Relative Motion Extension (RME) Rationale

- Repaired MP Joint(s) in 15-20° more extension than neighbors
- Extensor Tendon Zones 4-7
- Must have one EDC, EIP or EDM intact*
- Does not apply to ET of thumb

RME: Rationale

- Common muscle - multiple tendons & interconnections

RME: Rationale

- Splint injured digit(s) 15-20° more MPJ extension than non-injured MPJs
  - reduces strain on repair
  - limits excursion
  - safe hand function

Creates ‘Extensor Quadriga’ (common muscle & interconnections)

RME: Rationale

- SLACK when injured digit is in 15-20° more extension than neighbors
- LIMITS - not prohibit tendon excursion

Thank you, Dr. Lalonde!
EXTENSOR TENDON REPAIRS ZONES 4-7

Relative Motion Extension (RME)

RME: Rationale

EXTENSOR TENDON REPAIRS ZONES 4-7

RME = ICAM

ET Zones 4-7


Phase 1: 0 - 21 days

- BOTH orthoses:
  - Active Motion
    - MP flexion
    - IP flexion
    - MP + IP flexion
    - MP flexion/IP extension
    - Abduction
  - Passive place extension + active hold extension
  - Light to medium duty work and ADL's

Phase 2: 21 - 35 days

- RME only orthoses:
  - Active Motion
    - MP flexion
    - IP flexion
    - MP + IP flexion
    - MP flexion/IP extension
  - Passive place extension + light hold extension
  - Wrist flexion & extension with or without fist
  - Finger exercises out of RME orthosis

Long Finger

Index or Small

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Phase 3: 35 - 42 days

- Zone 5 most common (4-6-7)
- Long finger most common (index-ling-small)
- Simple injuries: 89 patients
- Complex: Zone 7 most common 2.3 (0-21) avg days to repair

ICAM = RME 2005

RESULTS

This data is 20 years old, timeframes are conservative!!

ICAM = RME 2005

RESULTS

- Grip at discharge 85% of opposite hand
- Discharge 7 week average (21-136 days)
- Return to Work average 18 days
- Average therapy visits = 8
- NO Complications, secondary surgery, CRPS.

ICAM = RME 2005

RESULTS

*Compared to contralateral digit

BEYOND ICAM 2005

Burns et al: 2013 Hand 8:1:77-22
Altobelli et al: 2013 JHS 38A: 1079-83
Hirth, Howell, O’Brien 2016 JHT Scoping Review

Proof of Concept RME 2016

Hirth, Howell, O’Brien: Relative Motion orthoses in the management of various hand conditions: A scoping review, 2016:405-32

UPDATE 2016:
Coilcott et al: + 21 Zones 5-6

Splint the wrist: yes or no?
SAGITTAL BAND NON-SURGICAL & POST-SURGICAL
Relative Motion Extension (RME)

Sagittal Band & Juncturae Tendinum

- Linked Motion
- Balanced MPJ Extension

SB & Juncturae Tendinum

SB injury-Link Unbalanced

Sagittal Band tension

- Hyperextension = 5-10°
- Neutral = 0°
- Full Flexion = 40-70°

MPJ Position alters Fiber Orientation & Tension

- Less tension on EDC/SB
- Centralizes EDC ↓stress SB&JT
- Limits arc of MPJ motion 60-70°
- Permits EDC excursion

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**Best Evidence Sagittal Band**

- RME orthosis only
  - 25-35° RME
  - 15-20° RME
  - "Expert Opinion"
- Observe EDC centralization with motion; painful?
- Full time wear
- 4-8+ weeks

**Non-Rheumatoid SB Injury**

- 15-20° RME
- 25-35° RME
- 4-6 weeks full time wear

**TIP: RM orthosis width & length**

**TIP: RM orthosis 1/12” or double it**

**BUILD RME ORTHOSIS**

Pair-Up
- RME for Long Finger
- RME for Index or Small finger

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Special Thanks to Amanda Higgins, OT and Colleagues
Fabrication of RME/RMF orthoses
Melissa Hirth, Melbourne Australia

RELATIVE MOTION FLEXION
RMF

RM Flexion
Maximum flexion of involved MPJ & 15-20° less MPJ flexion of uninvolved digits

Lumbrical “Little Remembered Facts”
Primary Mover MP flexion & IP extension
Inserts FDP only
4x’s > Excursion vs. IO
Main force pulling Lateral Bands Volar

RMF Rationale: Full flexion of involved MCPJ, 15-20° less flexion of neighbors

MP Flexion
- Passive tension on EDC & Hood restores stability

RMF Rationale: Full flexion of involved MCPJ, 15-20° less flexion of

MP Flexion
- Relaxes Lumbrical → less volar tension on LBs
  Quadriga FDP
RMF Rationale: *Full* flexion of involved MCPJ, 15-20° *less* flexion of neighbors.

**MP Flexion**
- Lumbrcal & Interossei extend PIP & DIP Joints

RMF to Restore Dispersal of Tension

"Each finger is a tube of interwoven aponeurosis, with each fiber having the distinct ability to move independently."

**ACUTE & CHRONIC BOUTONNIERE DEFORMITY**
Relative Motion Flexion to restore dispersal of tension

Rationale
**Acute Boutonniere**
- Central Slip Injured
  - Lateral Bands dorsal
  - Intact Triangular Ligament & Spiral Fibers
  - At-length TRL & ORL
Rationale

**Chronic Boutonniere**

- Lateral Bands volar
- TL & SF attenuated
- TRL & ORL shorten

**Fixed Boutonniere**

- ORL & TRL contracted
- DIPJ flexion contracture
- PIPJ stiff

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RMF Guidelines ET Zone 3 Repair

- Repair is stronger than secondary healing!
- Repair normal LB orientation!
- Repair has limited DIP & PIP stiffness!

0-7d
- Obtain PIP extension
- DIP flexion of 30-60°
- PIP FO static

10-31d
- Exercise only RMF, PIP 0-40°
- Continue PIP FO static in-between exercise & night
- If PIP extension retained, increase RMF wear; PIP 0-60°
- PIP FO static for protection & night

3-6 wks
- If PIP extension retained, increase RMF wear; PIP 0-60°
- Night PIP FO static

6-12wks
- Repair is stronger than secondary healing!
- Repair normal LB orientation!
- Repair has limited DIP & PIP stiffness!

BUILD RMF ORTHOSIS

Pair-Up
- Long Finger
- Small Finger
- Modified Long Finger

CASE STUDIES
RME & RMF

Acute Boutonniere
What structures are involved?

- Elson’s Test?
  Detects Central Slip Injury
- Tön’s Modified Elson’s Test
  Normal

- Pencil Test?
  RMF

- LBs dorsal
- CS tension
- Triangular ligament tension
- LX & IO extend PIPJ