Knee pain following Anterior Cruciate Ligament reconstruction does not influence knee function or activity level

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Introduction

- Commonly used grafts for ACL reconstruction
  - Bone-patellar tendon-bone autograft
  - Hamstring autograft

- BPTB autografts have shown lower re-rupture rates, improved rotational stability and rapid graft incorporation [1,3,6,7], but widespread use is tempered by concerns over knee pain and kneeling discomfort [4,8].

- HT autografts have been suggested as an alternative with reduced donor site morbidity but may cause knee flexion weakness and reduced rotational stability [5,9,11].

- Knee pain is often reported using a single measure and as a binary, unidimensional outcome [2,3], thus overlooking the complex nature of pain.

- Few studies have quantified pain severity or the clinical relevance of knee pain [10].

Study Objectives

Prospectively and longitudinally document the prevalence, severity and location of knee pain over 5 years post ACLR.

Evaluate the clinical significance of this pain using multiple measures at multiple time points.

Identify demographic, injury related and clinical factors associated with the development of pain.

Methods

Cohort study - Participants prospectively enrolled between Jan 2014 and Sept 2016.

- 1,407 participants included in analysis.

Graft selection determined by surgeon's assessment of patient demographics and physical examination findings.

- BPTB autograft reconstruction used for 1,145 (81%) patients.
- HT autograft reconstruction used for 262 (19%) patients.

Inclusion criteria
13-45 years old
Undergoing primary ACL reconstruction (including those with previous contralateral injury)

Exclusion criteria
Revision ACL reconstructions
Multi-ligament knee repair/ reconstruction
Previous meniscal surgery to ipsilateral knee
Concurrent lateral extra-articular tenodesis.

Statistical Analysis:
- Chi-squared test
- Binary logistic regression
- Mann-Whitney U test

Data collection time points

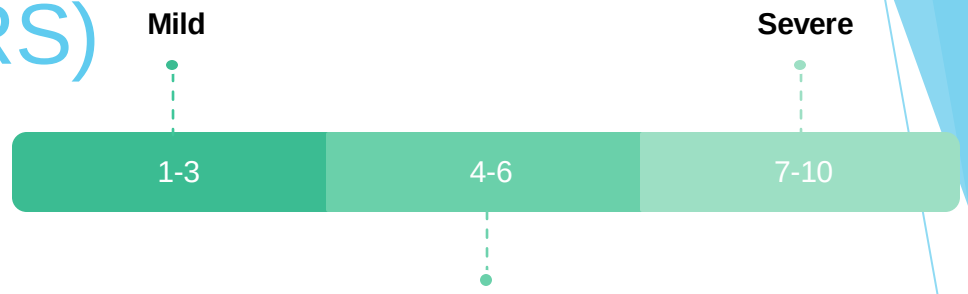
	Pre-op	Intra-op	6 months post-op	1 year post-op	2 years post-op	5 years post-op
Demographic data	X					
Intra-operative data		X				
Knee pain - presence (yes/no) - location (MCQ) - severity (NRS)			X	X	X	X
ACL-RSI score	X					
IKDC			X	X	X	X
Marx activity scale	X		X	X	X	X
KOOS						X
WOMAC						X

Results: Prevalence of knee pain

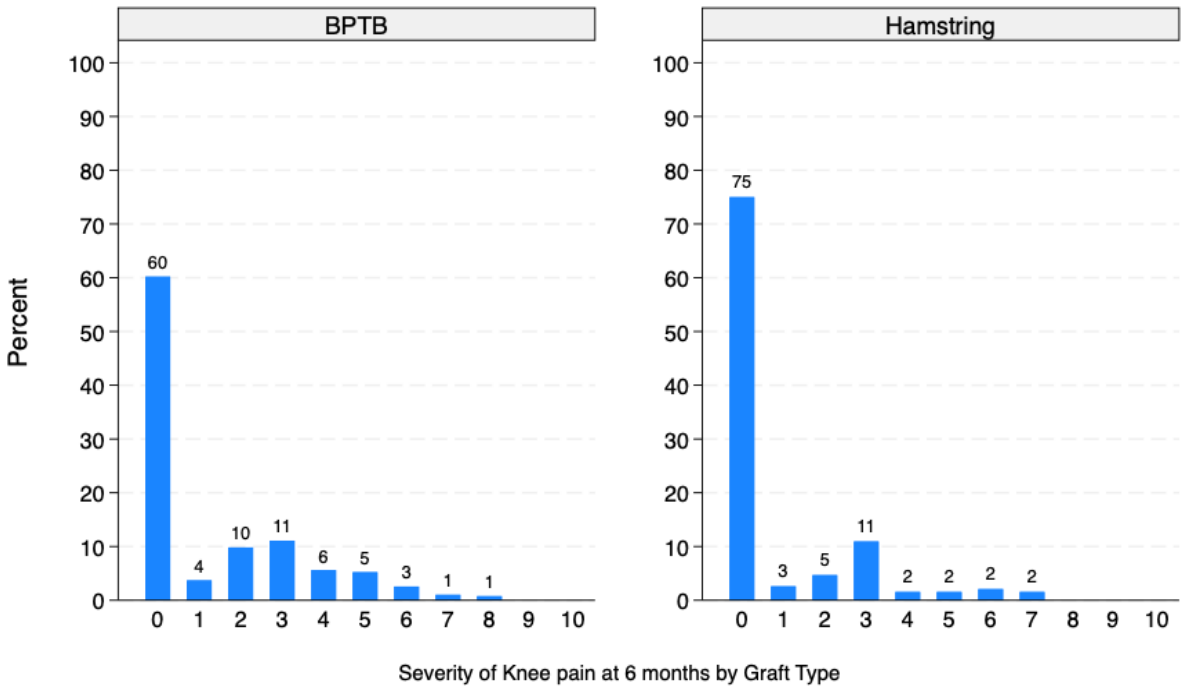
	6 months			1 year			2 years			5 years		
	BPTB	HT	P value	BPTB	HT	P value	BPTB	HT	P value	BPTB	HT	P value
Total patients	784	192		838	202		1081	247		972	225	
No Pain	472 (60)	144 (75)		480 (58)	124 (61)		710 (66)	164 (66)		668 (69)	171 (76)	
Knee pain (Yes)	312 (40)	48 (25)	**< .001**	358 (42)	78 (39)	0.288	371 (34)	83 (33)	0.83	304 (31)	54 (24)	**0.032**
Location of pain												
Anterior	205 (26)	12 (6)	**< .001**	216 (26)	42 (21)	0.131	209 (19)	48 (19)	0.702	160 (16)	24 (11)	**0.027**
Posterior	16 (2)	9 (5)		13 (2)	8 (4)		18 (2)	7 (3)		14 (1)	2 (1)	
Medial	56 (7)	20 (10)		89 (11)	20 (10)		109 (10)	22 (9)		88 (9)	25 (11)	
Lateral	35 (4)	7 (4)		40 (5)	8 (4)		35 (3)	6 (2)		42 (4)	3 (1)	

- Significant between group differences in the presence of knee pain and AKP at 6 months and 5 years post-op.

Results: Pain Severity (NRS)

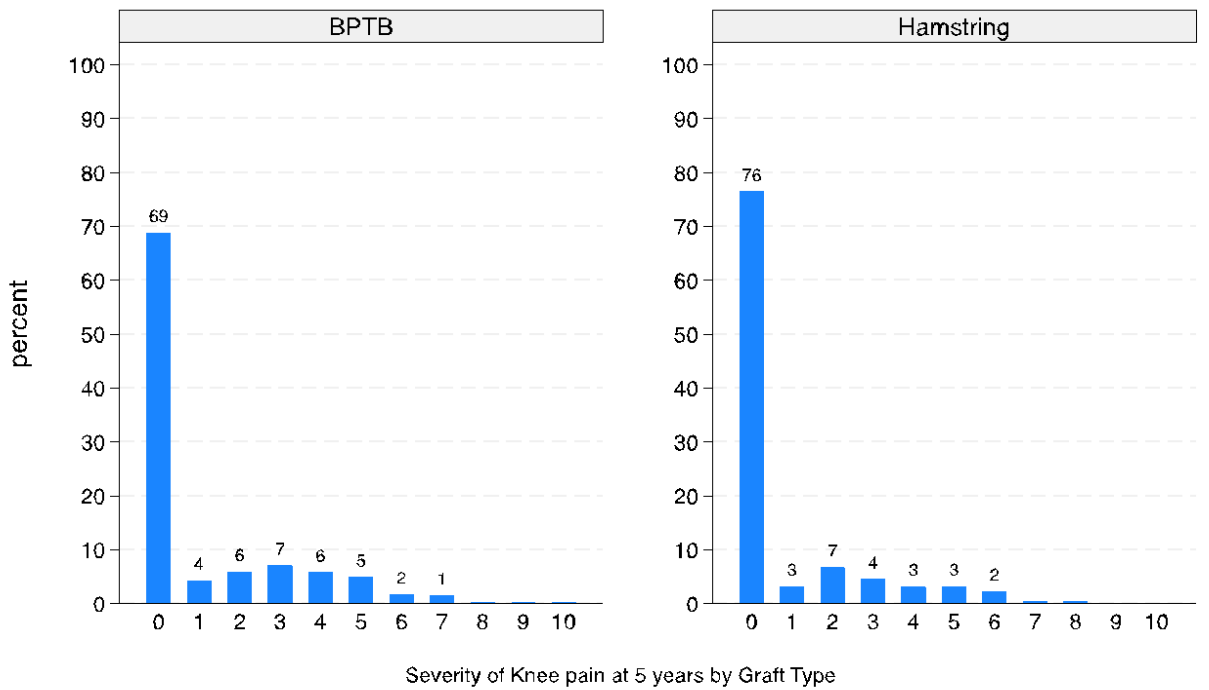


6 months post-op



Mean score
- BPTB = 3.4/10
- HT = 3.3/10

5 years post-op



Mean score
- BPTB = 1.1/10
- HT = 0.8/10

Results: KOOS, WOMAC, IKDC and Marx scores

	BPTB	Hamstring	P value
KOOS score			
Pain	95.3 +/- 8.5	95.5 +/- 8.6	0.31
Symptoms	90.8 +/- 11.8	90.8 +/- 12.6	0.508
ADL	98.2 +/- 6.2	98.1 +/- 6.4	0.979
Sports	88.8 +/- 15.8	89.8 +/- 16.0	0.194
QOL	83.8 +/- 19.4	84.7 +/- 19.6	0.272
WOMAC score			
Pain	99.6 +/- 1.4	99.5 +/- 1.2	0.725
Stiffness	99.3 +/- 1.2	99.5 +/- 1.0	0.963
Function	98.8 +/- 4.2	98.7 +/- 4.4	0.64
Total	97.6 +/- 6.4	97.7 +/- 6.5	0.374
IKDC Score			
5 years post-op	86.8 +/- 10.3	87.1 +/- 11.5	0.16
Marx Score			
5 years post-op	8.9 +/- 5.4	8.7 +/- 5.6	0.7

- No significant between group differences at 5 years post-op.

Results: Factors associated with knee pain

Female gender ($p < .035$)
Increasing age ($p < .014$)
BPTB autograft ($p < .004$)

Increasing age ($p < .001$)
BPTB autograft ($p < .027$)
Chondral pathology of MFC ($p < .020$)

6 months post-op

2 years post-op

5 years post-op

Chondral pathology of MFC ($p < .022$)

Discussion

Higher prevalence of AKP in BPTB than HT group at 6 months post-op (26%, 6% respectively), but mean pain severity was equivalent for both graft types (BPTB 3.4/10, HT 3.3/10).

At 5 years post-op, BPTB group were 1.59 times more likely to have pain but pain severity was low (1.1/10) and no significant differences in PROMs were observed.

Factors including female gender, older age and chondral pathology were associated with pain at various time points.

Improvement in AKP over time suggests rehabilitation and tissue healing are as important as graft selection in mitigating AKP.

Most reports of pain are mild in severity and do not limit activity levels, sports participation or knee function, which highlights the importance of how knee pain is defined and assessed.

Conclusions

- Findings demonstrate the importance of assessing pain using multiple measures to distinguish between mild discomfort and clinically meaningful pain that affects activity levels, knee function and quality of life.

- Mild non-limiting AKP should not deter surgeons from using BPTB autografts, particularly in younger patients and level 1 athletes.

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