Technique INTERNAL BRACE pour la réparation du ligament scapho-lunaire

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GEM 2019
What is *Internal Brace* (IB)?

**Suture Tape**
- 2 mm
- 1.3 mm

**Fiber Wire**
- Flat-braided Suture
- Ultra High Molecular Weight Polyethylene and polyester, and cyanoacrylate
- Collagen Coated FiberWire suture (Bovine type 1 collagen)

**Stronger than Fiber Wire**

- No reactions of allergic or sensitive nature
- Pharmacologically inactive
- Collagen coated suture is not absorbed, but may become encapsulated in the surrounding connective tissues.

*In Vivo*
What is *Internal* Brace (IB)?

Biologic repair or reconstruction reinforced with suture

Concept Launched in 2013

Lateral Ankle *Internal* Brace
Original IB - Championed by Gordon Mackay
30,000 ATFL IBs performed to date

Yoo JS et al., *J Orthop Traumatol*, 2016

DX SwiveLock Launched in 2015

DX SwiveLock SL *Internal* Brace
Championed by Steve J. Lee and Steve Shin
3,400 Units Sold To Date (~13 months)

Shin S et al., *J Hand Surg Am*, 2018
What are the Advantages of *Internal* Brace?

**Advantages**

- Added strength during healing period
- Knotless Repair
- Safe and Effective

*May allow for earlier rehab and return to activity*

- Proven faster rehab protocol in ankle
- Collecting data for 2-year retrospective

Yoo JS et al., *J Orthop Traumatol*, 2016
Where could we use *Internal* Brace?

**ANKLE**

**Figure 3.** Direct comparison between the two groups.

<table>
<thead>
<tr>
<th>Table 1 Clinical results of the patients</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean AOFAS score</strong></td>
</tr>
<tr>
<td>Preoperation</td>
</tr>
<tr>
<td>Internal brace group</td>
</tr>
<tr>
<td>Without internal brace group</td>
</tr>
<tr>
<td><em>p</em> value</td>
</tr>
</tbody>
</table>

Yoo JS et al., *J Orthop Traumatol*, 2016
Where could we use *Internal* Brace?

**KNEE**

![Image of knee structure]

<p>| Table: Comparison of Cyclic Displacement, Stiffness, and Ultimate Load |
|-------------------------------------------------|-----------------|-----------------|-----------------|</p>
<table>
<thead>
<tr>
<th></th>
<th>S-S</th>
<th>ALD-S</th>
<th>ALD-S-IB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyclic displacement (mm)</td>
<td>4.3 ± 1.1 (4.0–4.6)</td>
<td>4.2 ± 0.9 (4.0–4.4)</td>
<td>2.9 ± 0.8 <em>(2.7–3.1)</em></td>
</tr>
<tr>
<td>Stiffness (N/mm)</td>
<td>104.0 ± 40.0 (95.9–112.9)</td>
<td>122.0 ± 28.0 <em>(116.0–127.8)</em></td>
<td>156.0 ± 23.0 <em>(150.8–160.8)</em></td>
</tr>
<tr>
<td>Ultimate load (N)</td>
<td>416.0 ± 167.0 (380.4–451.8)</td>
<td>628.0 ± 223.0 <em>(580.4–675.4)</em></td>
<td>758.0 ± 128.0 <em>(730.8–785.6)</em></td>
</tr>
</tbody>
</table>

Abbreviations: ADL-S, adjustable-loop device-screw; ADL-S-IB, ADL-S-internal brace; CI, confidence interval; S-S, screw-screw.

Note: Sample size in each group is *n* = 10. Cyclic displacement (50–250 N) in ALD-S-IB group was significantly lower than in the other two groups. Stiffness, as well as ultimate load, in both ALD suspensory fixation groups was significantly higher than in the S-S group; however, no difference was found between both ALD-S and ALD-S-IB group.

*Statistical differences between groups.*

Smith PA et al., *J Knee Surg*, 2019
Where could we use *Internal* Brace?

**ELBOW**

**Figure 3**  
(A) Compared with native, torsional stiffness was significantly larger for standard docking, while the internal brace construct was not different.  
(B) Compared with native, ultimate failure torque was significantly larger for standard docking but not different for internal brace.  
(C) For gap formation, there were no significant differences compared with native for either standard docking or internal brace reconstructions. (Plots show mean ± standard deviation.)

Bernholt DL et al., *J Shoulder Elbow Surg*, 2019
Where could we use *Internal Brace*?

**TABLE 1. Comparison of Biomechanical Testing Between Specimens With UCL Repair Only and UCL Repair With Suture Tape Augmentation**

<table>
<thead>
<tr>
<th>Applied Load</th>
<th>UCL Repair Only</th>
<th>UCL Repair With Suture Tape Augmentation</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum load (N) with mean SD (N)</td>
<td>8.02 (SD, 2.24)</td>
<td>46.56 (SD, 25.56)</td>
<td>.012*</td>
</tr>
<tr>
<td>Load at clinical failure (N) with mean SD (N)</td>
<td>5.77 (SD, 2.23)</td>
<td>22.27 (SD, 17.59)</td>
<td>.031*</td>
</tr>
<tr>
<td>Load at 15° deflection (N) with mean SD (N)</td>
<td>3.62 (SD, 1.06)</td>
<td>11.43 (SD, 13.30)</td>
<td>.031*</td>
</tr>
<tr>
<td>Load at 20° deflection (N) with mean SD (N)</td>
<td>4.25 (SD, 1.28)</td>
<td>14.42 (SD, 15.59)</td>
<td>.031*</td>
</tr>
</tbody>
</table>

*Indicates statistical significance (P < .05).
Where could we use *Internal Brace*?

**WRIST**

<table>
<thead>
<tr>
<th>Sample</th>
<th>Stiffness (N/mm)</th>
<th>Maximum load (N)</th>
<th>Mode of failure</th>
<th>Stiffness (N/mm)</th>
<th>Maximum load (N)</th>
<th>Mode of failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>46.57</td>
<td>159.28</td>
<td>Graft tore through bone tunnel</td>
<td>42.16</td>
<td>300.05</td>
<td>Suture knot failure</td>
</tr>
<tr>
<td>2</td>
<td>24.75</td>
<td>132.91</td>
<td>Anchor failure of graft</td>
<td>56.9</td>
<td>98.10</td>
<td>Suture knot failure</td>
</tr>
<tr>
<td>3</td>
<td>36.07</td>
<td>113.72</td>
<td>Anchor failure of graft</td>
<td>31.1</td>
<td>218.97</td>
<td>Anchor failure of graft</td>
</tr>
<tr>
<td>4</td>
<td>24.34</td>
<td>87.51</td>
<td>Graft slippage</td>
<td>67.14</td>
<td>252.83</td>
<td>Anchor failure of graft</td>
</tr>
<tr>
<td>5</td>
<td>51.07</td>
<td>266.07</td>
<td>Graft slippage with some tearing into bone tunnel</td>
<td>38.94</td>
<td>334.65</td>
<td>Anchor failure of graft</td>
</tr>
<tr>
<td>6</td>
<td>77.87</td>
<td>366.38</td>
<td>Graft slippage with some tearing into bone tunnel</td>
<td>57.28</td>
<td>339.86</td>
<td>Suture knot failure</td>
</tr>
<tr>
<td>7</td>
<td>20.40</td>
<td>61.06</td>
<td>Graft slippage with some tearing into bone tunnel</td>
<td>29.30</td>
<td>409.13</td>
<td>Graft and suture tape failure</td>
</tr>
<tr>
<td>8</td>
<td>17.70</td>
<td>104.37</td>
<td>Graft tore through bone tunnel</td>
<td>46.9</td>
<td>186.81</td>
<td>Bone tunnel failure</td>
</tr>
<tr>
<td>9</td>
<td>17.80</td>
<td>112.52</td>
<td>Graft slippage</td>
<td>36.4</td>
<td>347.16</td>
<td>Failure of biotenodesis screw</td>
</tr>
<tr>
<td>10</td>
<td>24.50</td>
<td>84.57</td>
<td>Graft slippage</td>
<td>24.3</td>
<td>322.05</td>
<td>Graft slippage with some tearing into bone tunnel</td>
</tr>
<tr>
<td>11</td>
<td>33.30</td>
<td>176.54</td>
<td>Graft slippage</td>
<td>42.4</td>
<td>426.44</td>
<td>Graft slippage with some tearing into bone tunnel</td>
</tr>
<tr>
<td>12</td>
<td>9.93</td>
<td>58.39</td>
<td>Graft slippage</td>
<td>30.3</td>
<td>165.57</td>
<td>Graft slippage with some tearing into bone tunnel</td>
</tr>
<tr>
<td>Mean</td>
<td>32.03</td>
<td>143.61</td>
<td></td>
<td>41.3</td>
<td>283.47</td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>18.81</td>
<td>90.54</td>
<td></td>
<td>13.08</td>
<td>100.25</td>
<td></td>
</tr>
</tbody>
</table>

Kakar S et al., *J Wrist Surg*, 2019
Internal Brace in Hand and Wrist Surgery
Scapholunate Repair or Reconstruction

1

Repair

Reconstruction
Scapholunate Repair

1

Suture Anchor Technique

- PushLock, SutureTak, Corkscrew
- Goal: repair remaining ligament back down to bone

Tag stitch remaining ligament

Drill for Mini PushLock

Load PushLock and insert

Final Repair
2-0 FiberLoop
Smaller, tapered needle and shorter loop
  – Stand-alone AR: AR-7232-05
  – Will be running change in the DS kit

1.3 or 2 mm White/Blue SutureTape
Anchor repair with *Internal Brace Augmentation*

- DX SwiveLock SL, LabralTape, Suture Anchor
- Goal: repair remaining tissue back down to bone and augment with Internal brace for immediate stability
Scapholunate Repair

Thumb UCL Repair with InternalBrace™ Ligament Augmentation
Scapholunate Reconstruction

All-Dorsal Reconstruction Technique

Dorsal Reconstruction

- DX SwiveLock SL, SutureTape, 2-0 FiberLoop
- Goal: reconstruct the dorsal S-L ligament with an ECRB and reinforce with *Internal Brace*
Scapholunate Reconstruction

All-Dorsal Technique

Goal of reconstructions:
A. Recreate the torn ligament
B. Stop the scaphoid from flexing

Swive Lock 3.5
Scapholunate Reconstruction

DX SwiveLock SL

- 3.5 mm in width
- 8.5 mm in total length
- PEEK forked eyelet and anchor
- Accepts small grafts (2-3 mm for optimal fixation) or suture

Total anchor/eyelet length: 8.5 mm

Anchor Body L: 4 mm + Eyelet L: 4.5 mm

Anchor/Eyelet Ø: 3.5 mm
Scapholunate Reconstruction

Kit designed to be universal
2-0 FiberLoop
Smaller, tapered needle and shorter loop
- Stand-alone AR: AR-7232-05
- Will be running change in the DS kit

1.3 or 2 mm White/Blue SutureTape
Scapholunate Reconstruction
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Scapholunate Repair
Case Study

Branden Albert (Miami Dolphins)

- Lunate dislocation on November 13, 2016
- Surgery date: November 15, 2016
  - Scapholunate Repair with PuchLock + Internal Brace
### Scapholunate Repair Case Study

**One Day Post-Op**

**Branden Albert - T - Dolphins**

Dolphins LT Branden Albert (wrist) has been ruled out for Week 11 against the Rams.

It's a huge loss for the Dolphins' line, but they may catch a break if Rams RE Robert Quinn (illness) is unable to play after checking himself into a hospital earlier this week. Quinn was released on Tuesday, but it remains unclear if he'll be able to suit up. Rookie Laremy Tunsil will play left tackle.

Source: Adam Beasley on Twitter  
Wed, Nov 16, 2016 02:28:00 PM

**Two Days Post-Op**

**Branden Albert - T - Dolphins**

Dolphins LT Branden Albert is recovering from surgery on his dislocated wrist, and is week to week.

Albert has already been ruled out for Week 11, but apparently could be back as soon as Week 12. Per reporter Armando Salguero, it will "depend on how quickly he can regain strength and stability in his hand." It's a massive loss for a team that didn't get clicking until its offensive line got healthy. First-rounder Laremy Tunsil is filling in on the blincside.

Source: Miami Herald  
Thu, Nov 17, 2016 04:29:00 PM

**5 days Post-Op**

**Branden Albert - T - Dolphins**

Dolphins LT Branden Albert (wrist) said he hasn't ruled out playing next week. Albert is only a week removed from surgery. He reportedly wanted to play though his wrist injury Sunday and is pushing to return after missing only one game. With Laremy Tunsil and Mike Pouncey also sidelined, Miami's offensive line is a mess going into Week 12.

Source: Armando Salguero on Twitter  
Sun, Nov 20, 2016 08:10:00 PM

**13 days Post-Op**

**Branden Albert - T - Dolphins**

The Miami Herald's Adam Beasley reports Dolphins LT Branden Albert has a "better than not" chance to play Week 13 against the Ravens. Albert has sat out the last two games after dislocating his wrist in Week 10, but he said Monday he is feeling a lot better. With Laremy Tunsil (shoulder) and Mike Pouncey (hip) also sidelined, the Dolphins will welcome back Albert with open arms.

Source: Adam Beasley on Twitter  
Mon, Nov 28, 2016 12:11:00 PM

**PLAYING 19 days Post-Op**

**Dolphins' Branden Albert plays through pain with playoffs on the line**

Albert, the Dolphins’ Pro Bowl left tackle, played Sunday at Baltimore, roughly three weeks after having surgery to repair a dislocated left wrist that it took a team of trainers to pop back in place. It's an excruciating experience, especially in December, when the rest of your body is also beaten up, but...

"It's not tough," Albert said. "First of all, you know what you're playing for. You know the guys on the offense, and the team, are counting on you. You've got to dig down deep in yourself and say, 'Yeah, I'm not 100 percent, but you're supposed to be a great player, so figure it out. And don't make excuses.'"

To Albert, there's no option other than playing. It's December, his body is breaking down, and his surgically-repaired left wrist hurts badly. But he'll never give in.

And he won't even hint at his limitations.
Scapholunate Repair
Case Study

• 2.5 months out – **missed only 2 games**

Previous clinical literature reports 4 missed games as a minimum for this injury and surgery (*although it is usually more than that!*)

• Went back to play with a cast for three games then played the following two in a padded splint

• Helped the Dolphins make the playoffs
Merci pour votre attention

Olivier CAMUZARD

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