Suture Augmented versus Standard Anterior Cruciate Ligament Reconstruction: A Matched Cohort Analysis

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Disclosure

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Introduction

- ACL reconstruction (ACLR) with suture augmentation (SA) is popular, but no comparative data with standard ACLR exist.

We sought to compare clinical outcomes between matched cohorts of patients undergoing standard ACLR to those with SA with the hypothesis that ACLRs with SA would be associated with improved patient-reported outcome measures (PROMs) and earlier return to pre-injury activity level.
Methods

- Patients who underwent ACLR with hamstring grafts with minimum 2 year follow-up were included.
- Consecutive patients undergoing ACLR with SA were matched 1:1 by age, gender, BMI, and revision status to patients undergoing standard ACLR.
- ROM, pain (NPRS), postoperative activity, KOOS subscores, WOMAC, IKDC, SANE scores, time to return to activity (RTA), and complications were collected.
Figure 1: Diagram of the ACLR construct with suture augmentation (SA).

Figure 2: Arthroscopic view of the tensioned graft with SA
Results

- 60 patients were included (30 ACLR with SA, 30 standard ACLRs) with mean±SD age of 29.50±6.60 years, 43.4% male, body mass index 26.27±3.37 and 5 revision anterior cruciate ligament reconstructions matched to each cohort. Mean follow-up time was 29.54±5.37 months (24-43.7).
# Table 1 and Figure 3: Patient Demographics / Preop Scores

<table>
<thead>
<tr>
<th></th>
<th>ACLR with SA</th>
<th>Standard ACLR</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years ± SD, range)</td>
<td>29.34±7.55 (18-49)</td>
<td>29.65±5.65 (18-42)</td>
<td>0.866</td>
</tr>
<tr>
<td>Gender (% male)</td>
<td>43.4% (13)</td>
<td>43.4% (13)</td>
<td>1.000</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>25.79±3.15 (19.3-33.9)</td>
<td>26.74±3.59 (19.5-34.0)</td>
<td>0.199</td>
</tr>
<tr>
<td>Revision ACLR</td>
<td>5 (16.7%)</td>
<td>5 (16.7%)</td>
<td>1.000</td>
</tr>
<tr>
<td>ACL graft type (autograft, combined, allograft)</td>
<td>21 (70.0%), 2 (6.7%), 7 (23.3%)</td>
<td>19 (63.3%), 2 (6.7%), 9 (30.0%)</td>
<td>0.584</td>
</tr>
<tr>
<td>ACLR chronicity (&lt;6 weeks, 6 weeks-3 months, &gt;3 months)</td>
<td>16 (53.3%), 5 (16.7%), 9 (30.0%)</td>
<td>15 (50.0%), 7 (23.3%), 8 (26.7%)</td>
<td>0.809</td>
</tr>
<tr>
<td>Presence of meniscal injury</td>
<td>8 (26.7%)</td>
<td>10 (33.3%)</td>
<td>0.573</td>
</tr>
<tr>
<td>Grade 2 or higher chondral injury</td>
<td>6 (20.0%)</td>
<td>7 (23.3%)</td>
<td>0.754</td>
</tr>
<tr>
<td>Formal preoperative physical therapy</td>
<td>8 (26.7%)</td>
<td>10 (33.3%)</td>
<td>0.573</td>
</tr>
<tr>
<td>Follow-up (months)</td>
<td>29.0±4.84 (24.0-42.0)</td>
<td>30.08±5.89 (24.0-43.7)</td>
<td>0.456</td>
</tr>
</tbody>
</table>

**Preoperative PROMs**

- Maximum Daily NPRS
- KOOS
- Pain
- Symptoms
- ADL
- Sports/Rec
- QOL
- WOMAC
- IKDC
- SANE (pre-injury)

![Preoperative PROMs](image)
Figure 4: Average post-op changes in PROMs

Note: WOMAC is improvement, not raw score change
* Indicates significant difference
Figure 5: Average post-op changes in NPRS & SANE

Note: Maximum Daily NPRS and SANE score are improvements, not raw score changes
* Indicates significant difference
Figures 6 & 7: Frequency and time of full return to pre-injury activity activity

Mean percent return to pre-injury activity level

<table>
<thead>
<tr>
<th></th>
<th>Mean % RTA</th>
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<tbody>
<tr>
<td>SA</td>
<td>76.7%</td>
</tr>
<tr>
<td>Standard ACLR</td>
<td>56.7%</td>
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</tbody>
</table>

Mean time to return to pre-injury activity level (months)

<table>
<thead>
<tr>
<th></th>
<th>Mean Months</th>
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<tbody>
<tr>
<td>SA*</td>
<td>p=0.002, 9.17</td>
</tr>
<tr>
<td>Standard ACLR</td>
<td>12.88</td>
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</tbody>
</table>
Figure 8 and Table 4: Percentage of pre-injury activity level if not fully returned

![Bar chart showing percentage of pre-injury activity level for SA* and Standard ACLR. SA* has a p-value of 0.01 and 93.33%, while Standard ACLR has 83.17%.]
Figure 9: Comparative postoperative PROMs
Conclusion

ACLR with SA was associated with superior PROMs, less pain, and a higher percentage of and earlier return to pre-injury activity without associated overconstraint in ROM.

Longer-term and prospective studies are needed to determine if these results are durable.

The use of SA was also a independent predictor for improved post-operative scores in KOOS, WOMAC, IKDC, SANE, and maximum daily NPRS.