Use of Ankle Resting Angle as a Surrogate for Tendon Elongation in Individuals Following Achilles Tendon Rupture

Jennifer A. Zellers, DPT¹
Heather Gotha, MD²
Karin Grävare Silbernagel, PT, PhD, ATC¹

¹ University of Delaware, Newark, DE
² First State Orthopaedics, Newark, DE
Disclosure

NO CONFLICT TO DISCLOSE
Use of Ankle Resting Angle as a Surrogate for Tendon Elongation in Individuals Following Achilles Tendon Rupture
Jennifer A. Zellers, DPT
Heather Gotha, MD
Karin Grävare Silbernagel, PT, PhD, ATC
Our disclosures are in the Final AOFAS Mobile App.
We have no potential conflicts with this presentation.
Background

• Tendon elongation following Achilles tendon rupture associated with poor functional outcome
• Measurement of tendon length requires imaging modalities
• Simple method to assess tendon length without special equipment would be helpful in clinical assessment and management of these patients

Use of Ankle Resting Angle as a Surrogate for Tendon Elongation in Individuals Following Achilles Tendon Rupture
Background

- Surrogate measures of tendon length: Ankle resting angle
  - Knee extended\(^1\)
  - Knee flexed\(^2\)
- Achilles tendon resting angle (ankle resting angle with knee flexed)\(^2\)
  - Related to heel-rise height on heel-rise test
  - Sensitive to change over time
- Ankle resting angle has not been validated against measurement of Achilles tendon length using imaging

**Purpose of current study:** validate ankle resting angle to measurement of tendon elongation with extended field of view B mode ultrasound imaging
Methods

• Participants
  – Inclusion: Individuals with unilateral Achilles tendon rupture with surgical repair
  – Exclusion: Deep wound infection, lumbar radiculopathy affecting plantar flexors

• Procedure
  – Ankle resting angle: knee flexed, knee extended
  – B mode measurement of tendon elongation
  – Heel-rise test for calf endurance

• Statistical Analysis
  – Descriptive statistics
  – Pearson correlation for relationship between ankle resting angle and tendon elongation/heel-rise test performance

Use of Ankle Resting Angle as a Surrogate for Tendon Elongation in Individuals Following Achilles Tendon Rupture
Methods

Ankle resting angle

Ultrasound measurement

Use of Ankle Resting Angle as a Surrogate for Tendon Elongation in Individuals Following Achilles Tendon Rupture

ICC = 0.94

ICC = 0.80
Use of Ankle Resting Angle as a Surrogate for Tendon Elongation in Individuals Following Achilles Tendon Rupture

## Results – Descriptive Statistics

<table>
<thead>
<tr>
<th>Description</th>
<th>Mean (SD), N = 25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>44.2 (13.6) years</td>
</tr>
<tr>
<td>Time from Injury</td>
<td>22.5 (39.1) months</td>
</tr>
<tr>
<td>Relative resting angle – knee flexed</td>
<td>-5.4 (6.4)°</td>
</tr>
<tr>
<td>Relative resting angle – knee extended</td>
<td>-6.7 (8.8)°</td>
</tr>
<tr>
<td>Heel-rise test total work limb symmetry index</td>
<td>45.8 (23.8)%</td>
</tr>
</tbody>
</table>
Results – Relationship Between Ankle Resting Angle and Tendon Elongation

Use of Ankle Resting Angle as a Surrogate for Tendon Elongation in Individuals Following Achilles Tendon Rupture

\[ R = -0.452, p = 0.027 \]

\[ R = -0.528, p = 0.008 \]
Results – Relationship Between Ankle Resting Angle and Calf Endurance

Use of Ankle Resting Angle as a Surrogate for Tendon Elongation in Individuals Following Achilles Tendon Rupture
Discussion

• Both ankle resting angle with knee extended and knee flexed relate to tendon elongation
• Ankle resting angle with knee flexed also relates to performance on heel-rise test for calf endurance
  ‒ May indicate passive tension from the calf also affects ankle resting angle
• Limitations: cross-sectional design
References and Acknowledgements


Use of Ankle Resting Angle as a Surrogate for Tendon Elongation in Individuals Following Achilles Tendon Rupture