Ultrasonographic evaluation of the healing process of acute Achilles tendon rupture: comparison between operative versus non-operative treatment

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I have no financial conflict to disclose.
Clinical outcome of Achilles tendon rupture operative vs. non-operative treatment

- Re-rupture rate
  - operative ≤ non-operative

- Complication
  - operative > non-operative

- Healing process

Purpose

To compare ruptured Achilles tendon healing process using ultrasonography between operative and non-operative treatment.
Patients

From 2011 to 2016, 30 patients injured an acute Achilles tendon rupture.

<table>
<thead>
<tr>
<th></th>
<th>Operative</th>
<th>Non-operative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>23</td>
<td>7</td>
</tr>
<tr>
<td>Male:female</td>
<td>17:6</td>
<td>4:3</td>
</tr>
<tr>
<td>Age</td>
<td>40.5</td>
<td>39.6</td>
</tr>
</tbody>
</table>

Surgical technique

Modified Kessler method with #2 braided polyester sutures supplemented with 3-0 Vicryl circumferential sutures.
# Rehabilitation

<table>
<thead>
<tr>
<th>Operative</th>
<th>Non-operative</th>
</tr>
</thead>
<tbody>
<tr>
<td>post op.</td>
<td>Below knee cast</td>
</tr>
<tr>
<td></td>
<td>↓</td>
</tr>
<tr>
<td>2 wks.</td>
<td>Full weight bearing</td>
</tr>
<tr>
<td></td>
<td>with <strong>footplate orthosis</strong></td>
</tr>
<tr>
<td>4-6 wks.</td>
<td>↓</td>
</tr>
<tr>
<td>2 mos.</td>
<td>Remove orthosis,</td>
</tr>
<tr>
<td></td>
<td>Heel-rise exercise</td>
</tr>
<tr>
<td>3 mos.</td>
<td>↓</td>
</tr>
<tr>
<td>4-6 mos.</td>
<td>Return to sports</td>
</tr>
<tr>
<td></td>
<td>Return to sports</td>
</tr>
</tbody>
</table>
➢ Ultrasonographic Evaluation

- Prone position.
- Scanned at 1, 2, 3, 4 and 6 months postoperatively.
- Scanned in both **longitudinal** and **axial** plane.
Evaluation 1: Cross-sectional area (CSA) of ruptured Achilles tendon

- CSA was measured at the repaired/ruptured site.
- The ratio of CSA (affected / unaffected) was calculated.

Example

CSA ratio (%)
\[ \frac{3.6 \text{ cm}^2}{0.55 \text{ cm}^2} \approx 650\% \]
Evaluation 2: Tendon repair score

The ruptured tendon was evaluated at the repaired/ruptured site in the longitudinal or axial plane.

1. **Aechoic tendon defect area**
   - absent: 2 point, 0-50%: 1 point, 50-100%: 0 point

2. **Intratendinous hyperechoic area**
   - 0-25%: 3 point, 25-50%: 2 point
   - 50-75%: 1 point, 75-100%: 0 point

3. **Continuity of intratendinous fiburillar pattern**
   - complete: 3 point, incomplete: 1 point,
   - absent: 0 point

4. **Peritendinous edema**
   - absent: 2 point, present: 0 point

Total **10** point

Results 1: Change of CSAs

CSAs were larger in operative treatment.

* p<0.05 (Mann-Whitney's U test)
Results 2: Changes of tendon repair scores

Tendon repair scores in operative treatment were higher in the whole period.
Discussion 1: Repair rate of ruptured Achilles tendon operative vs. non-operative therapy

✓ **No difference** in long-term clinical results  

⇒ Healing process of ruptured Achilles tendon in early stage is unknown.

(In this study)

Operatively treated patients

⇒ **CSA↑**, **Tendon repair score↑**

In early stage, intratendinous morphology of operative treatment could restore faster.
Discussion 2: Early motion for Achilles tendon ruptures in non-operatively treated patients

- Twaddle et al. *AJSM* 2007
  - Compared between operative and non-operative
  - Placed below knee orthosis after 10 days casting
  - No difference between two groups in clinical results

However, re-rupture rate was high in operatively treated group (9.1%)…

It is unknown whether early motion exercise in non-operative therapy is actually safe or not.
Conclusion

✓ CSAs were larger in operative treatment.

✓ Tendon repair scores in operative treatment were higher in the whole period.