The climber’s pulley lesions
Pathophysiology
Clinical examination
Surgery? When?

F. Moutet
D. Corcella  A. Forli
Flexor tendon digital sheath

• 5 arciform and 3 cruciform pulleys
  – What for?

Constant lever arm flexion-extension ($l=l'$)

avoiding bow stringing effect at the joint level ($l'' \gg l=l'$)
Flexor tendon digital sheath

- Pulleys and the three climbing grips

Different tensile strains on the digital sheath

- "hook"
- "slope"
- "crimp"
Hook grip
Slope grip
Crimp grip
Tensile strains evaluation

\[ M(\theta) = A(\theta)\ddot{\theta} + C(\theta)\dot{\theta}\dot{\theta} + B(\theta)\dot{\theta}^2 + G(\theta) \]

Dynamic optimization

\[ C_{\text{dyn}} = \frac{1}{2} \left( \sum_i (M_{\text{dyn}}(t) - \dot{M}_{\text{dyn}}(t))^2 + \sum_{i=1}^n \left( \frac{\dot{M}_i(t)}{w_i(t)} \right)^2 \right) \]

agonistic and antagonistic muscular forces evaluation
Tensile strains evaluation

- Slope grip vs crimp grip

Over A4 crimp = 3.3 times slope

Over A2 crimp = 26.3 times slope!
Times are changing

Injuries 61% “indoor”

ENTREPRISES

38660 Saint Vincent de Mercuze (F)
Overuse syndrome

- Over Use syndrome
  - Intensive training
    - Over 3h/day 4 days/week
  - Specific training
    - Same repetitive gestures = micro-traumatic overload

Hydration
Stretching
Warm-up
Avoid specific training
Avoid crimp grip!!!
Tapping...!
Clinical diagnosis

• Pain (70%)
  • palmar at proximal phalanx level (P1)
  • loss of grip strength, antalgic loss of extension,
  • +/- lateral irradiations, crépitations, nodes, œdema.

• Snap noise (75%)
  • Can be hear few meters below!

• A2 of the Ring finger (75%)
Examination diagnosis

- Bow stringing palpable sometimes visible
Imaging diagnosis

• CTScan vs MRI
  • Crimp grip position: Profile of the injured and non injured finger bilateral and comparative!
Imaging diagnosis

- Ultrasonography (dynamic)
  - Into the water

**E > 2mm A2 ou A4**

= abnormal

**NB:**
A3 is a mobile pulley and so, No considered.
That is the question

Bow stringing?

Yes | No
---|---
Surgery | Splint

or not surgery

Yes

Surgery (under condition)

Doubt

CT-Scan - MRI
Ultrasonography

No

Surgery
Surgery under condition

• Complete rupture or not
  – Surgical vs conservative Tt.

• Level and motivation
  – Compétition, >7b/c on sight etc...

• Dead line?