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Tendon Transfers for Nerve Injuries

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Why do tendon transfers?

- To reconstruct a motion that enhances upper limb function
- To re-balance forces to allow other active muscles to function more effectively eg CP
- To eliminate a deforming force which may cause future functional loss eg claw, swan neck

Goals

- Function
- Aesthetic
- Hygiene

General Principles

Consider:-

- Patient
- Donor muscle
- Recipient site and pre op OT
- Timing
- Surgical Technique

The Patient

- Understand the concept
- Able and willing to comply with post op OT
- What are patients functional / aesthetic / hygiene goals
- Condition/disability static or progressive or likely to improve

Donor Muscle

APOSLE

- **Amplitude** (wrist flex/ext 3cm, finger flex 7cm, EDC/EPL 5cm)
 - **Power**
 - **One tendon , one function** (if split will act primarily on slip under greatest tension)
 - **Synergistic**
 - **Line of Pull**
 - **Expendable**
- *** Examine all muscles in upper limb

Recipient Site

- Pliable, vascularised tissue, no scar
- No open wound, infection, inflammation
- No un-united fractures
- Full passive ROM joints or web space
- Consider Xray
- Consider pre op OT / splinting for ROM / web space
- Must demonstrate passively ROM you want to attain w transfer post op

Timing

- Likelihood of recovery
- Internal splint to support partial function

Surgical Technique

- General Comments

- Identify recipient tendon site & length first
- Tunnel through sct is under superficial nerves
- No snags - free and easy line of pull
- Free up donor muscle belly without injury to NVB to increase amplitude
- If recovery of recipient muscle possible do end to side

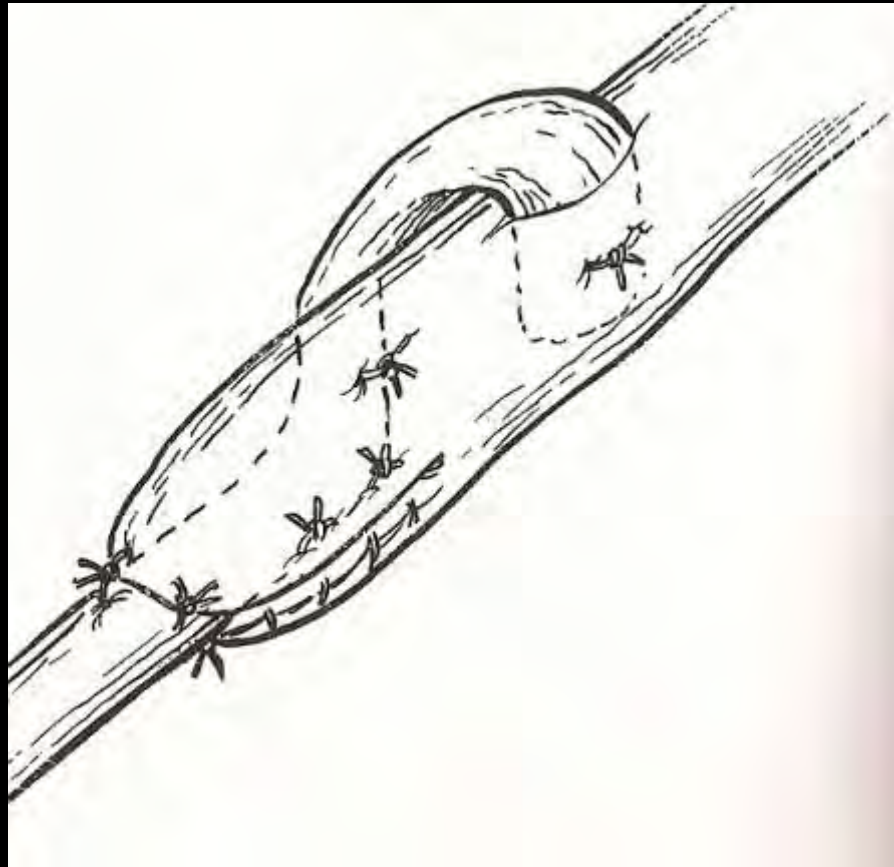
Surgical Technique - Setting tension

- Recipient tendon and extremity in functional position
- Donor muscle at resting length or slightly tighter
- Consider excursion of donor
- Passive vs Active
- Effect of tenodesis on hand/digit positioning

Surgical Technique - Tendon Joins

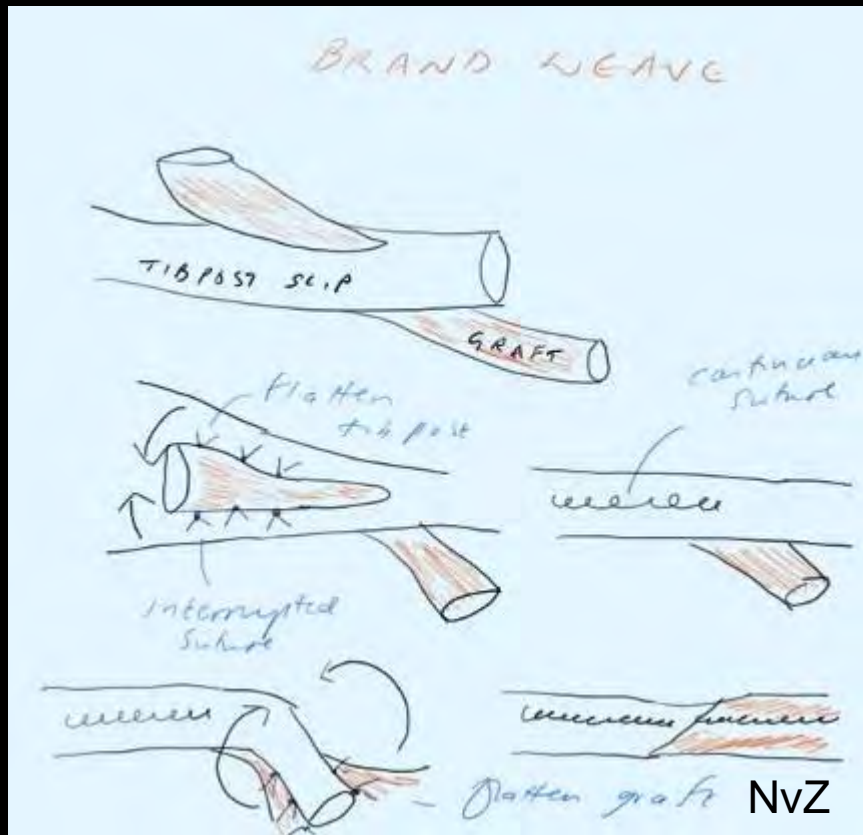
1. End to end (Pulvertuft, Brand)
 2. End to side (Pulvertuft)
 3. Side to side
 4. Tendon to bone
 5. Tendon to synthetic
- Use braided synthetic suture
 - Small bites, many sutures

Pulvertuft - end to end



Atlas of Hand Surgery, Conolly B, 1997

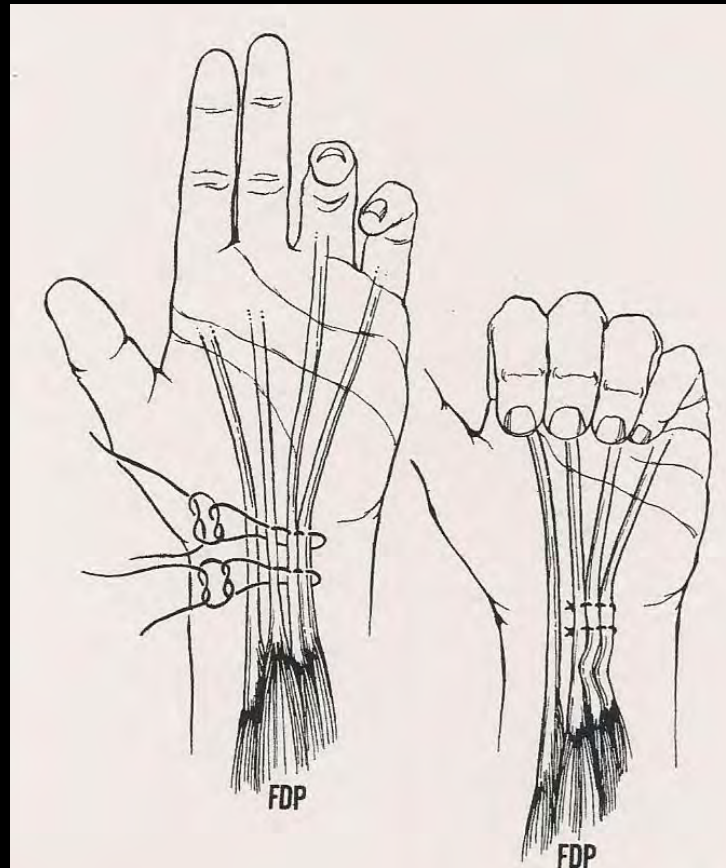
Brand - end to end / side



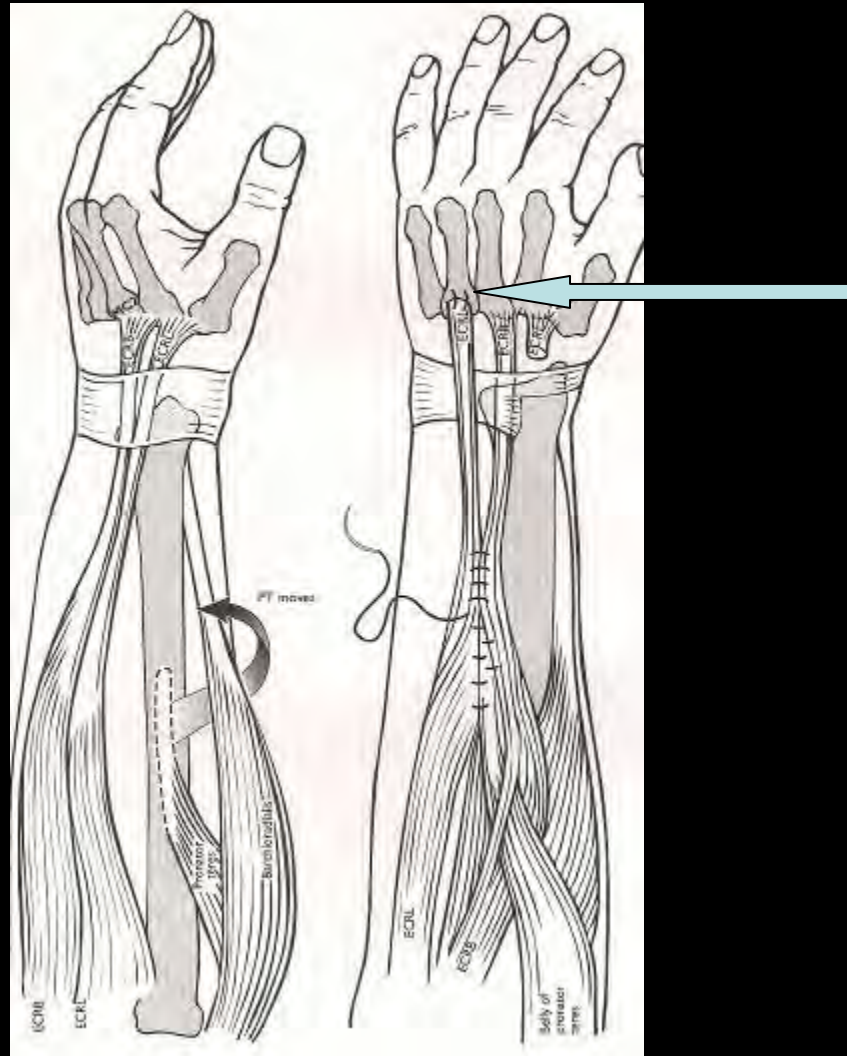
End to Side



Side to Side



Tendon to Bone



Tendon to synthetic



Radial Nerve

GOALS

- Wrist extension
- Finger extension
- Thumb extension

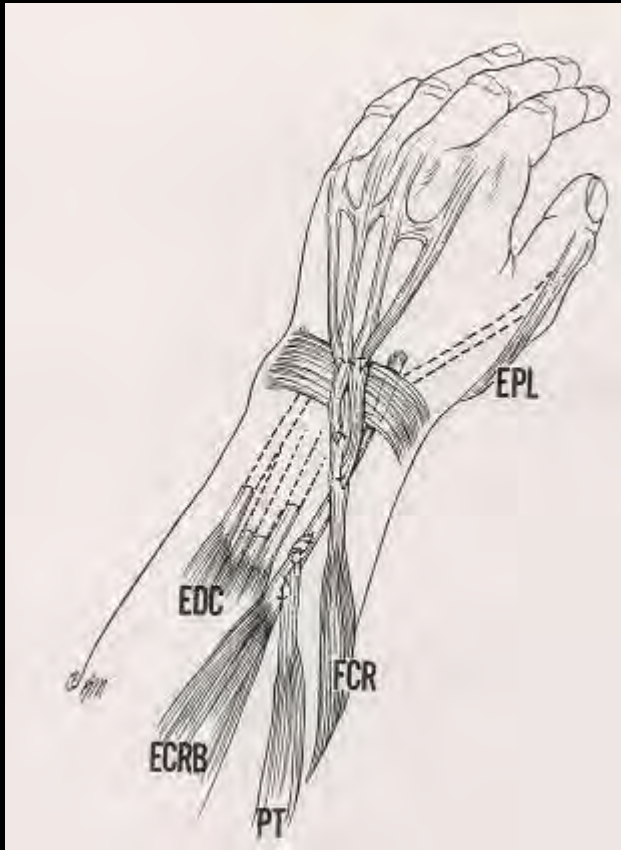


Radial Nerve

TRANSFERS

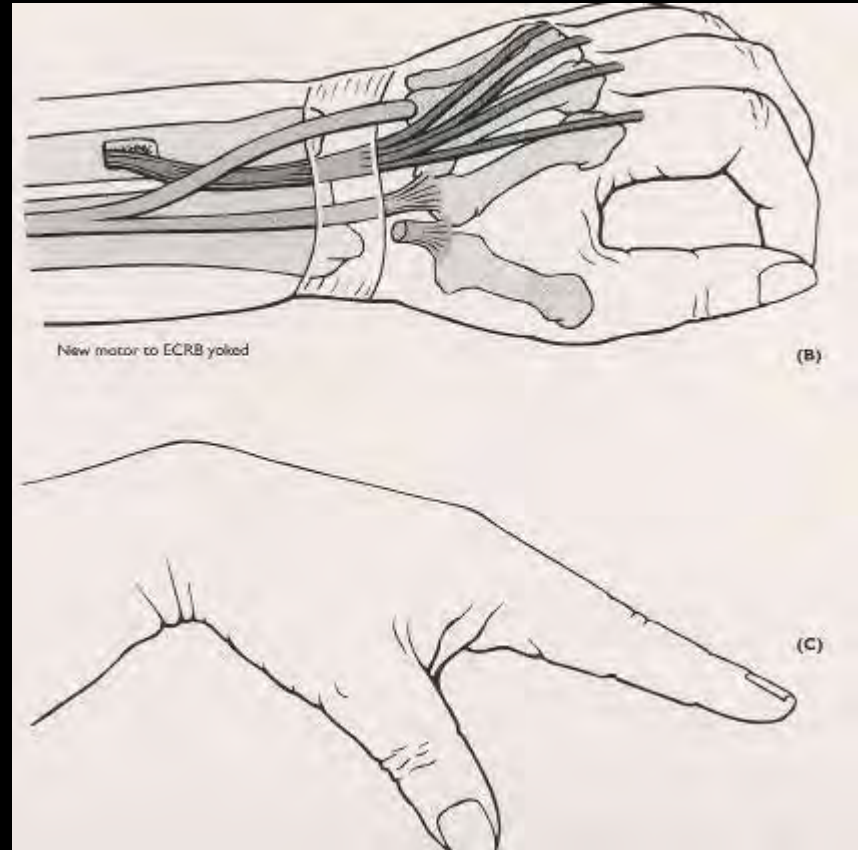
- Wrist ext - PT to ECRB
- Finger ext - FCR to EDC / tenodesis to ulna
- Thumb ext - PL to subluxed EPL / tenodesis to radius

Radial Nerve Transfers



Green's Operative Hand Surgery, Green et al, 1999

PT to ECRB, FCR
to EDC



Atlas of Hand Surgery, Conolly B, 1997

EDC tenodesis to ulna

Radial n palsy - PT to ECRB

PT to EPL

Low Median Nerve

GOALS

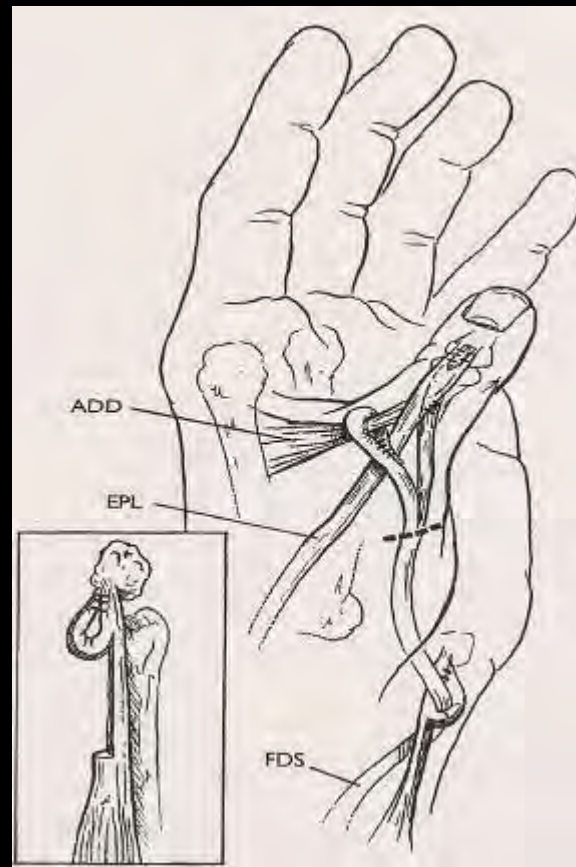
- Opposition
- Good 1st web

Low Median Nerve

TRANSFERS

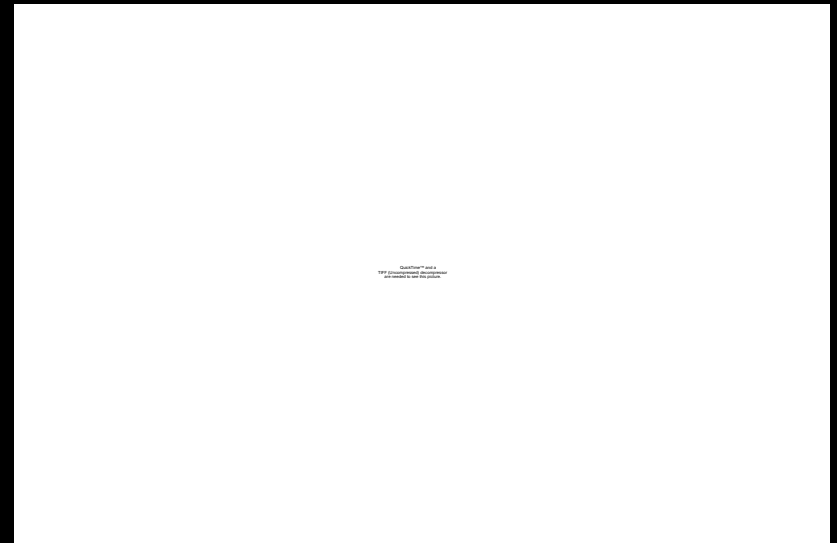
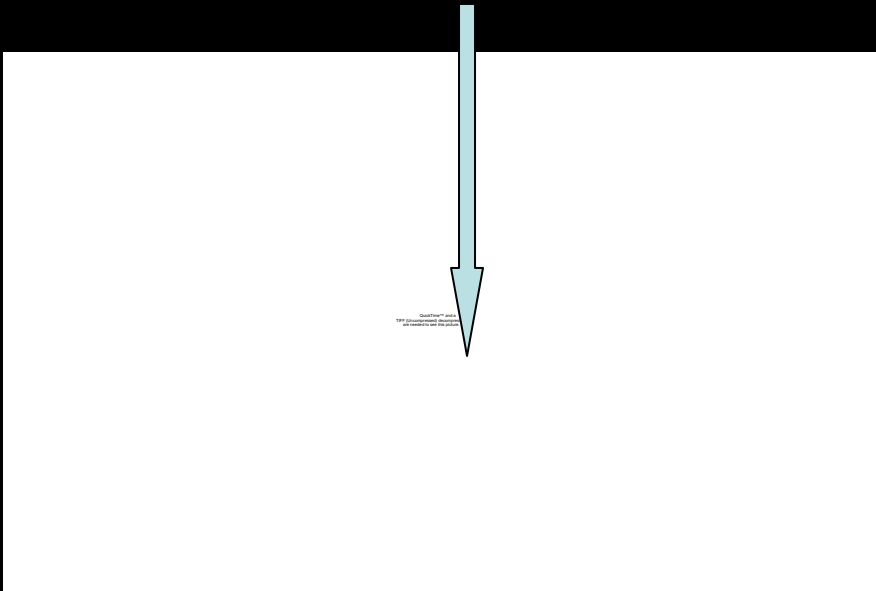
- Abduction/Opposition - EIP or FDS to APB tendon
- Good 1st web - splinting, Z-plasty, adductor fascia release

FDS Opponensplasty

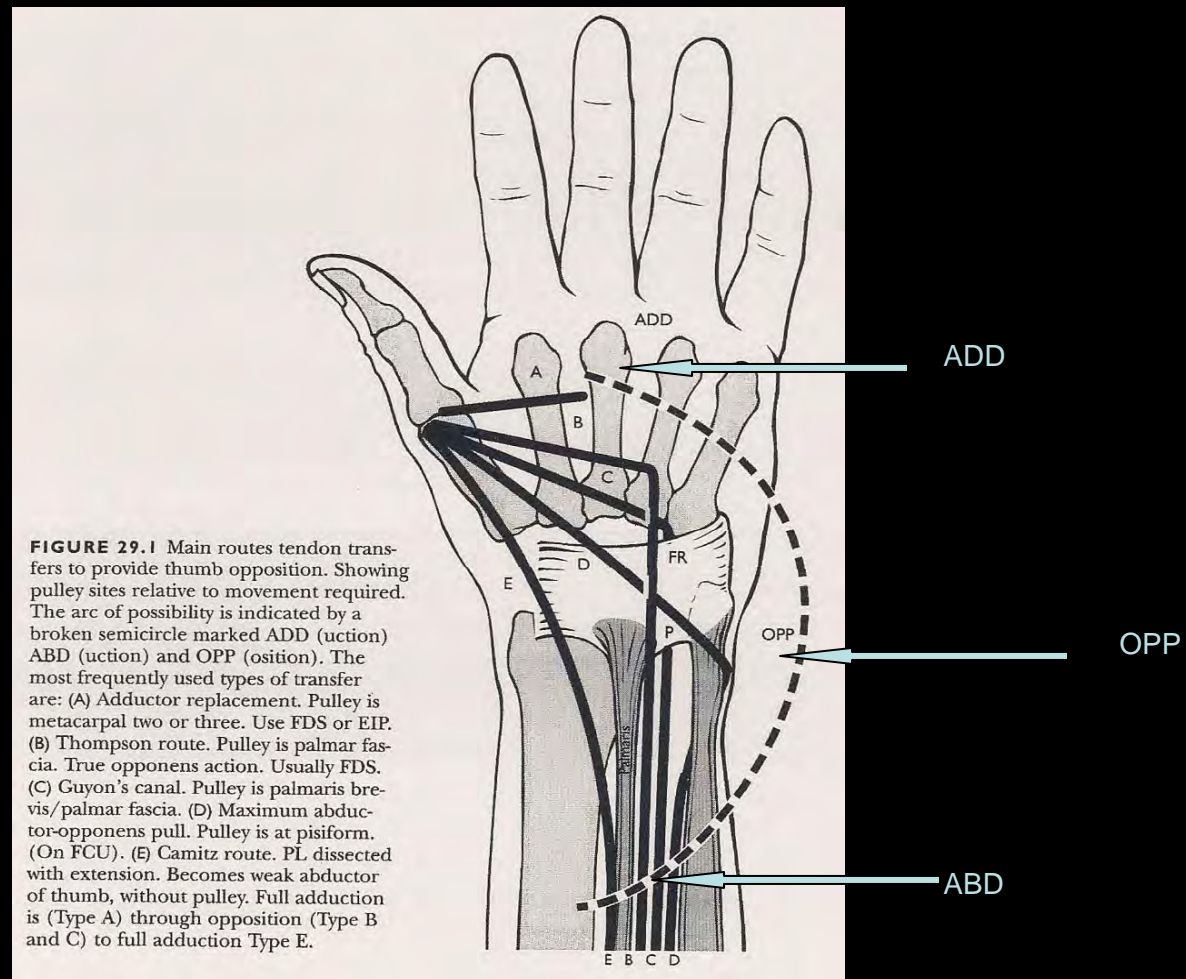


Opponensplasty (Thompson route)

Pulley on
plantar fascia



A Momentary Digression



High Median Nerve

GOALS

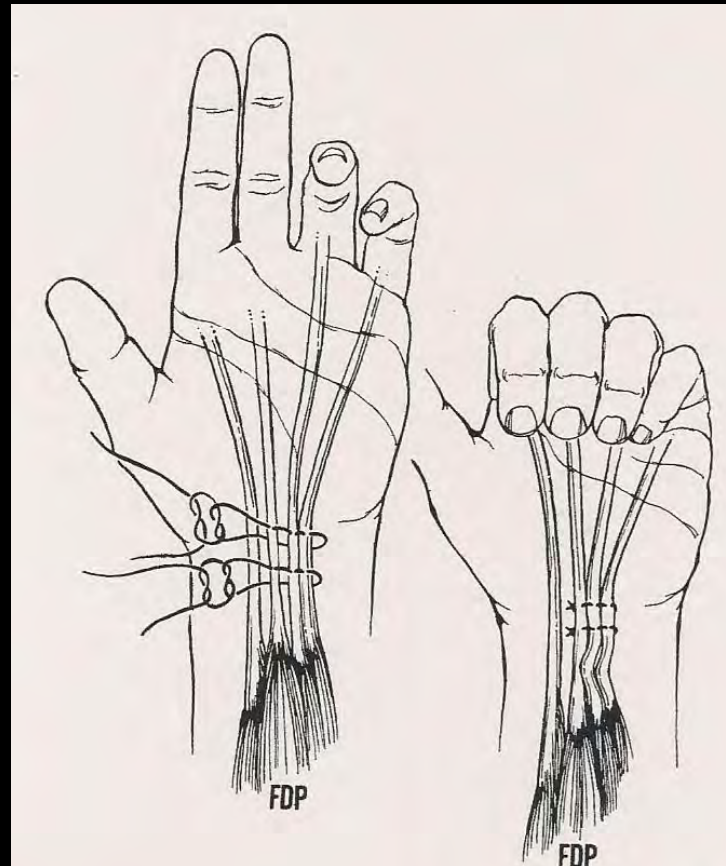
- Abduction/Opposition
- Good 1st web
- Finger flexion (IF, MF)
- Thumb flexion
- Pronation
- Sensation

High Median Nerve

TRANSFERS

- Opposition - as for low
- Good 1st web - as for low
- Finger flexion - FDP 4/5 to FDP 2/3
- Thumb flexion - BR or ECRL to FPL
- Pronation - Biceps - PT
- Sensation - nerve transfer from ulnar n

Finger Flexion - FDP 4/5 to FDP 2/3



Thumb flexion - BR or ECRL to FPL

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

GS



QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

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Low Ulnar Nerve

GOALS

- Improve key/tip pinch - 1st DI and adduction
- Address claw
- Address little finger abduction (Wartenberg's sign)
- Sensory restoration



Low Ulnar Nerve

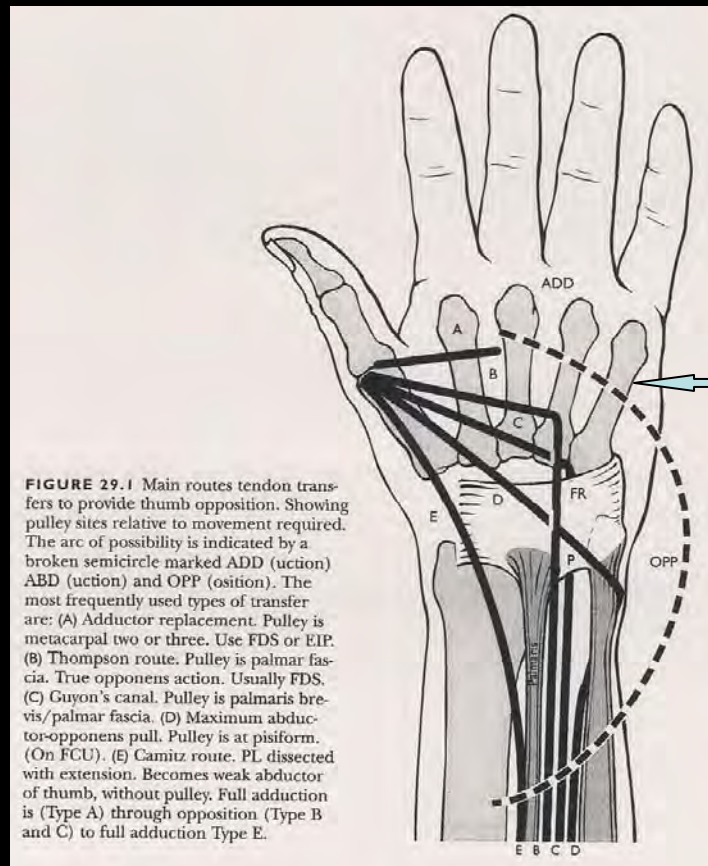
- TRANSFERS
- Improve key/tip pinch
 - EPB - 1st DI
 - FDS₃ adductorplasty
- Claw - Zancolli / ECRB & graft to lateral bands
- LF abduction - Split EDM
- Sensation - nerve transfer

Key Pinch - EPB - 1st DI



Green's Operative Hand Surgery, Green et al, 1999

FDS 3 Adductorplasty



ADDUCTION

Passive Claw Correction - Zancolli



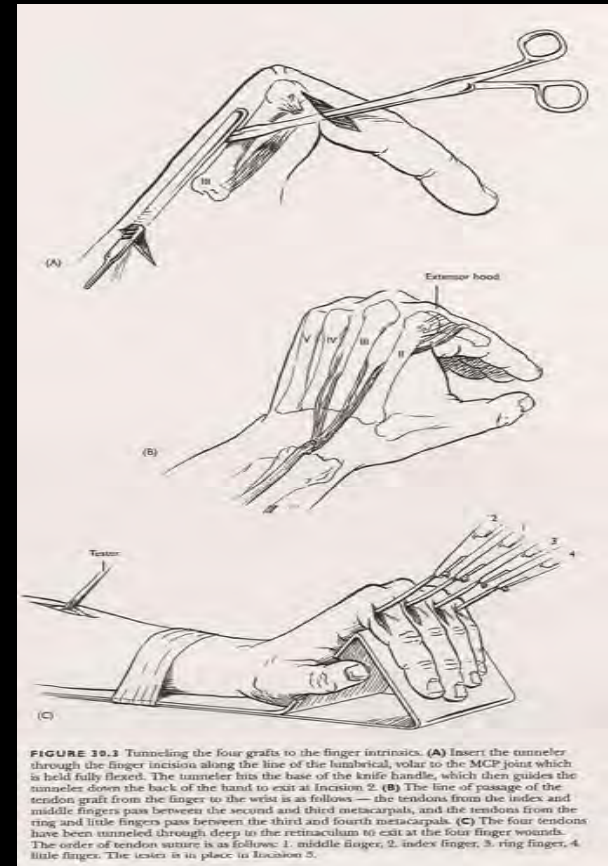
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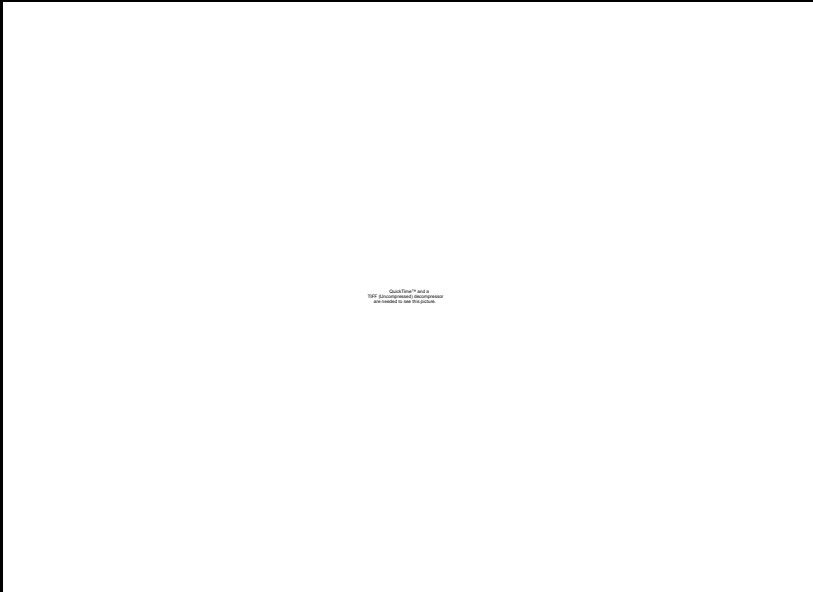
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Active Claw Correction - ECRB/L to lateral band (Plantaris graft)

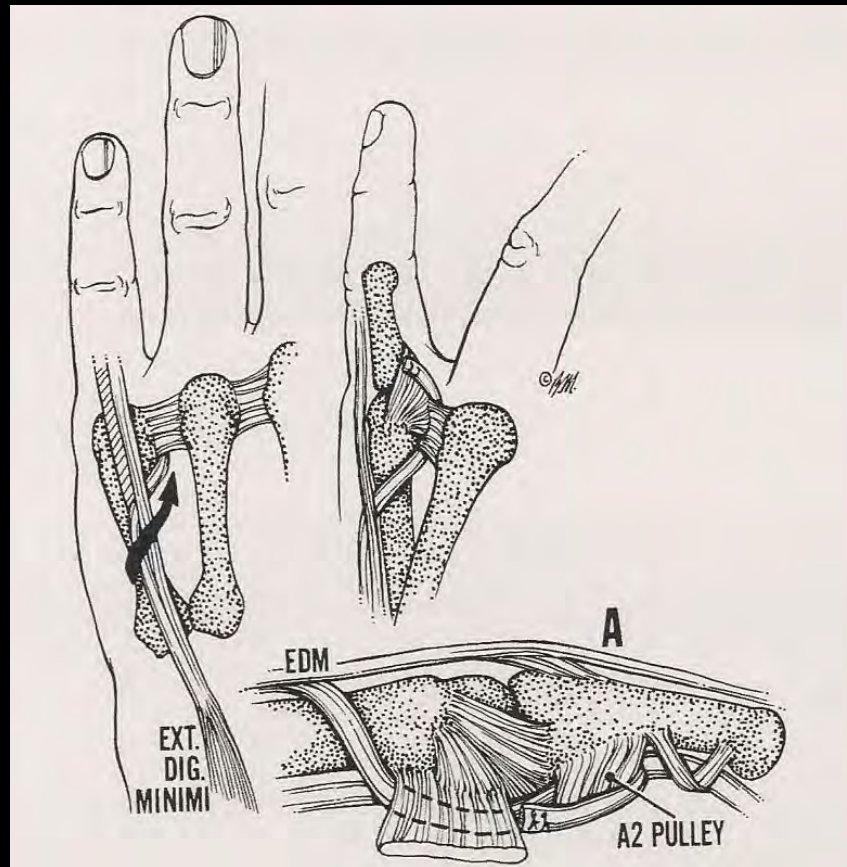
- ECRB/L motor
- Lengthen w plantaris graft (4 slips)
- Through intermetacarpal space
- Volar to deep transverse MC lig (through lumbrical canal)
- Into radial lateral bands MF,RF,LF & ulnar band of IF



ECRB/L to lateral band Intrinsicplasty



LF abduction - Split EDM



Ulnar slip EDM (under deep transverse MC lig.)

⤴ RCL of MCPJ

If clawed as well as abducted place distal end thru A2 pulley

High Ulnar Nerve

GOALS

- As for low
- Plus finger flexion RF and LF

High Ulnar Nerve

TRANSFERS

- As for low
- Finger flexion RF/LF - FDP 3 to FDP 4/5

Peroneal Nerve

GOALS

- Ankle dorsiflexion
- Foot eversion

Peroneal Nerve

GOALS

- Ankle dorsiflexion - TP to TA
- Foot eversion - TP to PB via Achilles graft

Pre Op

TP to TA/PB transfer



Z step lengthen Achilles and harvest graft from mid tendon



Isolate TP and TA



Release TP from insertion

TP
passed
thru'
IOM



TP brought
into incision
over TA &
split distally



TP split
close up



Leg
positioned in
splint for
transfers,
lateral slip
lengthened
with graft for
insertion to
PB



Post Op

Thank you for listening

