Pulley Ruptures in Rock Climbers
Outcome of Conservative Treatment with Pulley Protection Splint

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Finger Flexor Pulleys
Pulley Ruptures

• most frequent sport climbing injury

• mechanisms
  – crimping grip position
  – friction
  – peak loads

• increased tendon phalanx (TP) distance
  – measure with ultrasound
Pulley Ruptures

• conservative treatment with good results
  – tape
  – thermoplastic ring

• TP distance remains increased
Pulley Protection Splint
Pulley Protection Splint

- allows firm fixation
- pulley heals in almost physiological length
Pulley Protection Splint

- place closely to PIP joint
Pulley Protection Splint

- place closely to PIP joint
Pulley Protection Splint

- thermoplastic polyethylene (Aquaplast®)

- conical bar
Study Aims

• evaluate effectiveness of PPS

• study characteristics of pulley ruptures
Inclusion Criteria

- rock climber
- complete pulley rupture
- more than 6 months ago
- conservative treatment with PPS
- written informed consent

- Exclusion: combined A2-A3-A4 pulley ruptures, surgery
Methods

• TP distance measurement with ultrasound
  – diagnosis
  – follow-up

• Questionnaire
  – circumstances at event of injury
  – functional and sport specific outcome
  – measurement instructions
    o active finger range of motion (ROM)
    o finger strength
Active Finger ROM
Active Finger ROM
Active Finger ROM

- PIP joint flexion deficit > 15°
- PIP joint flexion < 90° and contralateral PIP joint flexion ≥ 90°
- PIP joint extension deficit > 15°
- PIP joint extension < 0° and contralateral PIP joint extension ≥ 0°
- DIP joint flexion deficit > 15°
- DIP joint extension deficit > 15°
- DIP joint extension < 0° and contralateral DIP joint extension ≥ 0°
Finger Strength

- three fingers
  - hanging
  - crimping
- one finger
  - hanging
- 80% of contra-lateral side
## Population

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Age</td>
<td>33.4</td>
</tr>
<tr>
<td>BMI</td>
<td>22.1</td>
</tr>
<tr>
<td>Climbing Years</td>
<td>11</td>
</tr>
<tr>
<td>Red Point</td>
<td>8.44</td>
</tr>
<tr>
<td>On Sight</td>
<td>7.87</td>
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</tbody>
</table>

### Key Points
- Pulley Ruptures
- PPS
- Aims
- Inclusion Criteria
- Methods
- **Results**
- Key Points
Circumstances

- Warm Up
  - Properly
  - Badly
  - Not at All

- Grip Position
  - Crimping
  - Hanging

- Injury Trigger
  - Peak Load
  - Static Stress
Circumstances

Type of Hold
- Narrow Edge: 22 (46.8%)
- Undercling Edge: 2 (4.3%)
- Undercling: 4 (8.5%)
- Undercling Pocket: 4 (8.5%)
- Finger Pocket: 6 (12.8%)
- Pinch: 4 (8.5%)
- Other: 3 (6.4%)
- Unknown: 2 (4.3%)

Pulley Ruptures I PPS I Aims I Inclusion Criteria I Methods I Results I Key Points
### TP Distance Reduction

<table>
<thead>
<tr>
<th>Pulley</th>
<th>TP Distance [mm]</th>
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<tbody>
<tr>
<td></td>
<td>Diagnosis</td>
</tr>
<tr>
<td>A2</td>
<td>4.4 ± 1.0</td>
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<tr>
<td>A4</td>
<td>2.9 ± 0.7</td>
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</tbody>
</table>

Note – data are means ± SD

- significant for both A2 (p<0.001) and A4 (p=0.001)
TP Distance Reduction

![Graph showing TP Distance Reduction with Pulley Ruptures comparison between A2 and A4 groups.](image)

**Aims**

**Inclusion Criteria**

**Methods**

**Results**

**Key Points**
Measurements

- **Obj. ROM**: Unrestricted
- **Subj. Motion Pattern**: Undisturbed
- **Obj. Strength Loss**: No
- **Sub. Strength Loss**: No

Additional categories:
- Restricted
- Slightly disturbed
- Yes
- Minor

Graph represents various measurements and their classifications.
General Outcome

- **Everyday Life**: No Constraints
- **Assessment**: Very Good
- **Same Again?**: Yes

[Diagram showing reduced finger dexterity with measures for no constraints, very good, and good.]
Key Points

- PPS reduces TP distance
- excellent results justify conservative approach
Thank you for your attention!

Questions or comments?