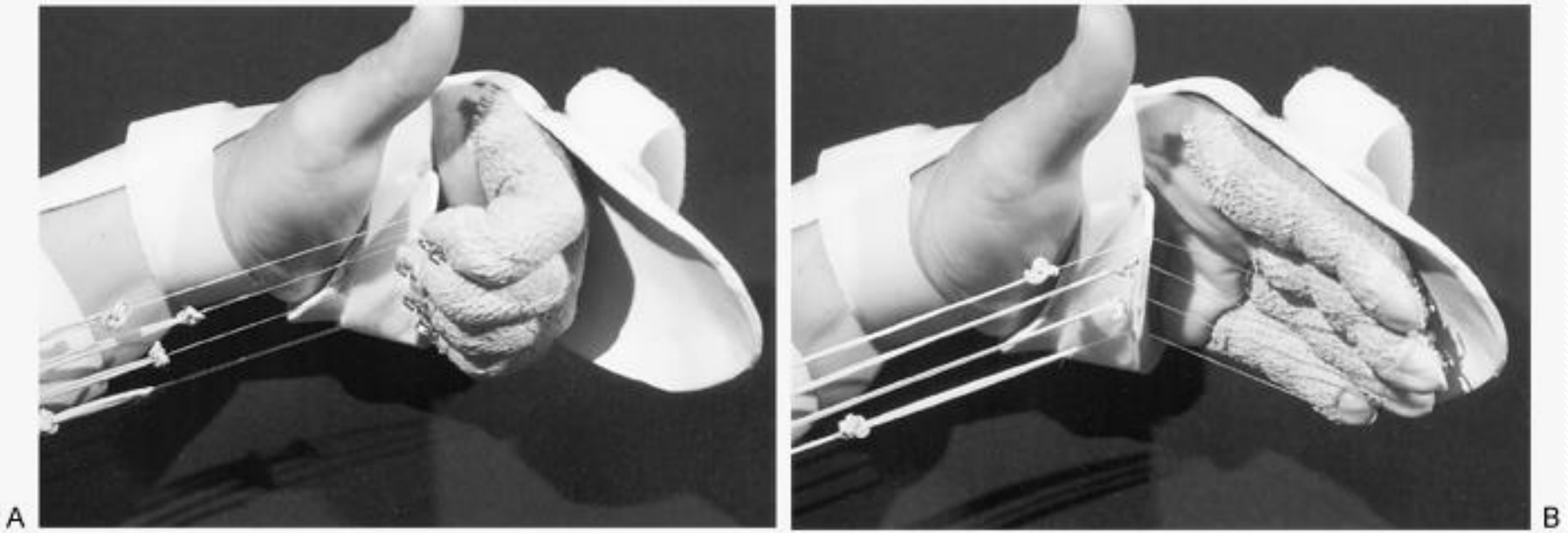
Kessler suture



Adelaide technique



Kleinert technic



- **Primary repair**
- **Delayed primary repair**
- **Secondary reconstruction**

Secondary reconstruction

Possibilities:

- One stage reconstruction
- Two stage reconstruction

One stage tendon reconstruction

Tendon transplantation

Indications:

Segmental tendon loss

Delay in primary repair(late referall, missed diagnosis, scar within the tendon sheat)

Damaged tendon in zone 2

Donor possibilities

Palmaris longus tendon

Musculus plantaris tendon

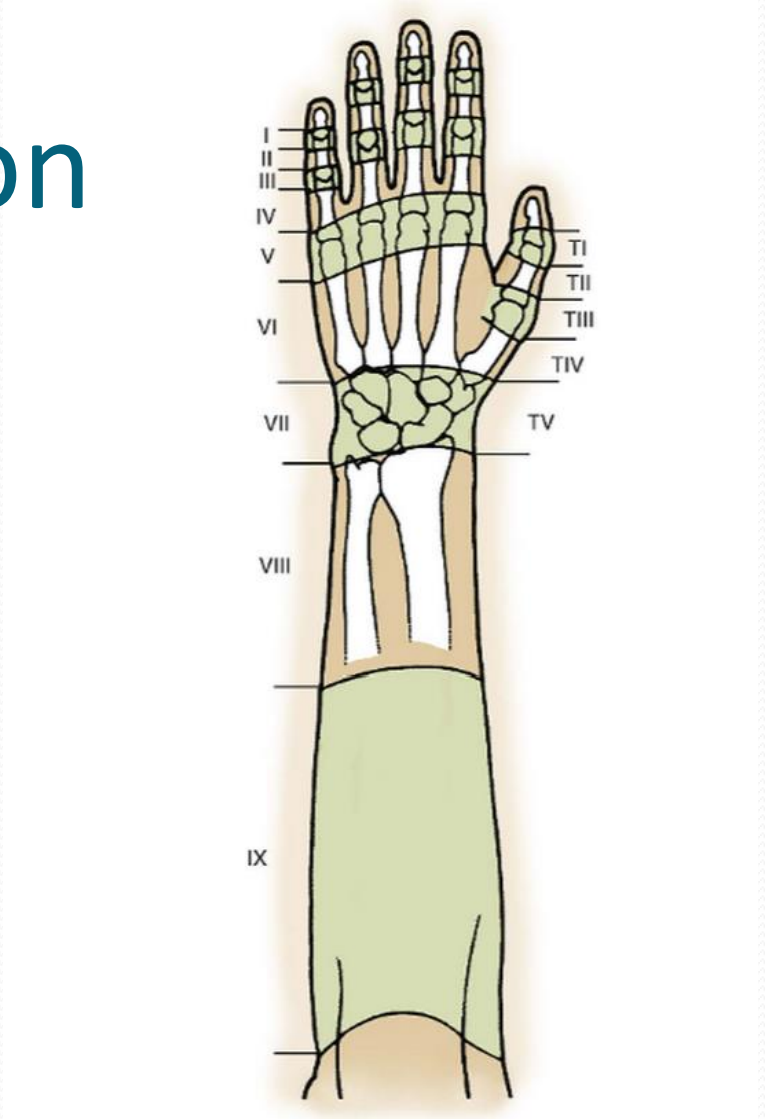
Short foot extensors

Two stage reconstruction

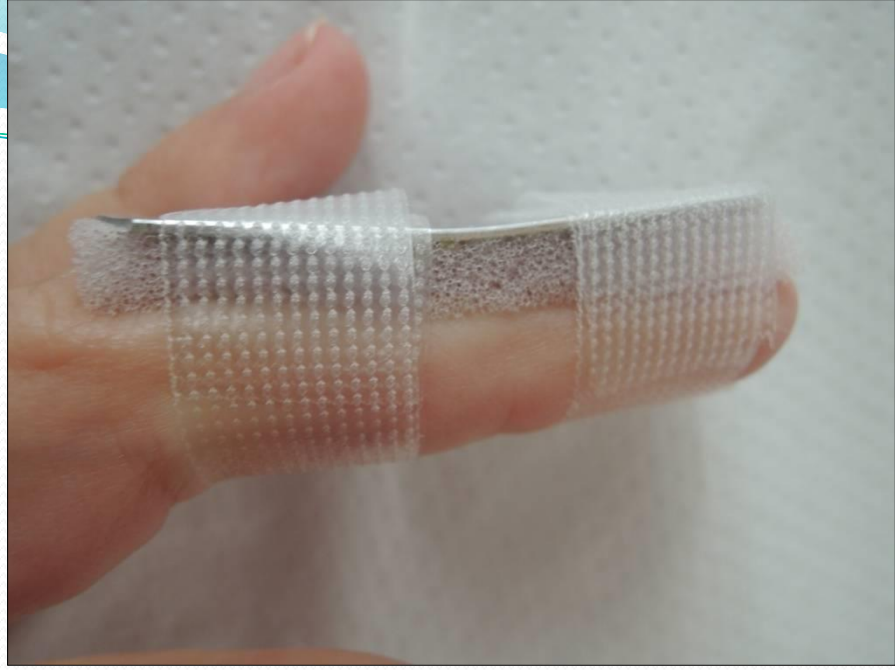
Indications:
Crushing injuries associated with underlying fracture or overlying skin damage
Failure of previous operations
Excessive scarring of the tendon bed
Damaged pulley system
Contracted joints

- **First phase: silicon rod implantation**
- **Second phase: tendon transplantation**

Extensor tendon



Mallet Finger




3

Boutonniere deformity

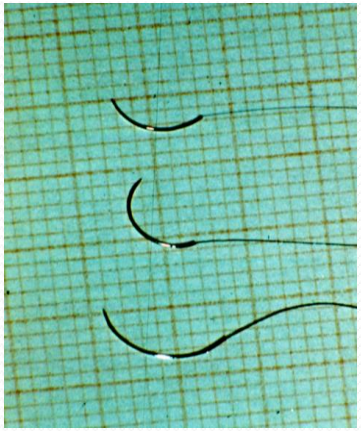
Microsurgery

The basis of the microsurgery:

Magnification

Equipments

Atraumatic suture materials



Replant or revascularise? Microsurgery

Transportation of amputate

- Make an ice bath in a big bag
  - Think champagne ice bucket!
- Wrap the amputate in moist gauze
- Put it in a smaller plastic bag
- Put the small bag into the big bag
- Do not put in direct contact with ice

The type of amputation:

- **Total amputation**

Replantation

- **Partial amputation**

Revascularization

The type of the amputation:

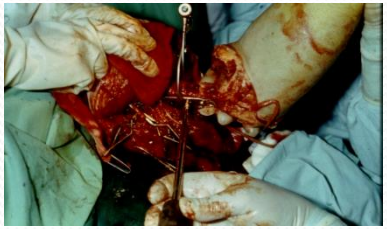
- Major amputation

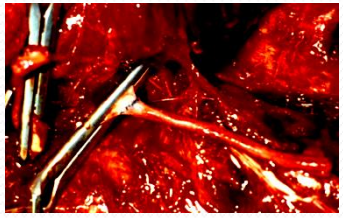
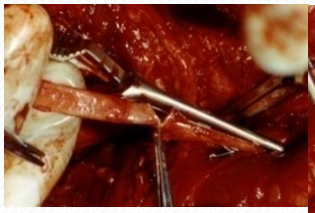
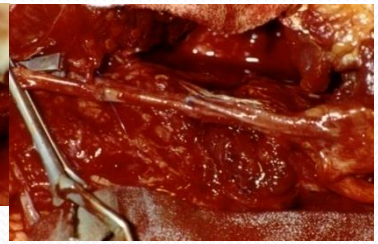
- Minor amputation

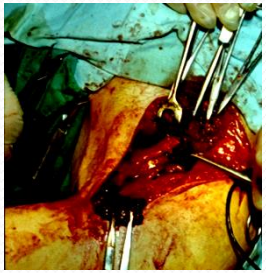
the borderline

The sequence of reconstruction the anatomical structure at major replantation

- Bone
- Vessel
- Nerves
- Muscles
- Skin



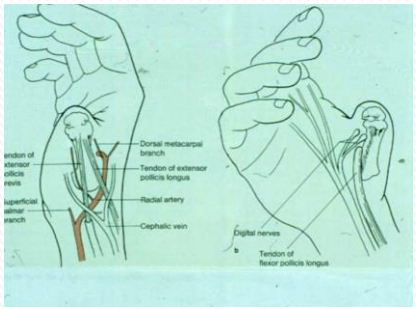


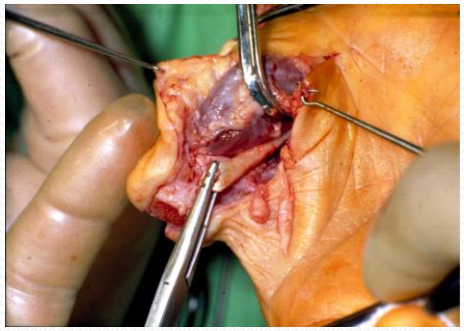
Reconstructive sequence

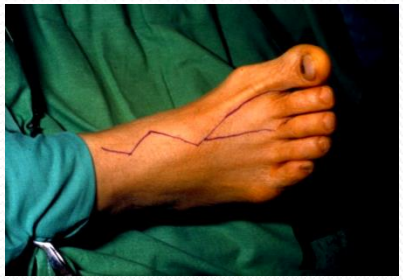
- Bones
- Extensors
- Flexors
- Arteries
- Nerves
- Veins
- Skin

Other options

2nd toe transfer:







The result of the transplantation:

The first toe replantation:

This was the first successful replantation in Hungary: 1979

In Boston in 1962, Malt and McKhann successfully replanted the completely amputated arm of a 12-year-old boy

The first major replantation

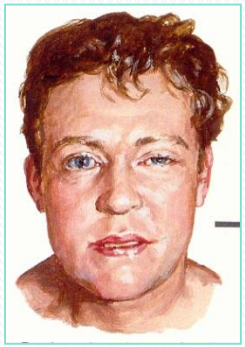
29th of April 1982 These was the first successful limb replantation in Hungary





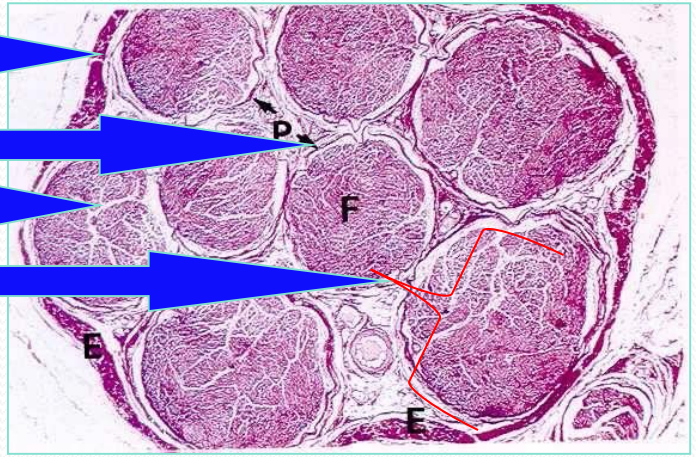
Nerve injury





Anatomy of the peripheral nerve

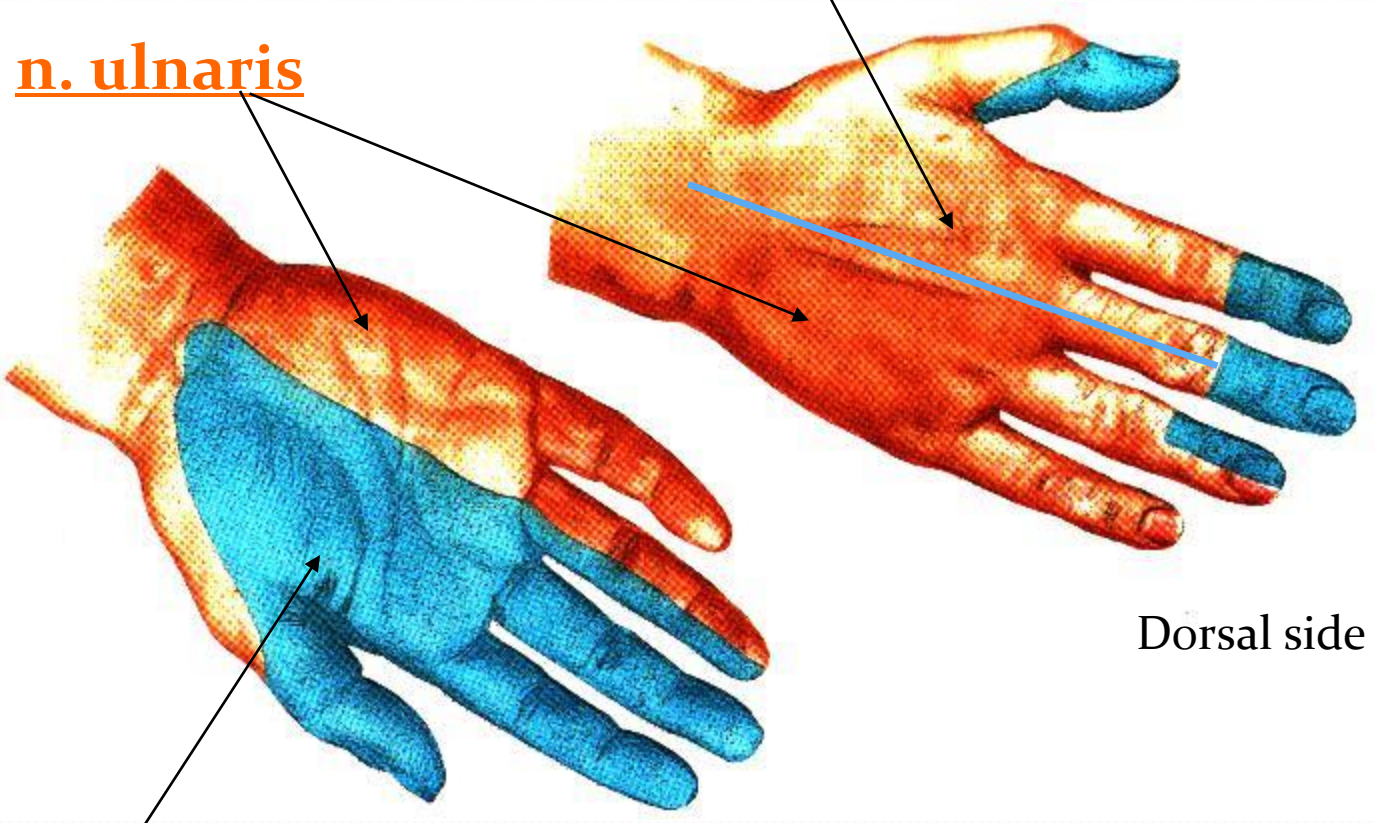
Epineurium
Perineurium
Endoneurium
Fasciculus



Innervation of the skin

n. radialis (ramus superficialis)

n. ulnaris



Dorsal side

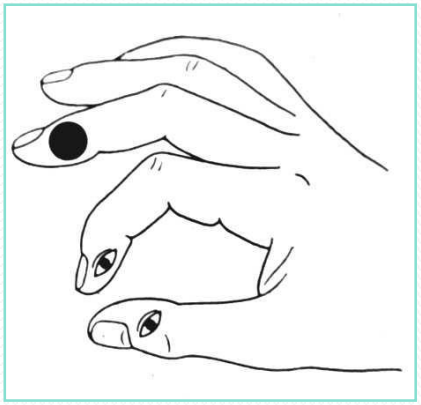
n. medianus

Palmar side

Signes of nerve injury

-loss of sensibility
-weakness or paralysis of muscles
-sudomotor and vasomotor paralysis
-positive Tinel sign

Subjective measurement



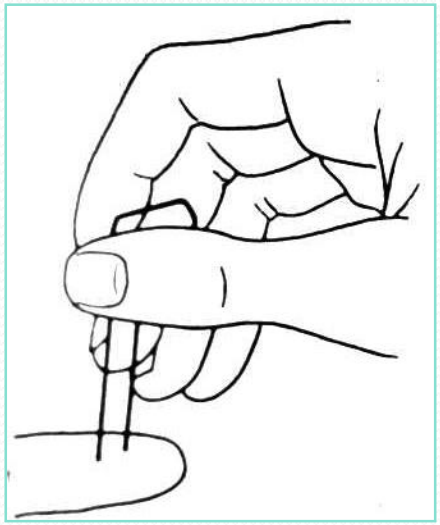
Loss of pain sensation/needle/

Fine tactile/Von Frey/

2 Point Discrimination

/Weber/

Pick up test /Moberg/



Objective measurements

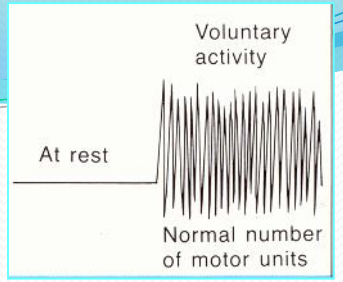
Ninhydrin test

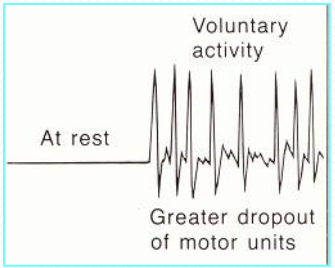
„Resistance”of the skin

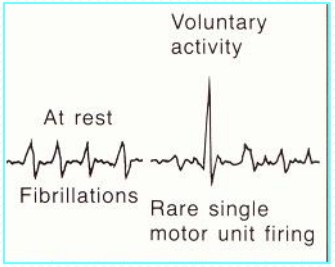
/Dermotest,Sudotester/

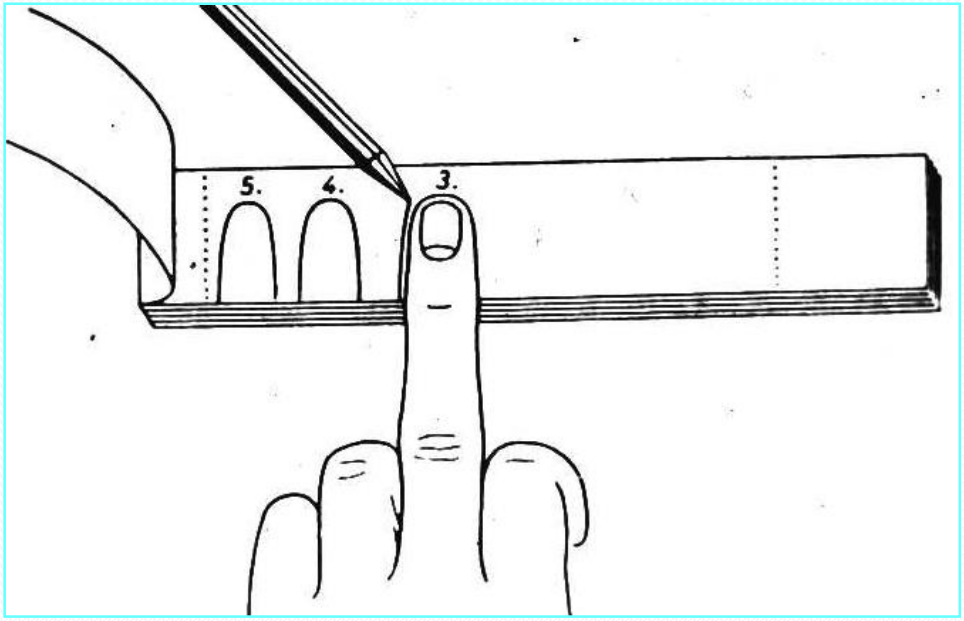
Electrodiagnosis

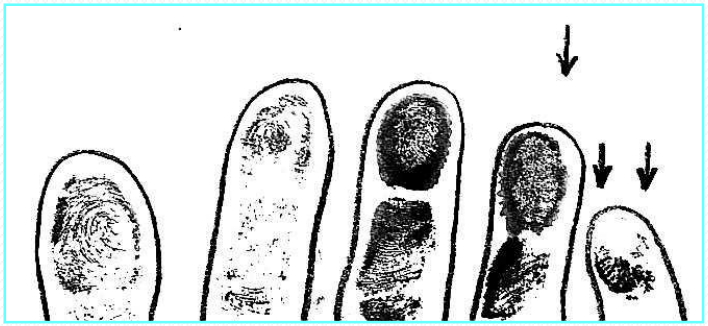
/EMG, ENG/











Classification of Nerve Injuries(Seddon)

NEURAPRAXIA **(nerve not working, anatomy of the nerve is intact)**
AXONOTMESIS **(axon cutting, basal lamina of Schwann cell is intact)**
NEUROTMESIS **(nerve cutting)**

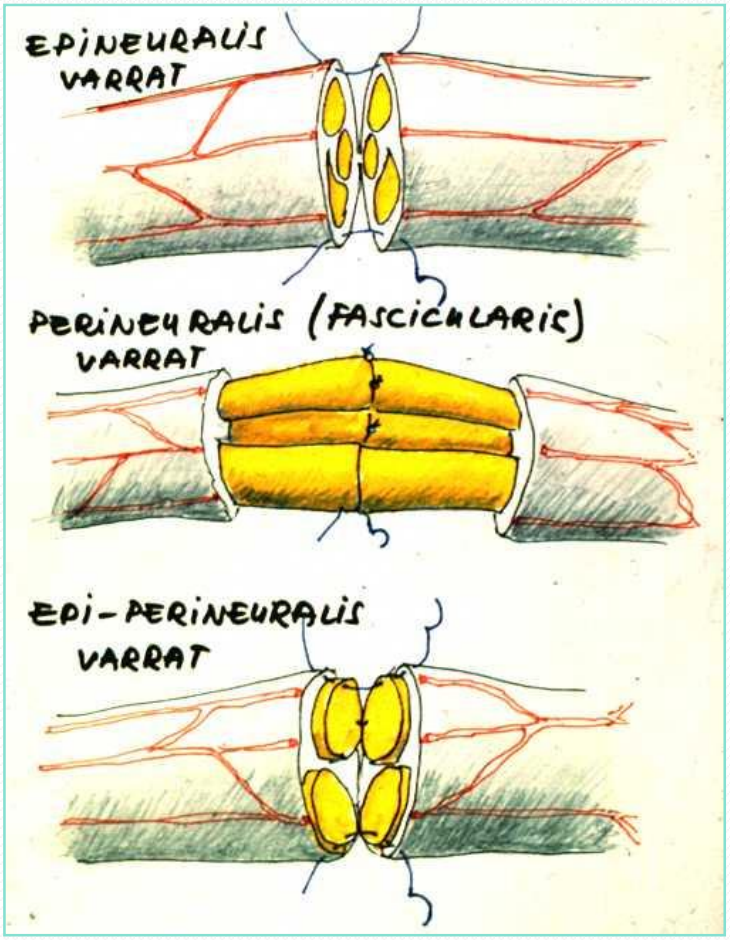
Methods of suturing(timing)

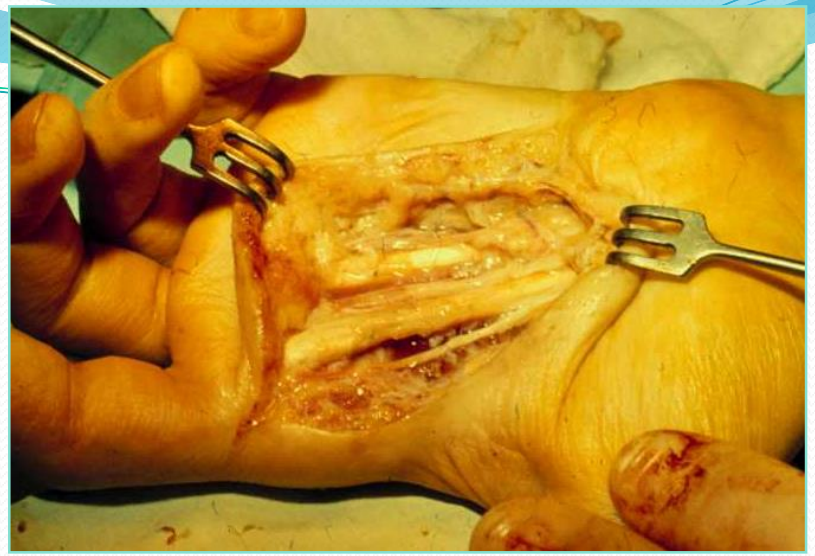
Primary suture **(within 5 days)**

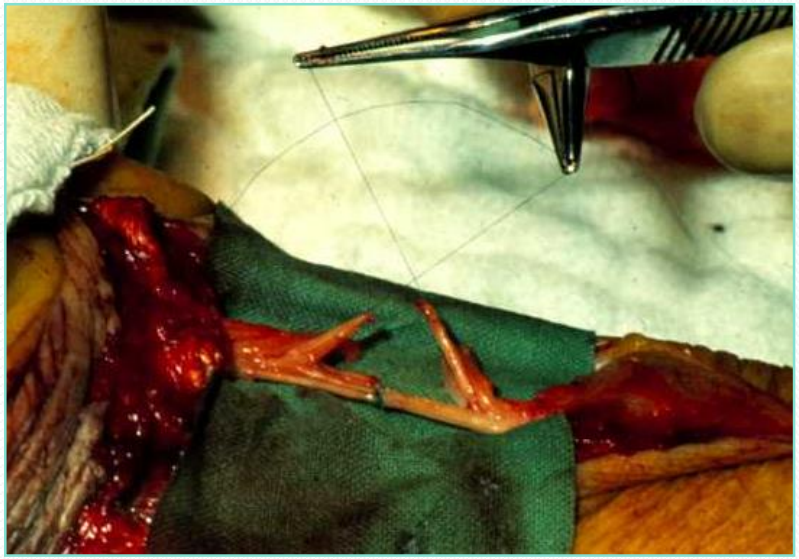
Delayed primary suture **(up to 3 weeks)**

Secondary suture **(3 weeks or longer)**

Final result







The repaired nerve should be without tension!

Radial nerve pulsy

- „**drop hand**”

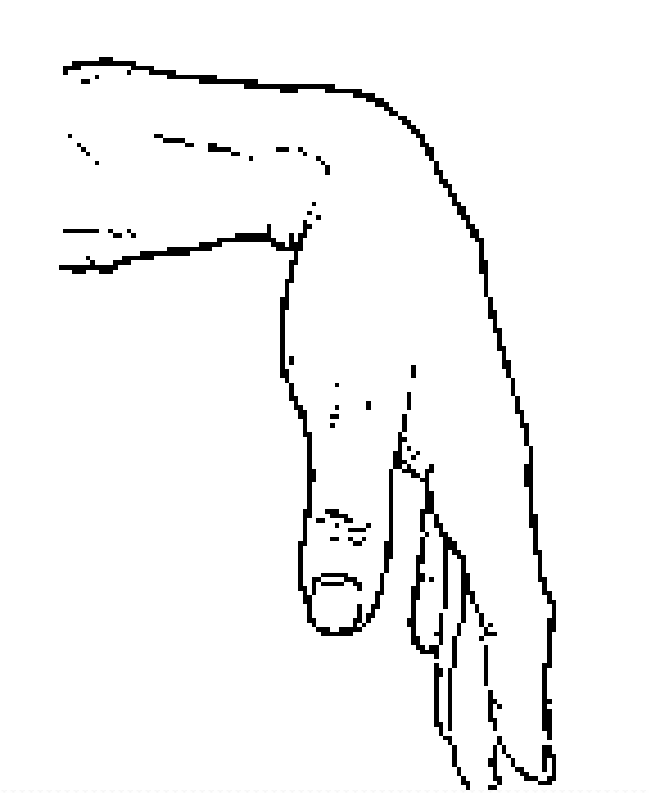
- Treatment

Nerve Repair and Graft
Tendon Transfers

PT to ECRB

FCR to EDC

PL to EPL



Ulnar nerve pulsy

FCU,FDP(ring,little finger)

Hypothenar muscles, all the interosseous, lumbricals for the ring and little finger)

Adductor pollicis, FPB (deep part)

Trauma, cubital-, Guyon tunnel, leprosy

Treatment: Static(e.g.Zancolli)

Dynamic(FDS transfer into the proximal phalanx)

- Claw hand deformity

Medial nerve pulsy

FDS, FDP(index, and middle)

APB, oppenens pollicis, FPB(superfic. head)

PT, FPL, PQ,

Opponensplasties:

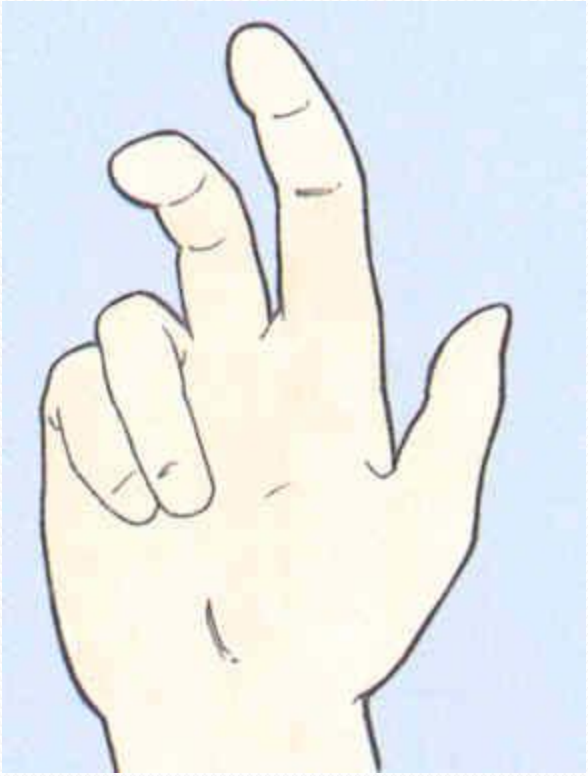
-FDS of the ring finger(Bunnel),

-EIP,

-Abductor digiti minimi(Huber),

-palmaris longus(Camitz)

„Hand of Benediction”



Hand infections

Anamnesis

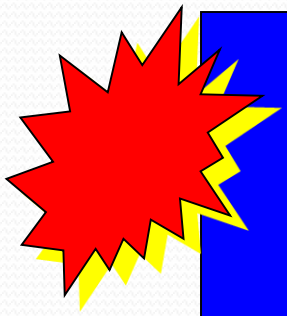
There is always a trauma, sometimes a microtrauma only..

First night awake!

Predisposing factors

Malnutrition
Alcoholism
Diabetes mellitus
Immun defficiency
Chronic corticosteroid use

The classic signs of inflammation



DOLOR	PAIN
TUMOR	SWELLING
RUBOR	ERHYTEMA
CALOR	↑ TEMPERATURE
+	+
FUNCTIO LAESA	FUNCTION LOSS

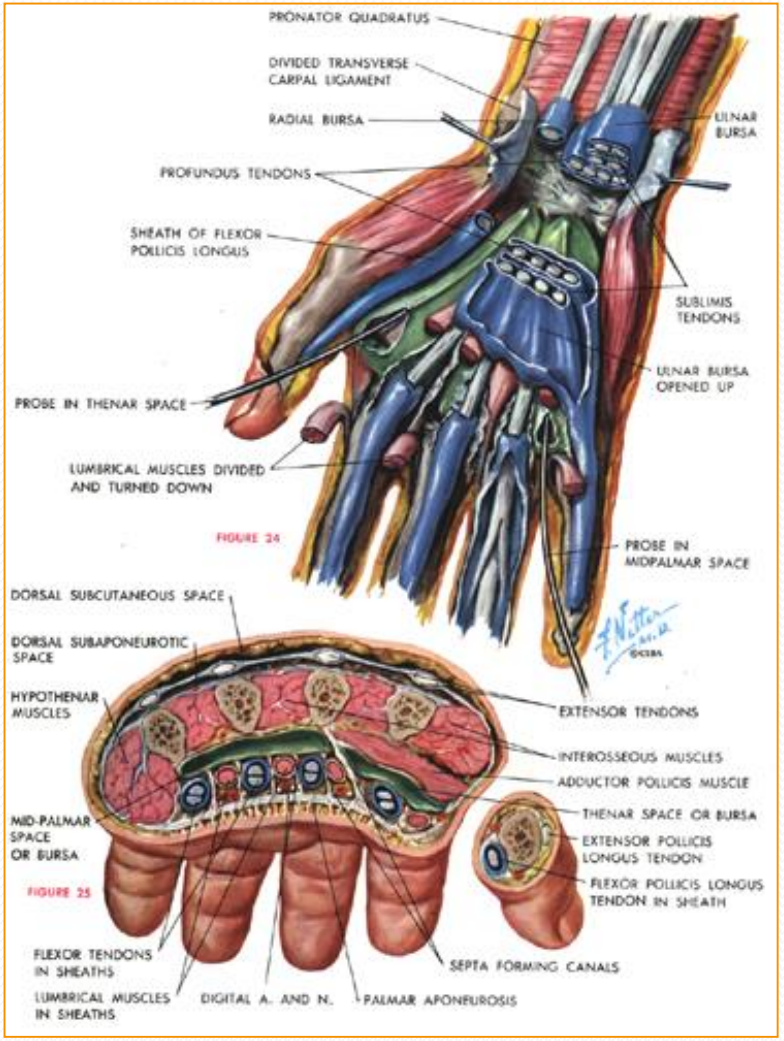
Treatment

- Excision of all necrotic tissue
- Open wound treatment
- Immobilization!, early mobilization
- Iv. antibiotic therapy!

Special anatomical considerations

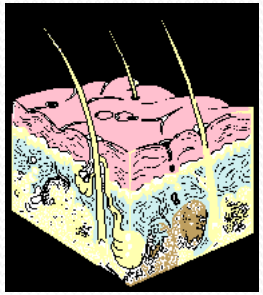
Palmar surface

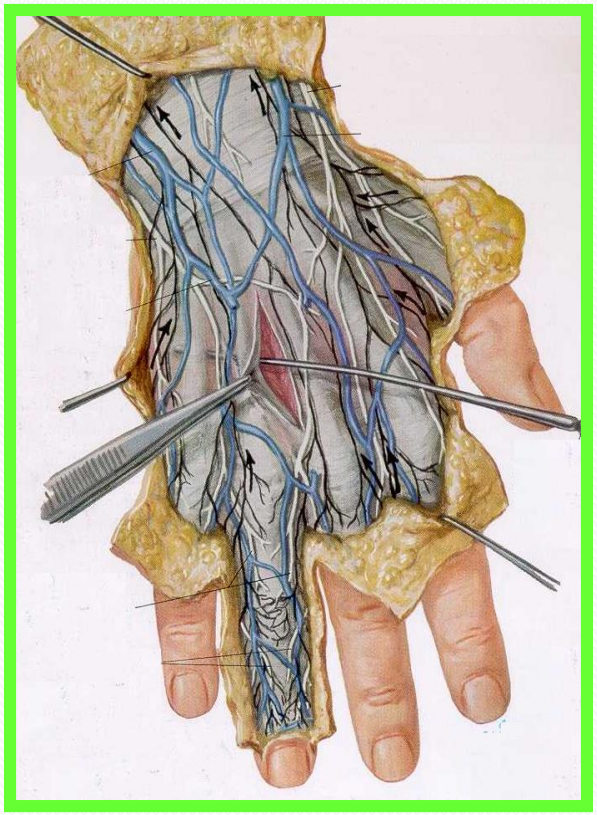
- Thenar
- Midpalmar
- Hypothenar
- Parona's

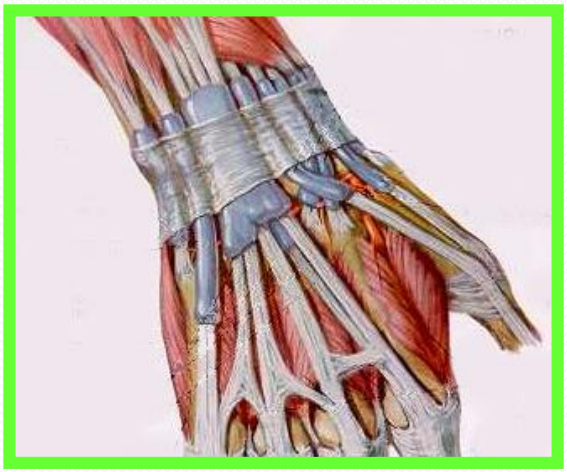


Special anatomical considerations

Dorsal surface



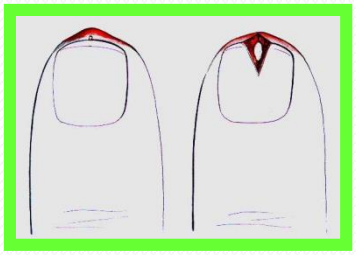


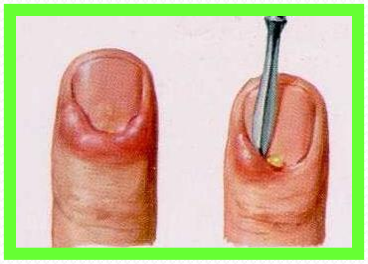


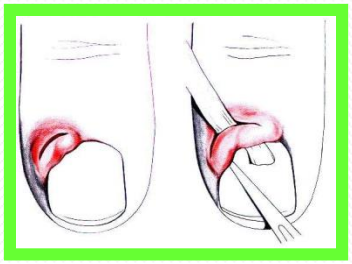
Paronychia

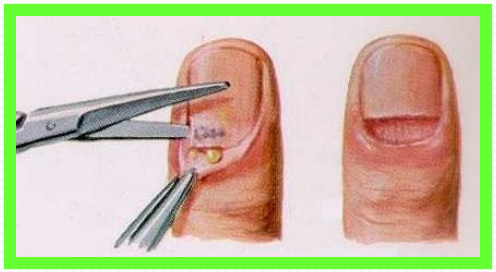
Panaritium paraunguale
Panaritium periunguale
Panaritium subunguale

Surgical treatment

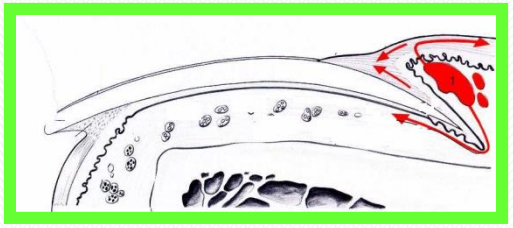


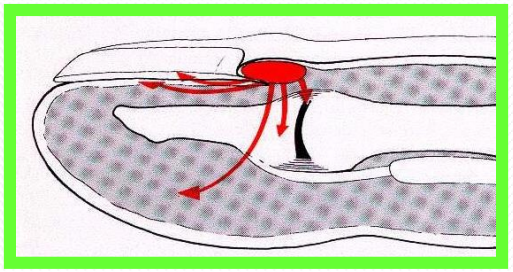






Complications





Cutan abscess

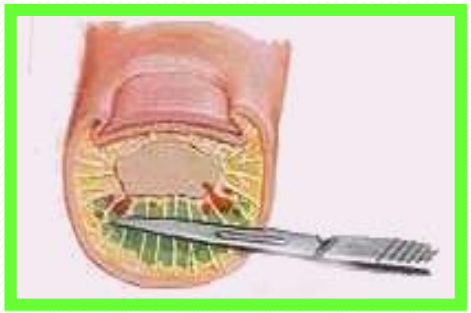
Bulla purulenta cuteaneum
Panaritium cutaneum

Treatment

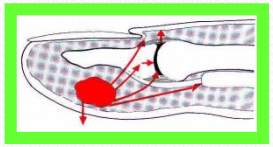
Felon

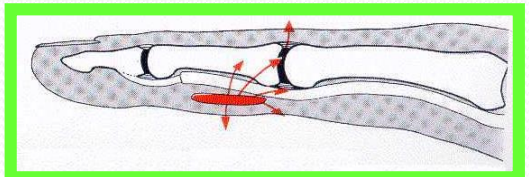
Panaritium subcutaneum
Abscessus subcutaneus

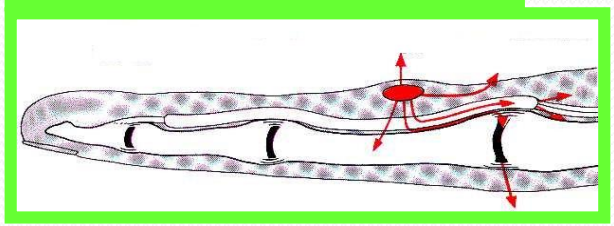
Treatment



Complications



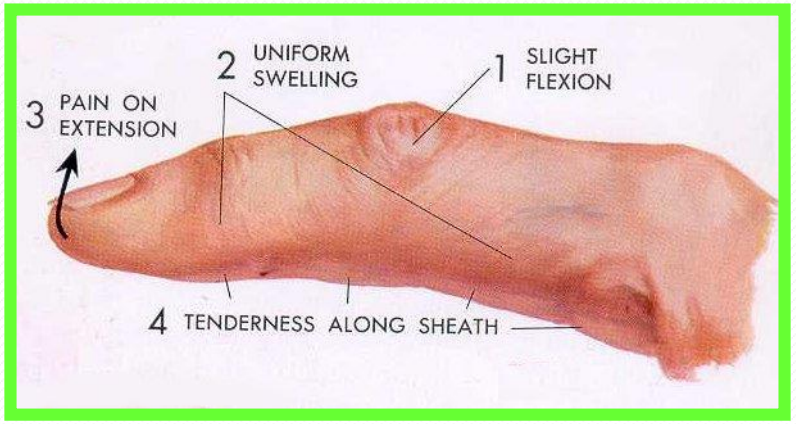




Tenosynovitis purulenta

Panaritum tendineum

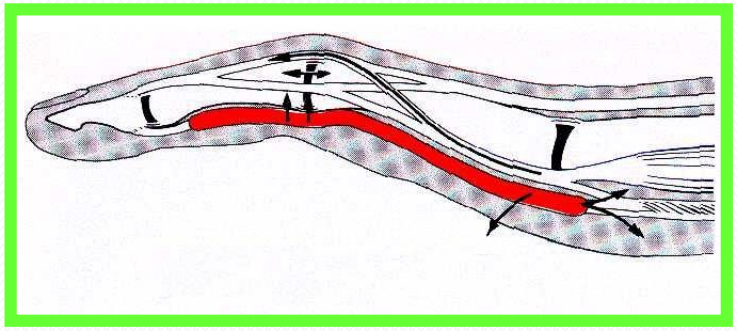
Pyogenic flexor tenosynovitis

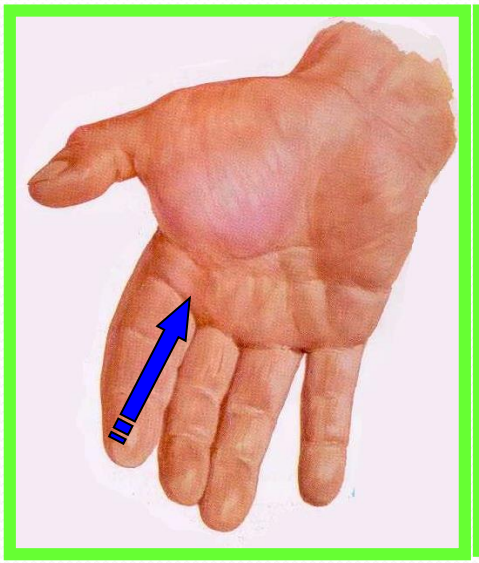


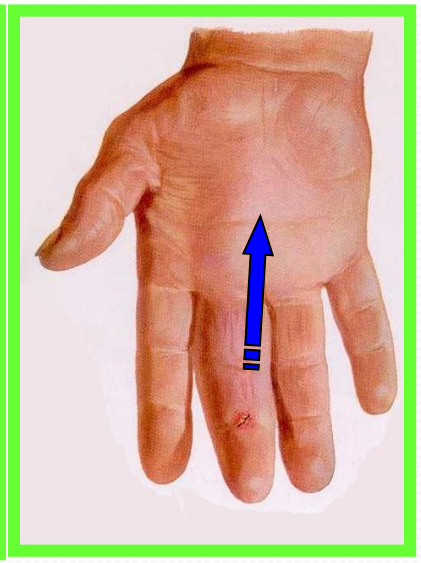
Kanavel signs

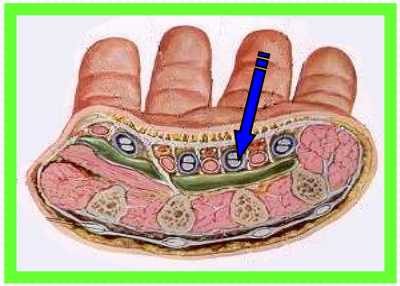
- Flexed resting posture
- Flexor sheath tenderness
- Fusiform swelling of digit
- Pain with passive extension

Tenosynovitis purulenta

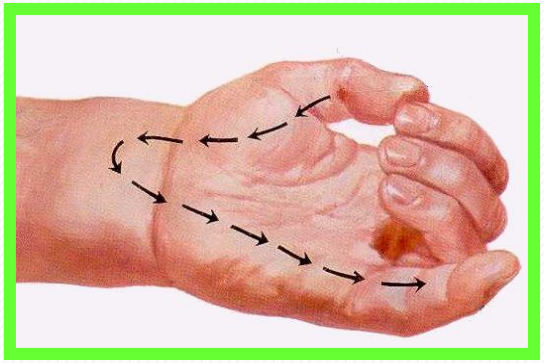






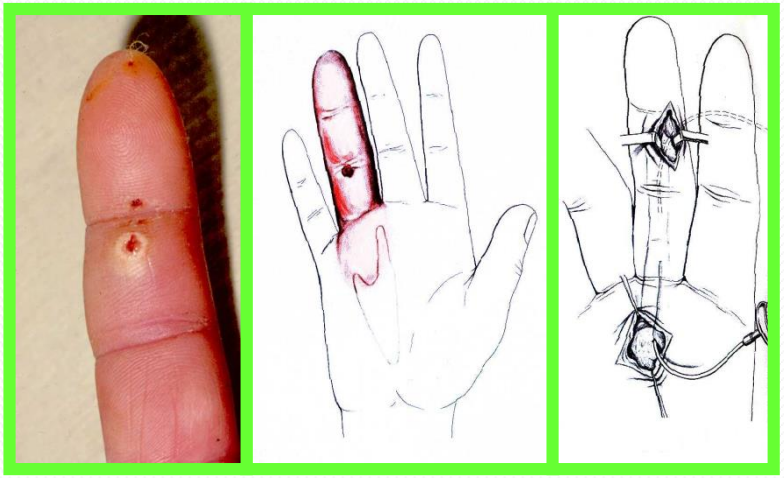


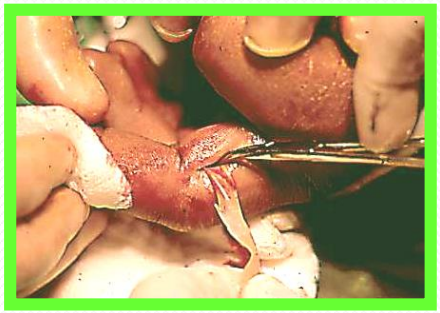
“horseshoe abscess”



Tenosynovitis purulenta

Treatment





Arthritis purulenta

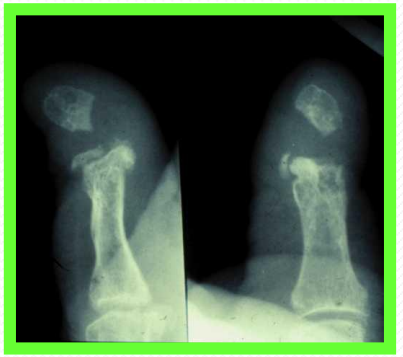
Panaritium articulare
Septic arthritis

Early recognition and treatment provides a good function later.

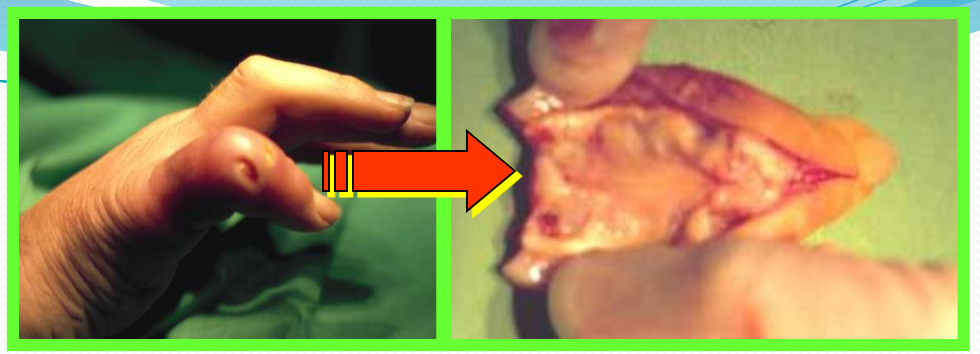
Late diagnosis and treatment leads the destruction of the joint.

Osteomyelitis

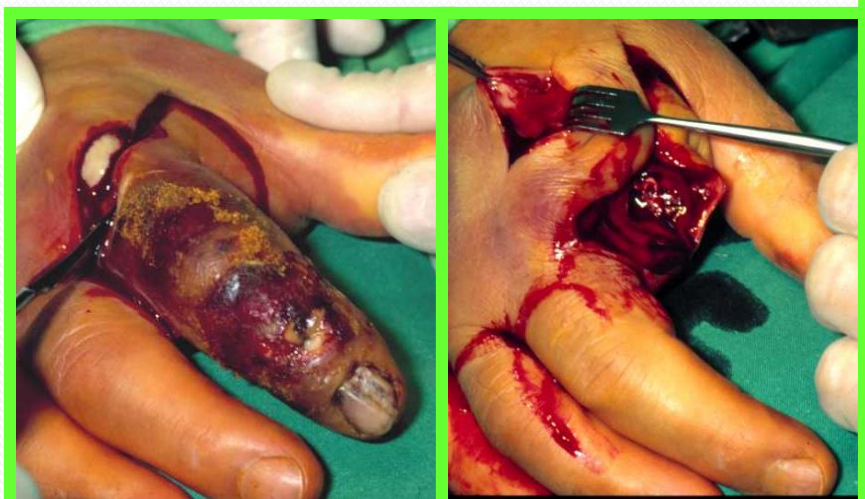
Panaritium osseale
Ostitis



Pandactylitis



Affects all tissues!



Dorsal phlegmone

Dorsal Subcutaneous
Dorsal Subaponeurotic Space Abscess
Interdigital Web Space Abscess