5 Complications to Avoid In ACL Surgery

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Speaker’s Disclosure

• Our fellowships and registry receive support from:

• Consultant:
  DePuy Synthes - Mitek Sports Medicine
  Histogenics

• Employed by:
  New England Baptist Hospital, Boston Sports and Shoulder Center
5 Complications to Avoid In (or After) ACL Surgery

• ACL Graft Failure and/or Revision
• Contralateral ACL Rupture
• Articular Cartilage Injury – from Medial Portal Drilling
• Intra-operative “Incidents”
• Intra-operative “Complications”
Successful ACL Reconstruction

Requires the following

1. High strength graft
2. Anatomic positioning
3. Rigid fixation
Graft Selection: Autograft vs. Allograft

• Can we find evidence (beyond Level 5 - “expert opinion”) to determine the risk of graft failure?
Can we get Higher Level Evidence?


• Graft re-rupture 4.3% auto-, vs. 12.7% allo-

• “For most patients, especially those who are younger and more active, we recommend BPTB autograft for ACLR, primarily because of its lower rupture rate and higher patient satisfaction.”
Can we get Higher Level Evidence?

- Keading et al. Prospective Analysis of 2488 Primary ACL Reconstructions From the MOON Cohort. AJSM 2015. *(Level 3 Evidence)*
  
  “The odds of ipsilateral ACL re-tear were 5.2 times greater for an allograft (P<.01) compared with a bone–patellar tendon–bone (BTB) autograft.”

- “Younger age, higher activity level, and allograft graft type were predictors of increased odds of ipsilateral graft failure.”
Can we get the **Highest Level Evidence**?

- Spindler et al. 6 Year MOON Study. *AJSM, 2011*
- Prospective Level 2 Cohort Study with 85% follow-up on nearly 400 patients
- Allografts were statistically significantly worse than autografts
- “In conclusion, our MOON results revealed that choosing an autograft would significantly, and in a clinically meaningful way, improve sports function and knee-related quality of life.”
Can we get the **Highest Level Evidence**?

  - Prospective, randomized Level 1 study
  - Allografts failed at a statistically higher rate (27%) vs. autografts (8%) \( p=0.03 \)
  - “Those patients who had an allograft failed at a rate over 3 times higher than those with an autograft.”
Summary

• Multiple studies, including the best data available confirm:

  – Autograft gives the best results in the young, active patient

  – We already know the best autograft choice?
Avoid Graft Failures

• Multiple studies, including the best data available confirm:
  – Autograft B-PT-B gives the best results in the young, active patient
  – Allograft ACL, like cosmetic surgery, should be reserved for the aging athlete
  – To avoid the complication of ACL graft failure: use autograft B-PT-B over hamstrings in the young athlete
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Contralateral ACL Injury

- Numerous programs, largely focusing on the female athlete, to reduce the risk ACL injury

- Data is mixed (but promising) for injury prevention protocols

- Can we extrapolate to protecting the other knee?
Injury Prevention Programs

Nathan L. Grimm, John C. Jacobs, Jr, Jaewhan Kim, Brandon S. Denney, Kevin G. Shea. Anterior Cruciate Ligament and Knee Injury Prevention Programs for **Soccer Players**: A Systematic Review and Meta-analysis. AJSM 2015 43 2049-2056

- Level 1 RCT’s
  - >11,000 athletes included
  - Almost 8,000 with ACL reporting
Injury Prevention Programs

• Shea et. Al. Systematic Review and Meta-analysis. AJSM 2015

• Could not demonstrate a statistically significant reduction in ACL injury risk

• There was a significant reduction in overall knee injury risk.

• Risk ratio was 0.74 (95% CI, 0.55-0.89), $P= .039$

• An injury prevention program may help reduce the risk of tearing the contralateral ACL
Kaiser Registry Data

• G Maletis, M Inacio, T Funahashi. Risk Factors Associated With Revision and Contralateral Anterior Cruciate Ligament Reconstructions in the Kaiser Permanente ACLR Registry. AJSM 2015.

• 17,436 ACL reconstructions with an average of 2.5 year follow-up
Using a hamstring graft significantly reduces the risk of contralateral ACL reconstruction (CA CLR).

### Kaiser Registry Data: Hazard Risk for Revision

<table>
<thead>
<tr>
<th></th>
<th>CA CLR&lt;sup&gt;e&lt;/sup&gt;</th>
<th>P Value</th>
<th>Global P Value&lt;sup&gt;e&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Graft: allograft vs BPTB autograft</strong></td>
<td>0.85 (0.65-1.10)</td>
<td>0.223</td>
<td>0.122</td>
</tr>
<tr>
<td><strong>Graft: HS autograft vs BPTB autograft</strong></td>
<td>0.75 (0.56-1.00)</td>
<td>0.047</td>
<td></td>
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<tr>
<td>Sex: male vs female</td>
<td>0.74 (0.57-0.97)</td>
<td>0.031</td>
<td></td>
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<tr>
<td>Age (per 1-y increment)</td>
<td>0.96 (0.95-0.97)</td>
<td>&lt;.001</td>
<td></td>
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<tr>
<td>BMI: 25-29 vs &lt;25</td>
<td>0.70 (0.55-0.89)</td>
<td>0.004</td>
<td>0.002</td>
</tr>
<tr>
<td>BMI: ≥30 vs &lt;25</td>
<td>0.63 (0.46-0.86)</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>Race: Asian vs white</td>
<td>1.06 (0.75-1.50)</td>
<td>0.746</td>
<td>0.127</td>
</tr>
<tr>
<td>Race: black vs white</td>
<td>0.80 (0.51-1.27)</td>
<td>0.339</td>
<td></td>
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<tr>
<td>Race: other vs white</td>
<td>0.78 (0.40-1.50)</td>
<td>0.455</td>
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<tr>
<td>Race: unknown vs white</td>
<td>0.32 (0.12-0.84)</td>
<td>0.020</td>
<td></td>
</tr>
<tr>
<td>Other event&lt;sup&gt;f&lt;/sup&gt;</td>
<td>1.50 (0.86-2.60)</td>
<td>0.156</td>
<td></td>
</tr>
</tbody>
</table>
Using a hamstring graft (versus B-PT-B) significantly reduces the risk of CACL.

• Why is this?
  – Let’s speculate

• Is it related to excess stress to the contralateral from using B-PT-B?
  – Not likely

• Could it be related to lower sports function and the higher rate of graft failure with hamstrings?
  – Seems likely – but probably not a valid reason to pick hamstrings in the young active athlete
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Avoiding the Medial Femoral Condyle with an Anatomic ACL Reconstruction

- Dr. Steiner suggests we use a complex flexible pin and reamer system.
- It looked enticing, but are we sure it won’t unravel?
- What about cost? A complete new set of instruments ( $$$ ) and a single use flexible guide pin ( $165 )
Avoiding the Medial Femoral Condyle with an Anatomic ACL Reconstruction

• How about medial portal with readily available instruments? Beath pin and 2.2mm nitenol wire
Avoiding the Medial Femoral Condyle with an Anatomic ACL Reconstruction

• Allows knee motion, can bend pin away from MFC and ream over it
Avoiding the Medial Femoral Condyle with an Anatomic ACL Reconstruction

• 2.2 mm nitenol guide wire for metallic interference screws ($23), and it is reusable
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Incident vs. Complication

- A Almazán, A Miguel, A Odor, J Ibarra.
  Intraoperative Incidents and Complications in Primary Arthroscopic Anterior Cruciate Ligament Reconstruction. Arthroscopy, Vol. 22

- Incident: untoward event which could be acted on and had no morbidity on patient
- Complication: untoward event that adversely affects the outcome, leads to morbidity
Incident vs. Complication

GH = Graft Harvest.  TP = Tunnel Placement.  
GF = Graft Fixation.
Majority of harvest issues related to hamstring harvest with premature amputation of graft
Meticulous Hamstring Harvest
Release all Bands – No Gastroc Dimpling
Incident vs. Complication

Majority of fixation issues related to broken bioscrews with B-PT-B grafts
Incident vs. Complication

- Titanium screws for B-PT-B grafts are reliable, do not break, and cost effective (<$100)
Incident vs. Complication

Patella fracture from use of osteotomes to harvest. Cuts made carefully with small saw blades.
Summary: 5 Complications to Avoid In (or After) ACL Surgery

• Use B-PT-B autografts for your young, athletic patients
• Injury reduction protocols reduce overall injury rates
• Anatomic technique requires care and attention to detail to protect MFC – but can be done in a cost effective manner
• Graft harvest and fixation are the sites of risk during surgery – technique and device matter
Thank You