

Best Graft for Patients With High Grade Laxity?



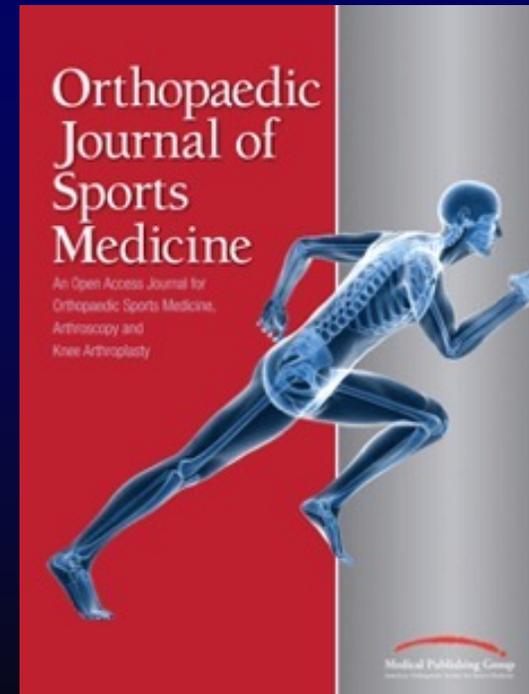
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Disclosures

- **Fellowship Support**
 - **Arthrex**
- **Editorial Board**
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What is “High Grade” Laxity?

Grade D IKDC Evaluation

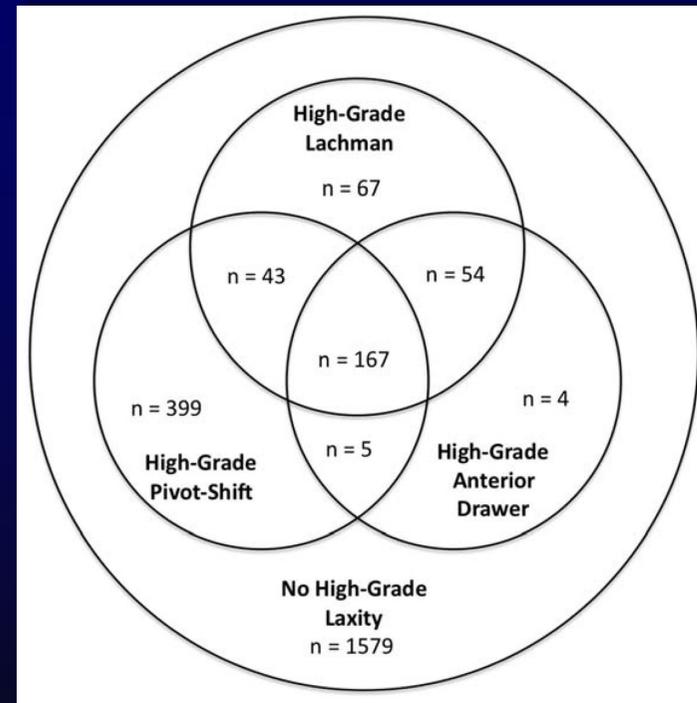
Lachman or
Anterior Drawer > 10mm
and/or
3+ Pivot Shift



Presentation of High Grade Laxity

**Isolated 3+ Pivot Shift
More Common than
Isolated Lachman > 10 mm**

**Isolated Anterior Drawer
> 10 mm is Rare**



Factors Associated with High Grade Lachman

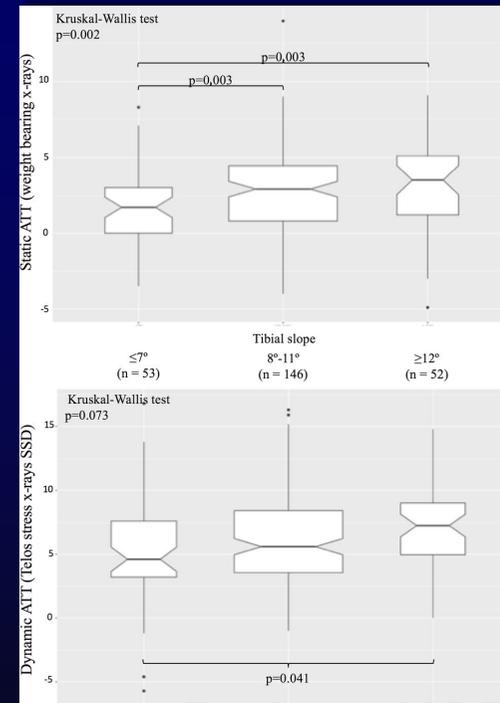
Risk Factor	Odds Ratio (95% CI)	Significance
Age less than 20 years	1.16 (0.86–1.56)	p = 0.33
Female Sex	1.14 (0.87 – 1.50)	p = 0.34
Body Mass Index over 25 kg/m ²	0.99 (0.72 – 1.31)	p = 0.93
Generalized Ligamentous Laxity	2.33 (1.59 – 3.42)	p < 0.001
Medial Meniscus Tear	1.63 (1.25 – 2.13)	p < 0.001
Lateral Meniscus Tear	1.41 (1.07 – 1.84)	p = 0.013
Chronic (>6 months) Relative to Acute (<3 months) ACL Injuries	2.99 (2.20 – 4.07)	p < 0.001

Factors Associated with High Grade Pivot Shift

Risk Factor	Odds Ratio (95% CI)	Significance
Age less than 20 years	1.34 (1.04 – 1.72)	p = 0.023
Female Sex	1.49 (1.18 – 1.88)	p = 0.001
Body Mass Index over 25 kg/m ²	0.89 (0.69 – 1.13)	p = 0.33
Generalized Ligamentous Laxity	3.46 (2.38 – 5.05)	p < 0.001
Medial Meniscus Tear	1.53 (1.21 – 1.94)	p < 0.001
Lateral Meniscus Tear	1.27 (1.01 – 1.61)	p = 0.041
Chronic (>6 months) Relative to Acute (<3 months) ACL Injuries	2.71 (2.04 – 3.61)	p < 0.001

Effect of Tibial Slope

**Greater Tibial Slope
Increased Static
And Dynamic
Anterior Tibial Translation
But Not Pivot Shift
In ACL Injured Knees**



**DeJour, KSSTA 2019
Batty, OJSM 2021**

Effect of Tibial Slope

Posterior Slope

$> 9^\circ$

Had 2.35x Risk
Of High-Grade
Pivot Shift

($\geq 2+$)



Role of Anterolateral Ligament

ALL Injury is
More Frequent in
Patients With
Higher Pivot Shift

	Positive ALL injuries	Negative ALL injuries	<i>p</i> value**
Overall ACL injuries			
Pivot shift grade			
0	13	22	0.0005
1	31	22	
2	50	13	
3	12	6	

Summary of Risk Factors

Chronic Injury (> 6 Months)

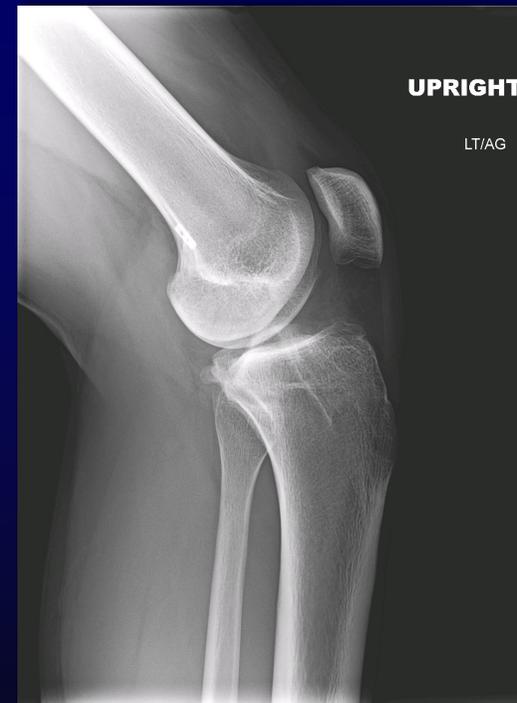
Generalized Laxity

Meniscal Tear

(? Any, Ramp, Root)

Higher Posterior Tibial Slope

ALL Injury



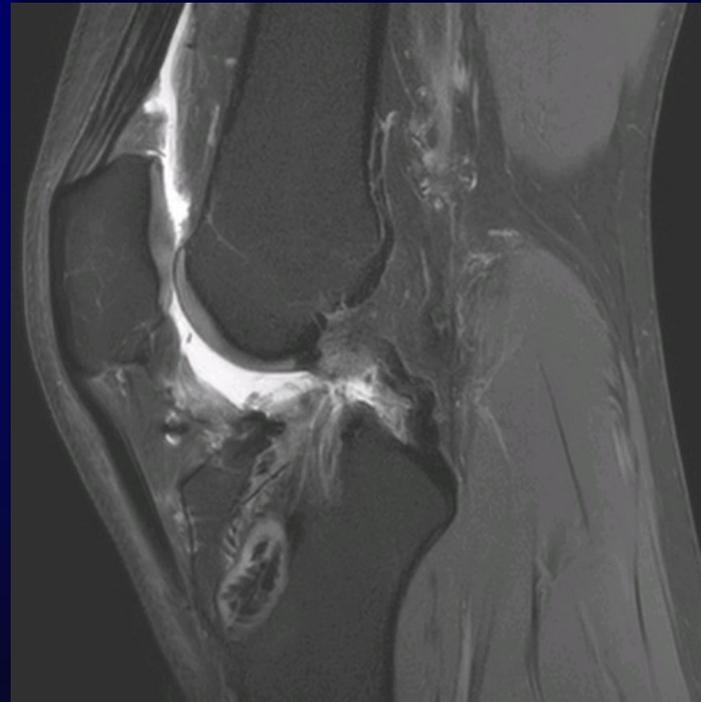
Does Pre-operative Laxity Matter?

YES!!!
High Grade
Pre-Operative Laxity
Increased Risk of
Revision Within
6 Years

High-grade laxity	Odds Ratio	95% Confidence Interval	Significance
3+ Pivot-shift	1.75	1.19 – 2.54	p = 0.002
Lachman > 10mm	1.76	1.10 – 2.80	p = 0.020
Anterior Drawer > 10mm	1.60	0.92 – 3.32	p = 0.098
Any one of the above	1.73	1.19 – 2.51	p = 0.004

Revision ACL

**Patients with
Failed ACL Reconstruction
Often Have
High Grade
Laxity**



Ideal Graft

Strong

Stiff

Rigidly Fixed

Quickly Incorporated

Durable

No Donor Site Morbidity



Graft Options

Autograft

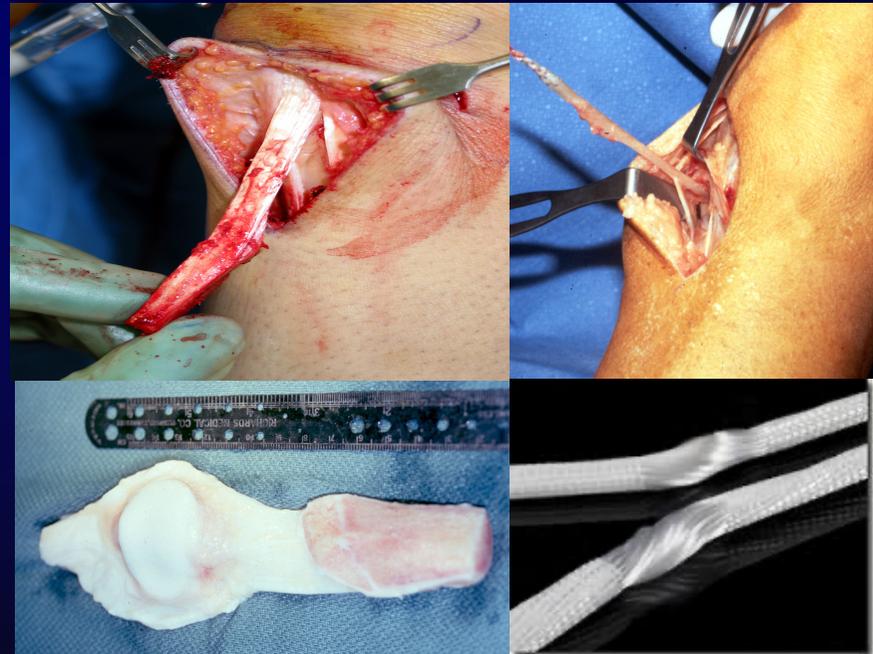
Bone-Patellar Tendon-Bone

Hamstring

Quadriceps Tendon

Allograft

Synthetic



Synthetic

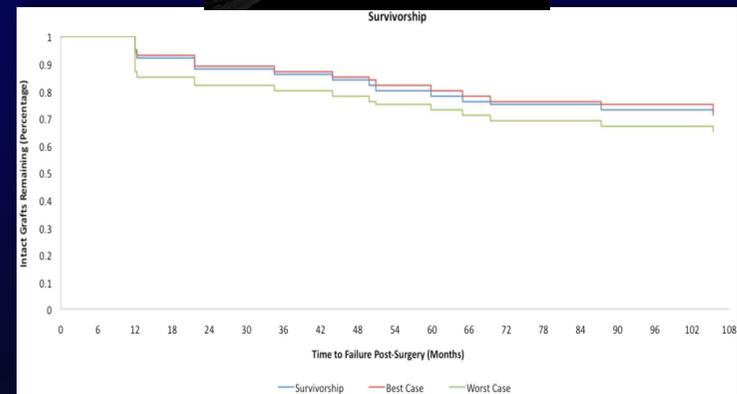
Strong and
No Need for Incorporation

Not Durable

LARS - 33.3% Failure Rate
At 7 year f/u

Reactive Synovitis

20%



Allograft

Large
No Donor Morbidity

Processing Affects Strength
Slower Incorporation
Higher Failure Rate in
Younger patients

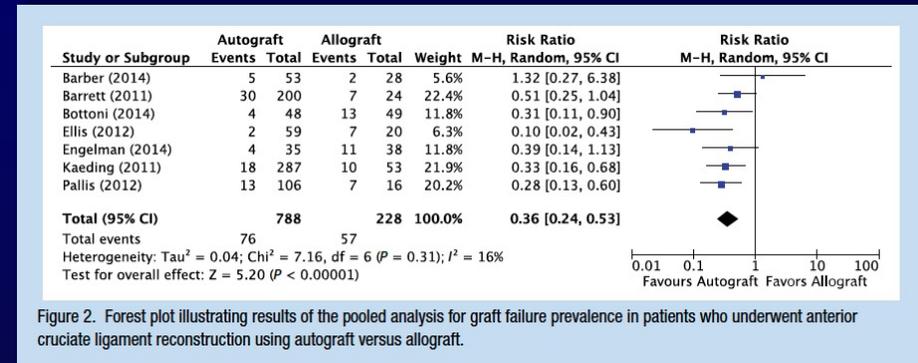


Figure 2. Forest plot illustrating results of the pooled analysis for graft failure prevalence in patients who underwent anterior cruciate ligament reconstruction using autograft versus allograft.

Autograft 9.8%
Allograft 25.0%

Hamstring

Large Cross-Section
Stiff & Strong
(If Quadrupled)

Slower Incorporation
Variable Size
6.8 x Failure Rate
With Size \leq 8mm



Bone-Patellar Tendon-Bone

Strong
Stiff

Rapid Incorporation

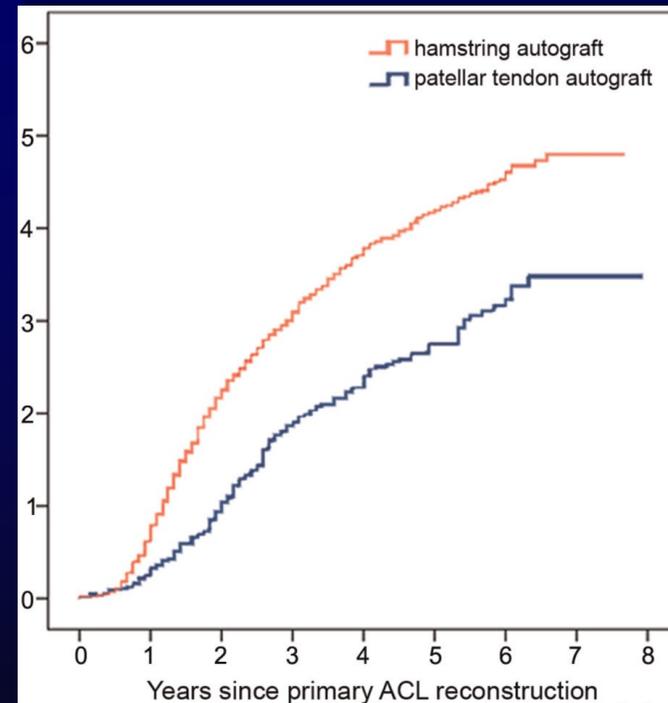
Donor Site Morbidity



B-PT-B vs Hamstring

**Higher Failure Rate
In Scandanavian Registries**

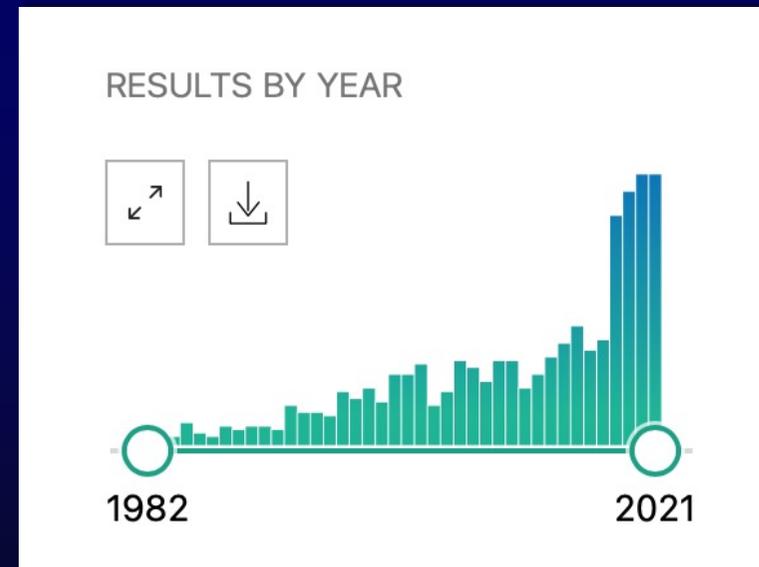
**MOON Group:
Hamstring Failures
2x in Young Active Patients
When Controlling for Laxity**



Quadriceps Tendon Autograft

**Marked Increase
In Usage Over
Past 10 Years**

**Dissatisfaction with
BTB or HS Grafts**



Quadriceps Tendon

Strong

2,185 vs 1,580 N

Large Cross-Section

91.2 vs 48.4 mm²

Stiff

466 vs 278 N/mm

Less Donor Site Morbidity



QT-Bone vs. Soft Tissue QT

Bone Versus All Soft Tissue Quadriceps Tendon Autografts for Anterior Cruciate Ligament Reconstruction: A Systematic Review



Raphael J. Crum, B.S., Jeffrey Kay, M.D., Bryson P. Lesniak, M.D.,
Alan Getgood, M.Phil., M.D., F.R.C.S(Tr&Orth), DipS.E.M., Volker Musahl, M.D., and
Darren de SA, M.D., F.R.C.S.C., M.B.A(c)

Similar Outcomes

Higher Rate of + Pivot Shift in QT-B

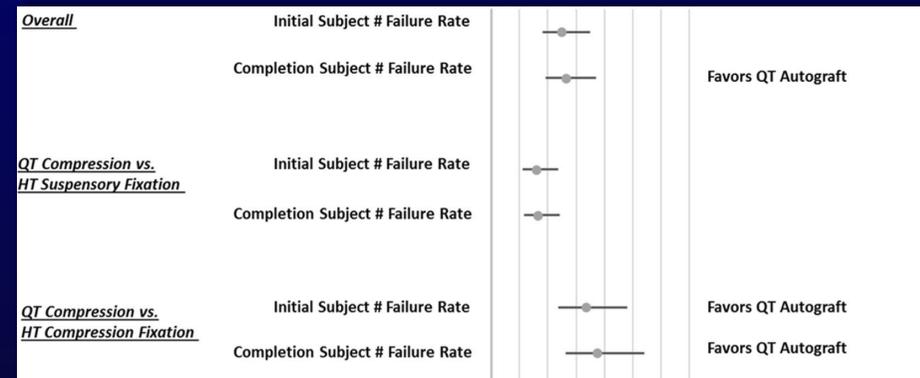
Systematic Review: Quad Tendon vs. Patellar Tendon

	nQT:BPTB	Mean difference (95% CI)QT – BPTB	Risk ratio (95% CI)QT:BPTB	P value
Side-to-side difference, mean	248:311	-0.18 (-0.65 to 0.29)		0.45
Side-to-side difference >3 mm	518:413		0.77 (0.49 to 1.18)	.23
Lachman grade 0	390:316		1.02 (0.91 to 1.14)	.76
Lachman grade 0 or 1	390:316		1.00 (0.97 to 1.03)	.79
Pivot-shift grade 0	416:341		1.04 (0.98 to 1.1)	.23
Pivot-shift grade 0 or 1	390:316		1.00 (0.97 to 1.02)	.85
Lysholm score, mean	357:459	-0.81 (-1.77 to 0.15)		.10
Objective IKDC A or B	328:427		0.97 (0.92 to 1.02)	.20
Subjective IKDC, mean	168:252	2.08 (-2.38 to 6.55)		.36
Donor-site pain	439:287		0.25 (0.18 to 0.36)	<.00001
Graft failure	439:287		0.72 (0.28 to 1.84)	.50

^aIKDC, International Knee Documentation Committee. Bolded values indicate significant difference.

Systematic Review: Quad Tendon vs. Hamstring

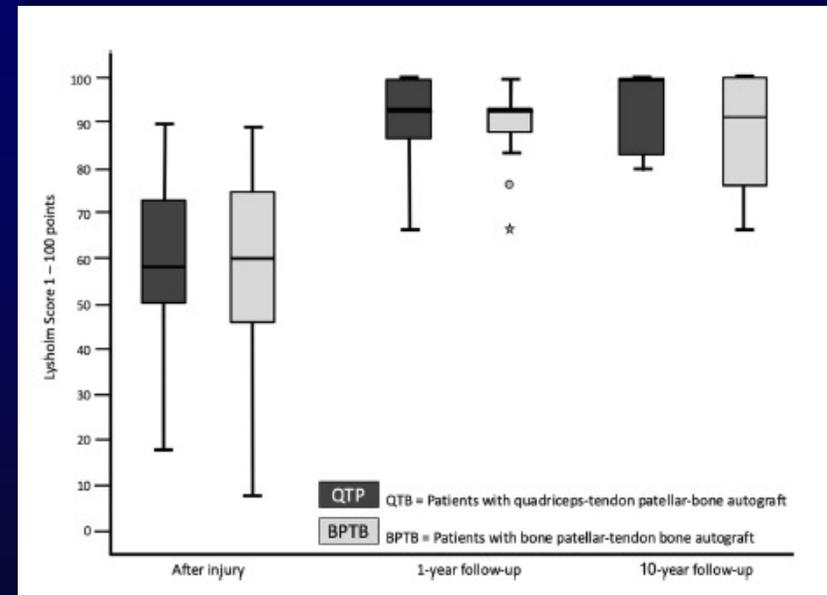
Quad Tendon Had
Less Pivot Shift Laxity
And
Lower Failure Rates
Especially if HS Femoral Fixation
With Compression Screw



B-PT-B vs Quad Tendon RCTs

Equal Outcomes

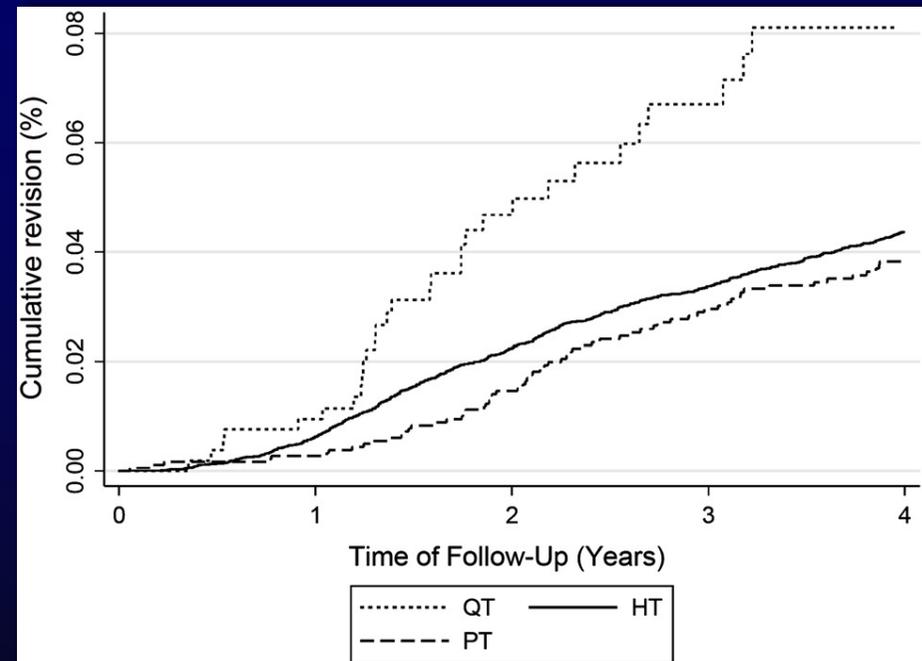
Less Donor Site Morbidity



Lind, Br J Sports Med, 2020
Barie, Arch Ortho Trauma 2021

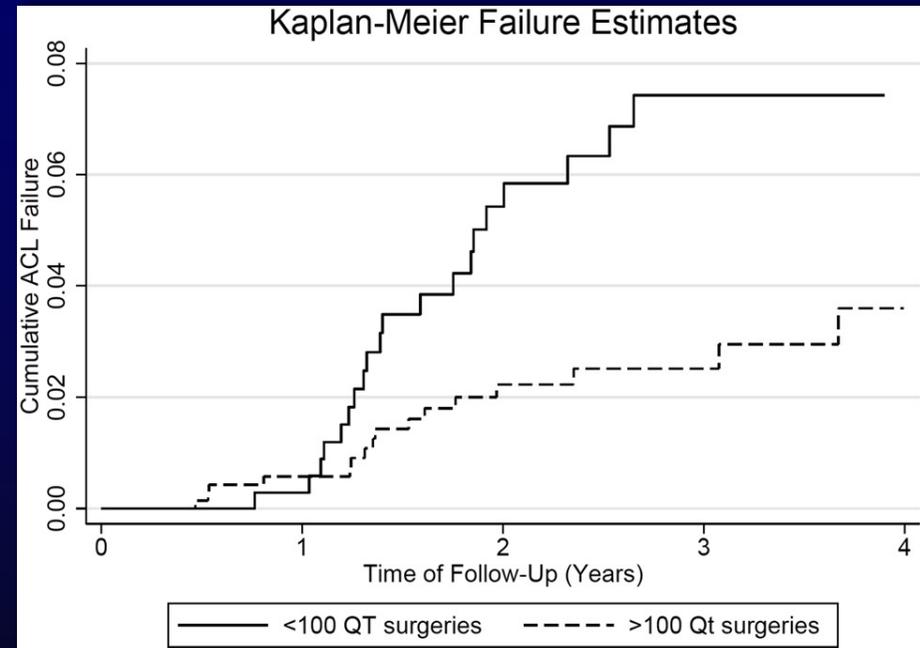
Danish Knee Ligament Registry

Significantly Higher
Revision Rate with
QT Graft



Experience Matters

**Much Higher
Revision Rate for
QT ACLR
In Centers That
Performed Fewer Than
100 QT Surgeries
Over 8 Year Period**



My Recommendations

- **Treat Associated Lesions (ALL, Menisci)**
- **Never Use Synthetic or Allografts**
- **Avoid Hamstrings in High Grade Laxity**
- **B-PT-B or Quad Tendon for Most**
- **Quad Tendon for Revisions or Kneelers**

Quadriceps Tendon



I'll try anything once, twice if I like it, three times to make sure.

(Mae West)

izQuotes

Merci Beaucoup !!

