The modification of Side-Locking Loop Suture for treating Achilles’ tendon disruption

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My disclosure is in the Final AOFAS Mobile App.
I have no potential conflicts with this presentation.
The issue of SLLS

- The two-strand side-locking loop suture (SLLS) technique provides high tensile strength and stiffness (1,2).

- This technique is currently the optimum suture method for safe and early active mobilization (3).

- Yotsumoto et al reported good clinical results with an average follow-up time of 2.9 years (4).

But,…

There are major differences among surgeons with regard to the optimum tension of SLLS.
Purpose

To introduce the detail of modification and to evaluate the clinical outcomes.
The modification of SLLS

Both stumps are sutured using SLLS technique. A suture is started from the stump and captures the tendon 3 cm from the stump.

The core suture must be pulled strongly, such as at a force of 10 kgf, to avoid any slack of the locking loop.
Both stumps are sutured.

The core sutures are tied using an antislip knot (5) between the stumps at 15 degrees of dorsiflexion of the ankle.

A peripheral suture is made of cross-stitches.

Antislip knot

First, a surgeon’s knot is made using a pair of core sutures. Next, both ends are made with 3 throws in the manner of a reef knot.

It is important to allow for ankle dorsiflexion over 20 degrees after tying.
## Patients

<table>
<thead>
<tr>
<th>Case</th>
<th>Age (y)</th>
<th>Sex</th>
<th>Side</th>
<th>Waiting time after injury (day)</th>
<th>Sports before injury</th>
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</thead>
<tbody>
<tr>
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<td>56</td>
<td>M</td>
<td>L</td>
<td>5</td>
<td>Tennis</td>
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<tr>
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<td>63</td>
<td>M</td>
<td>R</td>
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<td>38</td>
<td>F</td>
<td>R</td>
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<tr>
<td>4</td>
<td>30</td>
<td>M</td>
<td>R</td>
<td>3</td>
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<tr>
<td>5</td>
<td>75</td>
<td>M</td>
<td>R</td>
<td>3</td>
<td>Gateball</td>
</tr>
<tr>
<td>6</td>
<td>40</td>
<td>F</td>
<td>L</td>
<td>3</td>
<td>Volleyball</td>
</tr>
</tbody>
</table>

Mean 50 2.7

### Post-operative management

- No immobilization is applied, and active range of motion (ROM) exercise and partial weight bearing are allowed without delay.
- The patients are allowed to gradually return to sports after 2 months and to return to full-scale participation within 3 months postoperatively.
## Results

<table>
<thead>
<tr>
<th>Case</th>
<th>Follow-up (Mo)</th>
<th>Operation time (Min)</th>
<th>ROM DF</th>
<th>ROM PF</th>
<th>FWB (Wk)</th>
<th>Return to sports (Mo)</th>
<th>JSSF* ankle/hindfoot scale</th>
<th>Final survey</th>
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<tbody>
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<tr>
<td>Mean</td>
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<td>32.7</td>
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</tbody>
</table>

*Japanese Society for Surgery of the Foot

**MRI**

1M after surgery → 3M after surgery → 6M after surgery
The ultimate strength of SLLS technique with the cross-stiches $\approx 900 \sim 950$ N

$900 \sim 950$ N $\times 0.7 = 630 \sim 665$ N $\geq 600$ N  
Tensile strength of an Achilles tendon during bicycle riding (6).

The initial strength of our technique is considered to be sufficient to start ROM exercise early after surgery.
The biological repair between stumps may be impaired by the suture knot when it is located between stumps.

The occupation by the knot of up to 26 percent of the area within the repair site did not have any deleterious effects on tensile strength (7).

The cross-sectional size of an Achilles tendon

\[ 90 \pm 9 \text{ mm}^2 (8) \]

The cross-sectional size of the antislip knot

\[ 20 \text{ mm}^2 \]

22 % of an Achilles tendon

The biological repair is not hindered by the knot.
Conclusion

This modification of SLLS technique may be able to make it easier to use.

Every surgeon, whether they have experience with SLLS suture or not, can make it with uniform accuracy, and good clinical outcomes can be expected.
Reference


