No Differences in Re-Rupture Rate or Patient Reported Outcomes Between Quadriceps, Semitendinosus-Gracilis, or Bone-Patellar Tendon-Bone Graft In ACL Reconstruction at 1-Year Post-Operative

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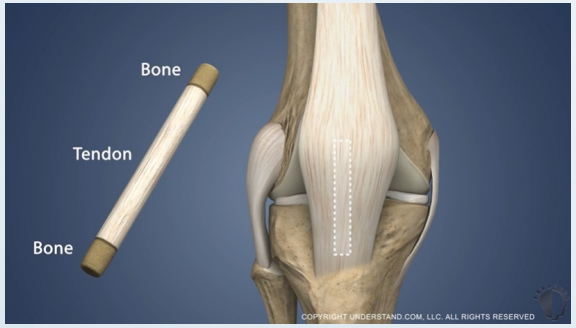
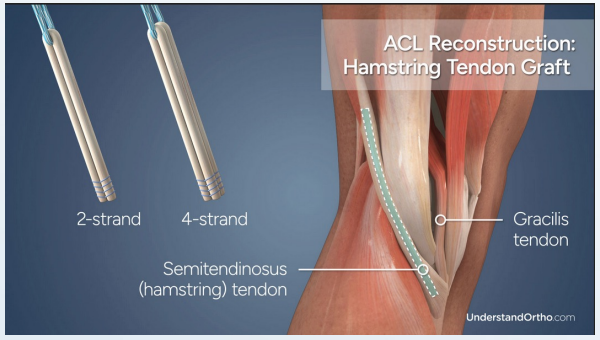
Introduction

- The ACL is one of the most researched ligaments in the orthopaedic literature.
- Once torn, due to poor blood-supply, surgical reconstruction is often required.
- The three most common autograft options are:

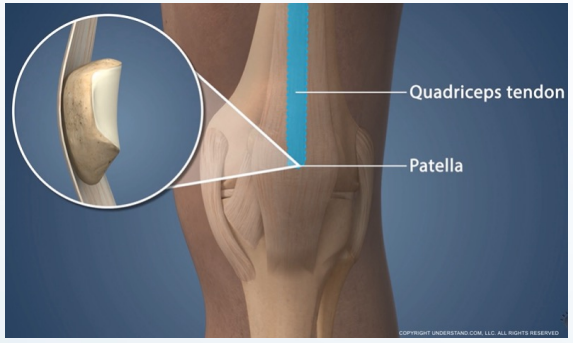
Bone-patellar-tendon-bone (BPTB)



Semitendinosus-Gracilis (STG)



Quadriceps Tendon (QT)



Images from: https://www.understandortho.com/knee/

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Greatest limitations of ACL reconstruction?

1. Re-tear
2. Variable functional outcomes

Graft selection affects both

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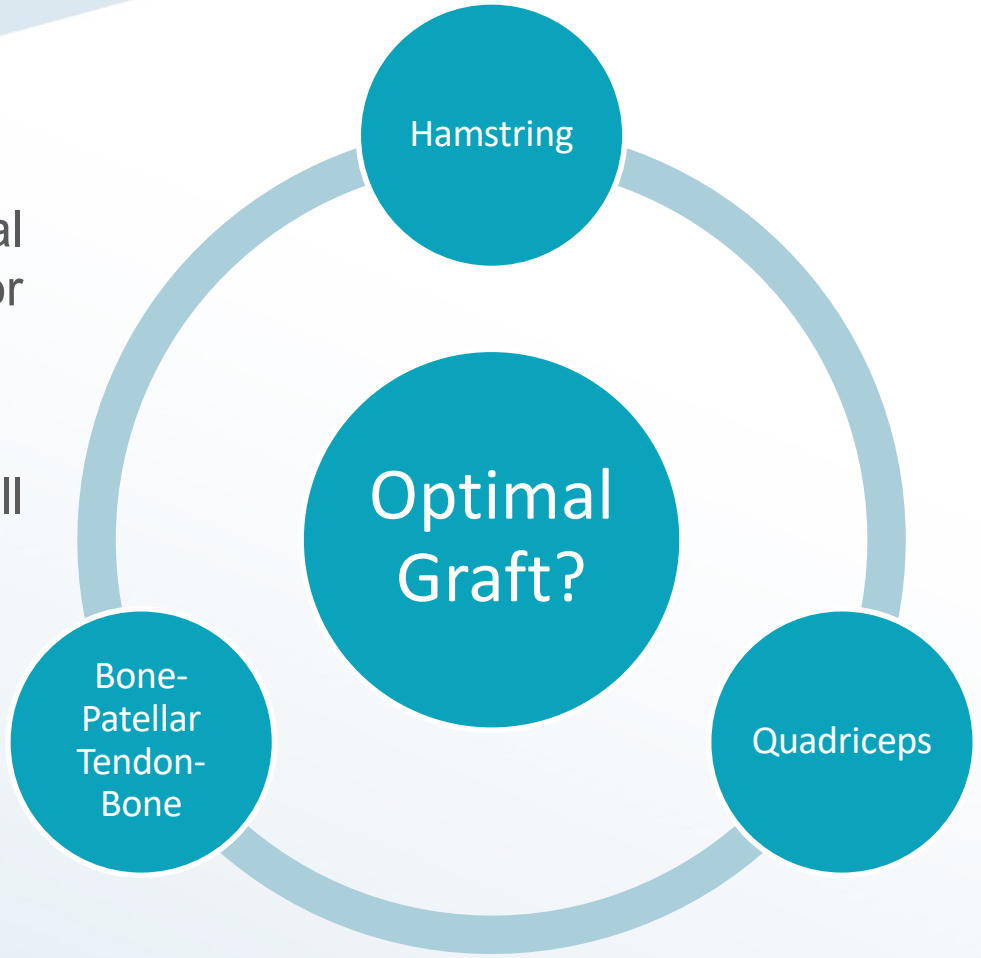
The Problem?

- Despite decades of research, there's no universal agreement on which graft type is superior for primary ACL reconstruction.

- No clinical trial to date has directly compared all 3 grafts with respect to:
    - Re-tear rate
    - Complications and revisions
    - Patient-reported outcomes
    - Strength and functional testing



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Purpose

- To compare re-rupture rates, quality of life, and functional outcomes between patients undergoing primary ACL reconstruction (ACLR) using a BPTB, STG, or QT graft at 5-years post-operative.

- **The 1-year post-operative results are presented here to provide insights into the early stages of recovery.**

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Methods

- **Design:** prospective cohort study
- **Setting:** single centre (Pan Am Clinic), five fellowship trained knee surgeons
- **Group allocation:** patients were consecutively enrolled based on study criteria and allocated to one of three graft groups (BPTB, STG, or QT) based on surgeon preference and expertise.
- **Inclusion Criteria:** >13yr of age, skeletally mature, diagnosis of complete unilateral ACL tear
- **Exclusion Criteria:** previous ACLR on either limb, partially torn ACL not requiring surgical repair, concomitant ligament tear requiring surgical repair, severe chondromalacia, rheumatoid arthritis, Workers Compensation Board claim, pregnancy at time of surgery

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Outcomes and Intervals

Assessment/Procedure	Baseline	Surgery	2-4 Wks	3 M	6 M	1-5 Y
Screening / Eligibility	•	•				
Informed Consent	•					
Demographics	•					
Operative Data		•				
Clinical Exam	•			•	•	•
PROMs (ACL QOL; SANE; Marx Activity Rating Score; Tegner Activity Score)	•				•	•
Strength Testing*	•					•
Safety/complications/re-operations		•	•	•	•	•

***Strength testing:**

- peak concentric flexion and extension torques as measured on a dynamometer.
- presented as limb symmetry indices, affected/unaffected limb

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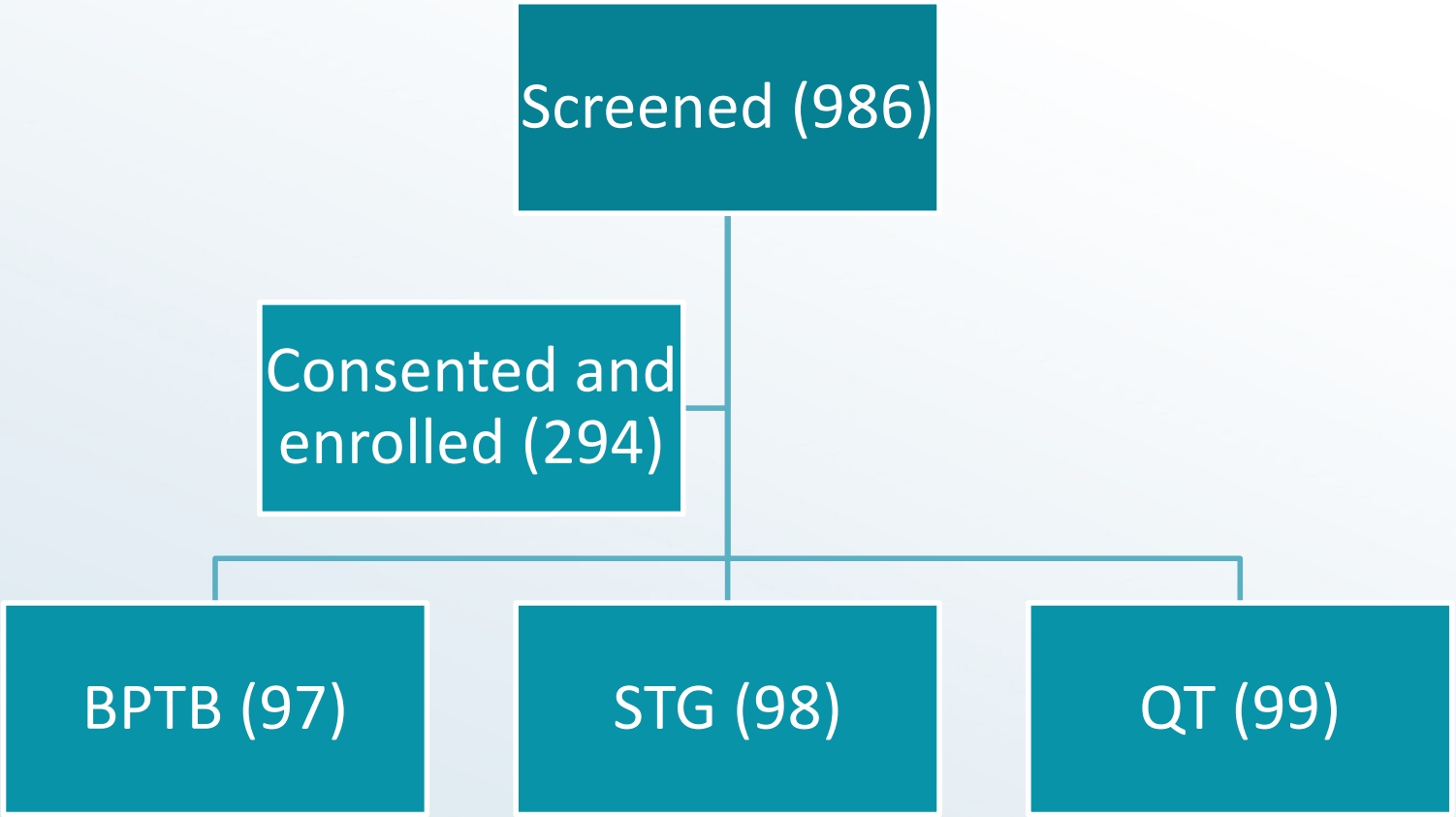
Recruitment



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Results

Table 1. Demographics and outcomes for BPTB, STG and QT groups.

	BPTB	STG	Quads	p-value
Age (yrs)	28.0 (8.6)	29.4 (9.2)	25.1 (7.9)	0.002*
Sex (M/F)	47/50	48/50	51/48	0.900
Re-rupture (count)	1	0	1	
Contra rupture (count)	0	0	0	
QOL (%)				
• **Baseline**	36.2 (15.2)	34.7 (14.6)	36.7 (14.2)	0.636
• **1 year**	73.7 (17.9)	67.8 (16.5)	70.5 (20.5)	0.132
SANE (%)				
• **Baseline**	48.5 (22.7)	47.7 (24.5)	51.7 (23.6)	0.461
• **1 year**	81.8 (13.6)	81.4 (10.2)	80.7 (14.1)	0.858
Marx Activity (/16)				
• **Baseline**	5.2 (5.2)	6.0 (5.5)	4.4 (5.3)	0.114
• **1 year**	7.5 (4.7)	6.1 (4.5)	7.6 (4.5)	0.067
Tegner Activity				
• **Baseline**	7.8 (1.6)	7.3 (1.9)	7.9 (1.5)	0.630
• **1 year**	5.9 (1.8)	5.4 (1.8)	5.6 (1.8)	0.232
Flexion torque (% - affected/unaffected)	95.5 (15.2)	86.5 (13.4)	96.3 (14.4)	<0.001*
Extension torque (% - affected/unaffected)	72.0 (19.1)	77.4 (20.1)	65.1 (16.4)	0.001*

** Significance level <0.05; Significant difference between groups based on 1-way ANOVA*

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Strengths & Limitations

- Long-term data are required to fully elucidate the impact of graft type on re-rupture rates, functional, and patient-reported outcomes.

- This Level II study (prospective cohort) may introduce confounding and surgeon bias, limiting internal validity compared to randomized trials, however it offers strong external validity (generalizability) and reflects real-world clinical practice.

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Conclusion

At 1-year postoperative:

- **No differences** with respect to re-rupture, quality of life, function or activity level.
- **Strength deficits were evident regardless of graft**, which should be considered when clearing patients for return to full activity.
  - QT demonstrated knee extension deficits compared to BPTB and STG
  - STG had decreased knee flexion strength compared to BPTB and QT

Future studies should explore the factors contributing to strength deficits during the first year of rehabilitation and identify strategies to address them.

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