Autograft versus Allograft use for ACL Reconstruction: Why support failure???

Darren L. Johnson, M.D.
Professor and Chairman
Medical Director of Sports Medicine
University of Kentucky School of Medicine
Clinical experience

- 19 years: Academic
- 100% sports practice
- KNEE/SHOULDER
- 450 cases/yr
- 200-225 ACL/YR
- 25-30+ REVISION ACL
- 20 COMBINED PCL/MCL/FCL
- Acute/Chronic
- Fellowship: 3 fellows
Autograft options

- BPTP
- Hamstring
- Quad tendon
Allograft options

- Achilles tendon

- BPTP allograft

- Soft tissue allografts
  - Semitendinososis
  - Post tibialias
  - Anterior tibialis
Why use autografts?

- **Lower failure rate** in young patients
- Low incidence donor site morbidity
- Early incorporation of graft
- Reduced cost
- No issues with availability
Conclusion: Patients undergoing ACL reconstruction with BPTB autografts demonstrate lower rates of graft rupture, lower levels of knee laxity, and improved single-legged hop test results and are more generally satisfied postoperatively compared with patients undergoing reconstruction with allograft BPTB.
Conclusions: No significant differences in function, activity, or satisfaction were found between allograft and autograft reconstructions in this patient population. The allograft group had a failure rate 15 times greater than that in the autograft group, with all failures occurring within the first year after reconstruction.
Background: There is recent evidence that use of allograft tendons for anterior cruciate ligament (ACL) reconstruction in young patients may result in increased failure rates compared with autologous grafts.

"those who entered the USMA with an allograft were 7.7 times more likely to experience a subsequent graft failure during the follow-up period when compared with the BTB autograft group (hazard ratio = 7.74; 95% confidence interval [CI], 2.67-22.38; P < .001)."

cohort. This cohort included 30 female and 90 male cadets. Of these 122 knees with prior ACL reconstructions, the grafts used were 61 bone-patellar tendon-bone (BTB), 45 hamstring, and 16 allograft. A total of 20 failures occurred among this cohort at an average of 545 days from matriculation. Of the failures requiring revision, 7 were BTB (11% of all BTB), 7 were allograft (44% of all allograft), and 6 were hamstring (13% of all hamstring). There was no significant difference in the graft failure between the BTB and hamstring autograft groups. In contrast, those who entered the USMA with an allograft were 7.7 times more likely to experience a subsequent graft failure during the follow-up period when compared with the BTB autograft group (hazard ratio = 7.74; 95% confidence interval [CI], 2.67-22.38; P < .001). When allografts were compared with all autografts combined, a similar increase failure was noted in the allograft group (hazard ratio = 6.71; 95% CI, 2.64-17.06; P < .001).

Conclusion: In this young active cohort, individuals having undergone an allograft ACL reconstruction were significantly more likely to experience clinical failure requiring revision reconstruction compared with those who underwent autologous graft reconstruction. The authors recommend the use of autograft in ACL reconstruction in young athletes.

Keywords: anterior cruciate ligament; reconstruction; allograft; autograft; revision
### Transtibial Tibialis Anterior Allograft vs Medial Portal Autograft

**Table:**

<table>
<thead>
<tr>
<th></th>
<th>Allograft</th>
<th>Autograft</th>
</tr>
</thead>
<tbody>
<tr>
<td># of patients</td>
<td>69</td>
<td>63 (66 knees)</td>
</tr>
<tr>
<td># &lt; 25 years of age</td>
<td>31</td>
<td>All</td>
</tr>
<tr>
<td>Mean age</td>
<td>31.7 years</td>
<td>17.3 years</td>
</tr>
<tr>
<td>Male/Female</td>
<td>38/31</td>
<td>36/27</td>
</tr>
<tr>
<td>Mean follow-up</td>
<td>55 months</td>
<td>35.1 months</td>
</tr>
<tr>
<td>Graft choice</td>
<td>All TA allograft</td>
<td>56 PT, 10 HS</td>
</tr>
<tr>
<td>Return to play</td>
<td>4 months</td>
<td>6 months</td>
</tr>
<tr>
<td>% ACL revision</td>
<td>35% (11/31)</td>
<td>8% (5/66)</td>
</tr>
<tr>
<td>% Re-operation</td>
<td>55% (17/31)</td>
<td>17% (11/66)</td>
</tr>
<tr>
<td>Reasons for re-operation</td>
<td>16 ACL revisions, 9 menisci, 1 TKA</td>
<td>5 ACL revisions, 3 menisci, 2 MUA/LOA, 1 MM Tx</td>
</tr>
<tr>
<td>Mean Lysholm</td>
<td>85.6</td>
<td>92.2</td>
</tr>
<tr>
<td>Mean Tegner</td>
<td>4.4</td>
<td>8.6</td>
</tr>
<tr>
<td>IKDC (normal or nearly normal)</td>
<td>86.2%</td>
<td>98.5%</td>
</tr>
<tr>
<td>IKDC (abnormal or severely abnormal)</td>
<td>13.7%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Able to return to same sport</td>
<td>58%</td>
<td>91%</td>
</tr>
</tbody>
</table>

**References:**
Is Allograft vs Autograft a Cause of Primary ACLR Failure?

Kaeding. AOSSM 2008, Sport Health 2011

MOON 2002 & 2003

- Min 2-yr f/u phone or ?
- n= ~1000
- 94 % follow-up
- Failure defined as revision
- Results:
  18yr: ALLO 20% vs Auto 6%
  40 yr: ALLO 3% vs Auto 1%

5. NNH (# needed to harm) is 7 at high school
Graft Incorporation???

- Faster remodeling response in autograft vs allograft @ 2 wks and 8 wks postop
  - *Bhatia et al, Bony Incorporation of Soft Tissue Anterior Cruciate Ligament Grafts in an Animal Model, AJSM Aug 2012*

- *Shouldn’t delayed allograft incorporation delay rehab/Return to Sports??!!*
Low Donor Site Morbidity

- Equivalent subjective/clinical outcome scores on comparative studies
  - Kraeutler et al, BPTP autograft vs allograft in outcomes of ACL reconstruction, AJSM April 2013

- Decrease anterior knee pain
  - Regain full hyperextension
    - Shelbourne et al, Preventing anterior knee pain after ACL reconstruction, AJSM Jan-Feb 1997.
  - Layered closure
  - Different autograft choice (HS, QT)
Reduced Cost

- Total mean cost/case for BPTB allo vs auto
  - $4,147 ± $943 vs $3,154 ± $704
  - Barrera Oro et al, Arthroscopy Sep 2011

- Allograft ACL reconstruction most costly and least effective strategy for average patient
  - Genuario et al, AJSM Feb 2012
Allograft Availability

• Not all grafts are created equal!!!!!!
  – Limited information on source/outcome
  – Limited information on processing techniques

• Demand has greatly increased in last 10 years

Jost et al, HSS Journal, Oct 2011
### Graft choice for professional/collegiate athletes

<table>
<thead>
<tr>
<th></th>
<th>Autograft BPTB</th>
<th>Autograft Hamstring</th>
<th>Allograft Achilles</th>
</tr>
</thead>
<tbody>
<tr>
<td>NBA</td>
<td>81%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NFL</td>
<td>82%</td>
<td>12%</td>
<td>6%</td>
</tr>
<tr>
<td>SEC</td>
<td>69%</td>
<td>25%</td>
<td>6%</td>
</tr>
<tr>
<td>Pac-12</td>
<td>92%</td>
<td>8%</td>
<td></td>
</tr>
</tbody>
</table>

Total Autograft = 85%

Total Autograft = 94%

Total Autograft = 94%

Total Autograft = 100%
Do it Right the First Time!!!!

Autografts for young active patients

- lower failure rate
- NO STUDY HAS SHOWN A BENEFIT TO ALLOGRAFT
- lower cost
- no disease transmission
Future of ACL Surgery

We will individualize the surgery(graft)/rehab/RTP to the athlete, injury pattern, unique patients anatomy/pathologic kinematics. Not all athletes with an ACL injury will have the same operation(graft)/rehabilitation timeline/RTP.
THANK YOU
References

• Ellis et al. Outcomes and Revision Rate After Bone–Patellar Tendon–Bone Allograft Versus Autograft Anterior Cruciate Ligament Reconstruction in Patients Aged 18 Years or Younger With Closed Physes. Arthroscopy Dec 2012.
• Pallis et al. Survival Comparison of Allograft and Autograft Anterior Cruciate Ligament Reconstruction at the United States Military Academy. AJSM June 2012.
• Shelbourne et al. Preventing anterior knee pain after ACL reconstruction. AJSM Jan-Feb 1997.