# Tendon Transfers in Median, Radial & Ulnar Nerve Palsy

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# Principles

- Compliant Patient
  - Incl expectations
- Adequate Soft Tissue Bed
  - Wounds healed, scars mature
- Supple Joints
  - No transfer can move a stiff joint

# Principles

- What's missing?
- What do they really need?
- Sensate limb

# SAVES

- Strength
  - At least Grade 4+ power
- Amplitude
  - 3,5,7 rule
  - Augment with tenodesis
- Volition
  - Must be able to control

# SAVES

- Expendable
  - 5 control pron/sup
  - 7 control wrist
  - 18 flex/ext digits
  - 20 small muscles
- Synergistic
  - Easier retraining

# LIFT

- Line of pull
  - Straight line if possible
  - Minimise “pulleys”
- Integrity
  - One tendon, one function
  - If 2 functions, greatest tension works first

# LIFT

- Fixation
  - Bone better than tendon
  - End to side
  - End to end
- Tension
  - No consensus
  - Often experience
  - Tend to put in tighter

# Low Median Nerve

- Loss of opposition
  - Is a combination of flexion, palmar abduction and pronation
- APB most important in achieving this
  - FPB, OP also role

# EIP Opponensplasty

- Extensor Indicis
  - No loss of grip strength
  - No pulley requirement
- Harvest just proximal to MCP joint
- Second incision at radial aspect of ulna neck, expose EIP muscle (most distal)

# EIP Opponensplasty

- Retrieve EIP
- 3rd incision just proximal and ulna to pisiform
- Develop a subcutaneous tunnel from pisiform to APB at thumb MCP

# EIP Opponensplasty

- Tension so thumb rests in palmar abduction and opposite IF/MF w the wrist in neutral

# FDS Opponensplasty

- RF or MF
  - Harvest at A1 pulley
- Pulleys
  - Ulna border of palmar fascia
  - FCU near pisiform
- SubQ tunnel to reach thumb
- Tension so w wrist extension get full opposition

# Palmaris Opponensplasty

- Often used when do CTR at same time
- Beware palmar br
- Take strip of palmar fascia

# Palmaris Opponensplasty

- Tends to abduct more than oppose
- Can create a pulley in retinaculum

# ADM Opponensplasty

- Predictably available
- Good if forearm trauma
- Release as far distal as possible
- Also must elevate muscle proximally

# High Median Nerve

- Lose
  - Forearm pronation
  - Wrist flexion (FCR)
  - Thumb flexion
  - Finger flexion (IF,MF)

# High Median Nerve

- Pronation loss
  - May be compensated for by shoulder and other muscles
  - Individualise as to whether needed

# Thumb Flexion

- Brachioradialis to FPL
- Release from radial styloid and mobilise ¾ of way up forearm
- Release FPL at musculotendinous junction

# BR to FPL

- Provisionally attach and check tension
- Thumb should extend with wrist flexion
- Flex fully with wrist extension

# Finger flexion

- IF,MF Flexion
  - FDP RF and LF side to side
- Identify tendons in forearm and placed mattress sutures through all 4 tendons to create 1 unit

# Pronation transfer

- Biceps rerouting

- Step cut the tendon and reroute around radial side of proximal radius and re-attach to distal stump

# Radial Nerve Transfers

- Injury above PIN
  - Lose all wrist and finger/thumb extension
- At PIN
  - Some wrist extension preserved, may deviate radially (ECRL)

# Pronator Teres for Wrist Extension

- PT for wrist extension
  - Harvest strip of periosteum to achieve adequate length
  - Reroute around subQ border of radius

# Palmaris for thumb extension

- PL for thumb extension
  - Take EPL out of compartment and reroute subcutaneously
  - Must pass deep to superficial nerve branches

# FCU type

- FCU for finger extension
- Must remove some muscle belly from distally
- Pass around ulna to get to EDC

# FCR Type

- FCR for finger extension
- Pass around radius to get to EDC

# FDS Type

- FDS (III-V) for finger extension
- Good especially if poor wrist range of motion
- Pass through interosseous membrane to get to EDC

# Tensioning

- All 4 fingers extend together when wrist is flexed

- All fingers and thumb can be passively flexed into a fist with the wrist extended

# Tensioning

- Wrist transfer first
  - Weave PT into ECRB with the wrist in 30-45 degs of extension
  - Wrist then brought to neutral and then weave FCR or FCU into EDC with the MCP joints in full extension
  - With EPL under full tension weave PL

# Tensioning

- Wrist transfer last
  - Donors to EDC & EPL with 30 degs wrist extension, fingers and thumb extended fully
  - Tension so 30 degs wrist flexion gives adequate extension and with wrist extended can fully passively flex digits
  - PT into ECRB so 30 deg resting posture of wrist

# Post Op

- Immobilise
  - Wrist slight extension (30 degs)
  - MCP slight flexion (45 degs)
  - Thumb full abduction

# Low Ulnar Nerve Palsy

- Loss of interossei and ulna lumbricals
- Weakness
- Deformity
- Uncoordinated

# Low Ulnar Nerve Palsy

- Claw hand
- Lead with metacarpal heads on grasp
- Roll up of gingers in flexion
- Weakness of grip

# Low Ulnar Nerve Palsy

- Bouvier's Test
  - To determine if static transfer OK or dynamic needed
- Block MCP extension, ask patient to actively extend IP joints
- +ve test if can extend

# Ulnar Nerve Transfers

- Bouvier's Test +ve
- Can do a static procedure
- Simple Claw
  - MCP Capsulodesis
  - FDS Lasso

# MCP Capsulodesis

- 3-4cm incision at distal palmar crease
- Release A1 pulleys
- Release proximal portion of volar plate
- Anchor to metacarpal neck

# FDS Lasso

- Expose A1 & 2 pulleys
- Release the FDS at end of A2 pulley
- Retrieve between A1 & 2
- Sew back to self around A1 pulley
- In resting cascade

# Ulnar Nerve Transfers

- Bouvier's Negative
- Need to provide IP extension
- Complex Claw
  - FDS transfer
  - Wrist extensor-intrinsic transfer
  - Improve strength and synchrony

# FDS Transfer

- Bruner incision over PIP
- Expose lateral band over proximal phalanx with separate incision
- Divide FDS as distally as possible

# FDS Transfer

- Pass through lumbrical canal to radial aspect of small and ring fingers

- Tension to recreate digital cascade

# Wrist extensor-intrinsic transfer

- ECRB or ECRL
- Use if combined palsy so no median motor to use

# Wrist extensor-intrinsic transfer

- Pass volar to deep intermetacapal lig
- Attach to radial lateral band

# Ulna Transfers for Pinch

- Adductor pollicis and 1st Dorsal interosseous
- Loss of effective power pinch
- May also get significant IP flexion, MCP hyperextension

# ECRB to Adductor Pollicis

- ECRB harvest and then retrieve proximal to retinaculum
- Take graft or Z-lengthen tendon
- Create tunnel between Add Policis & interossei volar to 2nd metacarpal and exit between 2nd/3rd metacarpal.

# ECRB to Adductor Pollicis

- Suture to AdPol tendon with wrist in neutral and thumb adducted against index

- Firm adduction of thumb with wrist flexion and abductionwith wrist extension

# FDS III or IV to Adductor Pollicis

- Release A1 pulley and harvest FDS just proximal to decussation
- Tunnel FDS to ulna side of thumb
- Tension in 30 degs wrist extension and thumb against IF

# Post Op

- Thumb spica for 4 weeks
- Then gentle AROM & active assisted
- At 8-10 weeks begin resistance

# Summary

- Individualise transfers based upon patients deficits and needs
- May not need all transfers in a set
- Stick to principles

# Thank You

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