5 Complications to Avoid In ACL Surgery

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Speaker’s Disclosure

• Our fellowships and registry receive support from:
  Arthrex, DePuy-Synthes, DonJoy, J&J Orthopaedics,
  Smith & Nephew, Linvatec, ZimmerBiomet
• 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?
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What Does Darren Johnson Say?

- 35% revision in <25 yr. old vs. 13% in >25 yr. old with non-irradiated grafts
- "Given the failure and reoperation rate that we observed, caution is warranted in using … anterior tibialis allograft … in younger patients"
- He should have said: "You are crazy to use allografts in younger patients"

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What Does Gene Barrett Say?

- Barrett et al. Allograft Anterior Cruciate Ligament Reconstruction in the Young, Active Patient. Arthroscopy, 2010 (Level 3 comparative study)
- Allografts were 4.2 times more likely to fail when compared to autograft BTB, using non-irradiated BTB grafts
- "We conclude that fresh-frozen BPTB allografts should not be used in young patients who have a high Tegner activity score because of their higher risk of failure.”

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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?

  - "There were no significant differences in graft failure rate, postoperative laxity, or patient-reported outcome scores when comparing ACL reconstruction with autografts to nonirradiated allografts in this systematic review."
  - "These findings apply to patients in their late 20s and early 30s. We caution against extrapolating these findings to younger, more active cohorts."
- More to follow

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.”

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**Summary**

- Multiple studies, including the best data available confirm:
  - Autograft gives the best results in the young, active patient
  - Can we determine the best autograft choice?

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**Meta-analysis 2005 Arthroscopy Goldblatt, Richmond, et al**

- B-PT-B autograft vs. DSTG autograft RCT’s
- Eleven studies met inclusion criteria
- Total 1039 patients included
  - 515 underwent reconstruction with PT
  - 524 underwent reconstruction with HAM
- Each study did not report on all outcome measures
### Summary of Results

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Studies</th>
<th>N</th>
</tr>
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<tbody>
<tr>
<td>Ext loss &gt; 5 deg</td>
<td>5</td>
<td>406</td>
</tr>
<tr>
<td>Ext loss &gt; 0 deg</td>
<td>3</td>
<td>186</td>
</tr>
<tr>
<td>Ant knee pain</td>
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<td>367</td>
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<tr>
<td>Crepitance</td>
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<td>IKDC D</td>
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<td>450</td>
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<tr>
<td>IKDC C+D</td>
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<td>516</td>
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<tr>
<td>Swelling</td>
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<td>286</td>
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<tr>
<td>IKDC B+C+D</td>
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<td>450</td>
</tr>
<tr>
<td>KT &gt; 5 mm</td>
<td>3</td>
<td>182</td>
</tr>
<tr>
<td>Pivot-shift &gt;= 2</td>
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<td>672</td>
</tr>
<tr>
<td>Meniscus Surgery</td>
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<td>451</td>
</tr>
<tr>
<td>Complications</td>
<td>5</td>
<td>530</td>
</tr>
<tr>
<td>Lachman &gt; 0</td>
<td>7</td>
<td>713</td>
</tr>
<tr>
<td>Pivot Shift &gt; 0</td>
<td>8</td>
<td>761</td>
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<tr>
<td>Worse Activity</td>
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<td>340</td>
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<tr>
<td>Rupture</td>
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<td>597</td>
</tr>
<tr>
<td>Flex Loss &gt; 5 deg</td>
<td>4</td>
<td>446</td>
</tr>
<tr>
<td>KT &gt; 3 mm</td>
<td>3</td>
<td>182</td>
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<tr>
<td>Giving-way</td>
<td>3</td>
<td>286</td>
</tr>
<tr>
<td>Lachman &gt;= 2</td>
<td>6</td>
<td>624</td>
</tr>
</tbody>
</table>

### Registry Data

- Since the data is gathered without an hypothesis and there is no randomization – Level 3
- But:
  - Large number of patients
  - Multiple surgeons, so widely extrapolatable
  - May be the best data we have

### Scandinavian Registry Data

  - The risk of revision was significantly lower in the patellar tendon group versus the hamstring group (hazard rate ratio = 0.63; 95% CI, 0.53-0.74)
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**Scandinavian Registry Data**

Expected proportion of revisions (%), estimated as 1 minus the Kaplan-Meier survival probabilities.

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**Kaiser Registry Data**


- 17,436 ACL reconstructions with an average of 2.5 year follow-up

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**Kaiser Registry Data: Hazard Risk for Revision**

<table>
<thead>
<tr>
<th>Hazard Risk for Revision</th>
<th>HR (95% CI)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graft: allograft vs RPTB autograft</td>
<td>1.24 (1.11-1.39)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Age (per 1 y increment)</td>
<td>0.99 (0.98-1.00)</td>
<td>.001</td>
</tr>
<tr>
<td>BMI: 25.29 vs &lt;25</td>
<td>0.76 (0.59-1.00)</td>
<td>.032</td>
</tr>
<tr>
<td>Race: Asian vs white</td>
<td>0.72 (0.52-1.00)</td>
<td>.039</td>
</tr>
<tr>
<td>Race Black vs white</td>
<td>0.58 (0.38-0.90)</td>
<td>.022</td>
</tr>
<tr>
<td>Race other vs white</td>
<td>0.84 (0.50-1.41)</td>
<td>.734</td>
</tr>
<tr>
<td>Other event</td>
<td>1.23 (0.70-2.14)</td>
<td>.436</td>
</tr>
</tbody>
</table>
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Summary

- 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?
Slide 24: Injury Prevention Programs
  • Level 1 RCT's
    -- >11,000 athletes included
    -- Almost 8,000 with ACL reporting

Slide 25: 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???

Slide 26: 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
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Kaiser Registry Data:
Hazard Risk for Revision

Using a hamstring graft significantly reduces the risk of contralateral ACL reconstruction (CACLR).

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Using a hamstring graft (versus B-PT-B) significantly reduces the risk of CACLR

• 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

- Dr. Deberadino suggests we use a reverse cutting drill
- Very enticing
- What about cost? >$300 for a single use device
- Does that help your surgicenter budget?

Avoiding the Medial Femoral Condyle with an Anatomic ACL Reconstruction

- How about medial portal with readily available instruments? Beath pin and 2.0mm 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

- 2.0 mm nitinol 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.

- 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

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Incident vs. Complication

GH = Graft Harvest. TP = Tunnel Placement.
GF = Graft Fixation.

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Majority of harvest issues related to hamstring harvest with premature amputation of graft
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Meticulous Hamstring Harvest
Release all Bands – No Gastroc Dimpling

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Incident vs. Complication

Majority of fixation issues related to broken bioscrews with B-PT-B grafts

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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.
- 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
REFERENCES:


