

Val d'Isère, 01-2018

Graft selection in chronic multiligament injured knees.

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Surgery



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Sports Medicine
Research Laboratory



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Institute of Health

					2014	2015	2016
	ACL	---	---	---	3324	3404	3477
→	ACL	---	MCL	---	49	28	38
	---	PCL	---	---	12	23	12
→	ACL	---	---	LCL	10	8	12
	ACL	---	---	LCL	7	10	4
	ACL	PCL	---	---	5	6	3
	ACL	PCL	---	LCL	1	3	3
	---	---	MCL	---	1	0	2
	---	PCL	MCL	---	5	2	2
	ACL	---	---	---	0	1	2
	ACL	PCL	MCL	LCL	1	1	2
	---	---	---	LCL	1	0	1
	---	---				0	1
	---	PCL				1	1
	ACL	---				0	1
	ACL	PCL				1	1
	ACL	PCL	MCL	---	4	3	1
	---	PCL	---	LCL	0	3	0
	---	PCL	---	LCL	2	3	0
	ACL	PCL	---	---	1	1	0

79 / year in Sweden
 $\pm 8 / 1.000.000$ people / year

					2014	2015	2016
ACL	---	---	---	---	3324	3404	3477
ACL	---	MCL	---	---	49	28	38
---	PCL	---	---	---	12	23	12
ACL	---	---	LCL	PLC	10	8	12
ACL	---	---	LCL	---	7	10	4
ACL	PCL	---	---	---	5	6	3
ACL	PCL	Grafts / surgery 2 3 4 5		Cases / mio people / year 5,6 1,7 0,3 0,1		3 2 2 2 2 1 1	
---	---						
---	PCL						
ACL	---						
ACL	PCL						
---	---						
---	PCL	---	---	PLC	0	1	1
ACL	---	MCL	LCL	PLC	1	0	1
ACL	PCL	---	LCL	---	3	1	1
ACL	PCL	MCL	---	---	4	3	1
---	PCL	---	LCL	---	0	3	0
---	PCL	---	LCL	PLC	2	3	0
ACL	PCL	---	---	PLC	1	1	0

Acute vs. chronic multiligament injured knees



Acute:

90 % good/excellent results with surgery
within 3 weeks

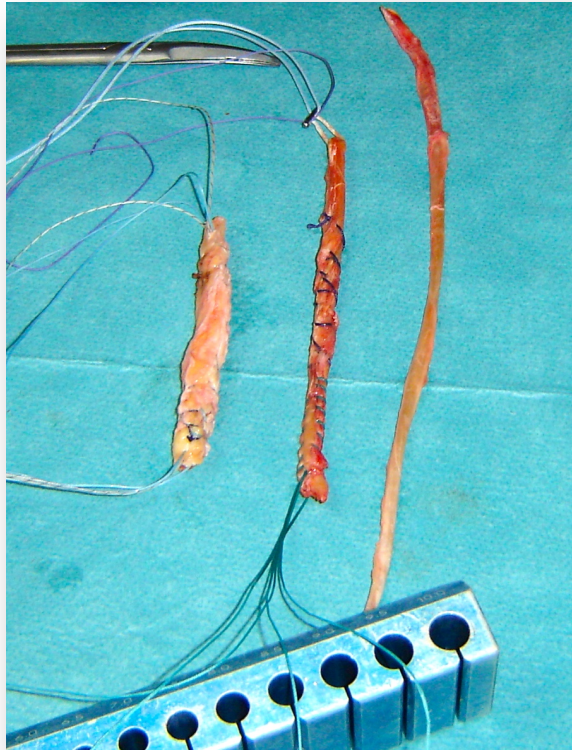
1980's: Baker C; Müller W; 1990's: DeLee,
2000's: Engebretsen L, LaPrade R

Chronic

Few and inhomogenous studies –
variable results

Strobel MJ (Arthroscopy 2006) : 62 % IKDC C

Graft type



- BPTB
 - ST/G
 - Quadriceps
 - TFL
- } 5 grafts/knee
- Contralateral grafts
 - Allograft / ligament augmentation

Thumbrule graft sequence

Hamstrings



Patellar tendon



Quadriceps

Graft type

Ultimate tensile load (N)

ACL	2160
Patellar tendon (10 mm)	2376
Semi-tendinosus (one strand)	1216
Hamstring (4 strands)	4108
Quad tendon (10mm)	2352

Selection criteria

- ✧ Previously used grafts / surgical history
- ✧ Patient profile
- ✧ Surgeon's experience



Hamstrings

Patellar tendon

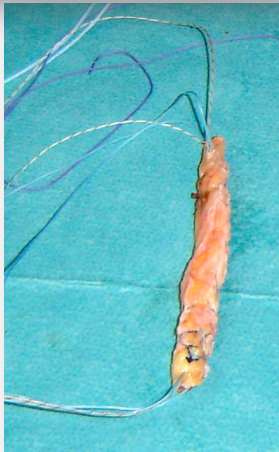
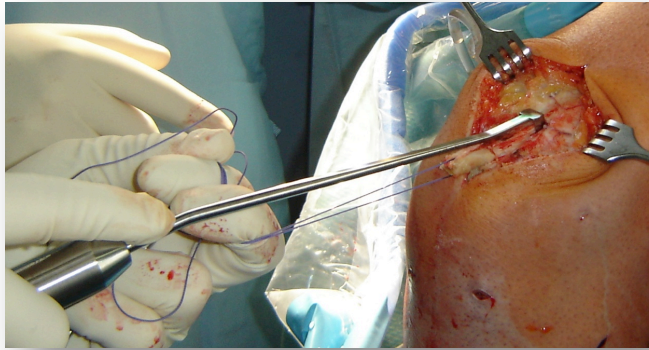


Iliotibial band



- ✧ Mechanical properties similar to ACL
(Noyes F, Clin Orthop 1983)
- ✧ Good clinical results; 16% failure rate
@ 15 y (Stensbirk KSSTA 2013)
- ✧ 20% cosmetic, 8% hernia complaints
(Bak K, KSSTA 1999)

Quadriceps tendon



- ✧ Frequent choice in revisions
- ✧ Harvesting: (demanding), minimally invasive
- ✧ Variability in graft diameter (big & strong grafts)
- ✧ Reduced anterior knee pain
- ✧ Ideal for certain sports (alpine skiing, Volleyball, ...)
- ✧ Less morbidity of extensor mechanism than BTB
- ✧ Sometimes dysplastic

Quadriceps tendon

Table 1. Biomechanical Properties of Quadriceps and Patellar Tendons

Property	Quadriceps Tendon	Patellar Tendon	<i>P</i> Value
→ Cross-sectional area, mm ²	91.2 ± 10.9	48.4 ± 8.1	.005
Ultimate stress, MPa	23.9 ± 7.4	33.4 ± 9.0	.011
Ultimate strain, %	10.7 ± 1.4	11.4 ± 2.1	.484
Young modulus, MPa	255.3 ± 61.4	337.8 ± 67.7	.006
→ Stiffness, N/mm	466.2 ± 133.3	278.0 ± 75.1	.005
Ultimate load, N	2,185.9 ± 758.8	1,580.6 ± 479.4	.045

NOTE. Data are presented as mean ± standard deviation.



- ✧ No donor site morbidity
- ✧ Fresh frozen, cryopreserved
- ✧ Disease transmission
- ✧ Availability (legal situation in Europe)
- ✧ Storage problems
- ✧ Longer incorporation
- ✧ Retear risk (registry data)
- ✧ Preferred for periphery

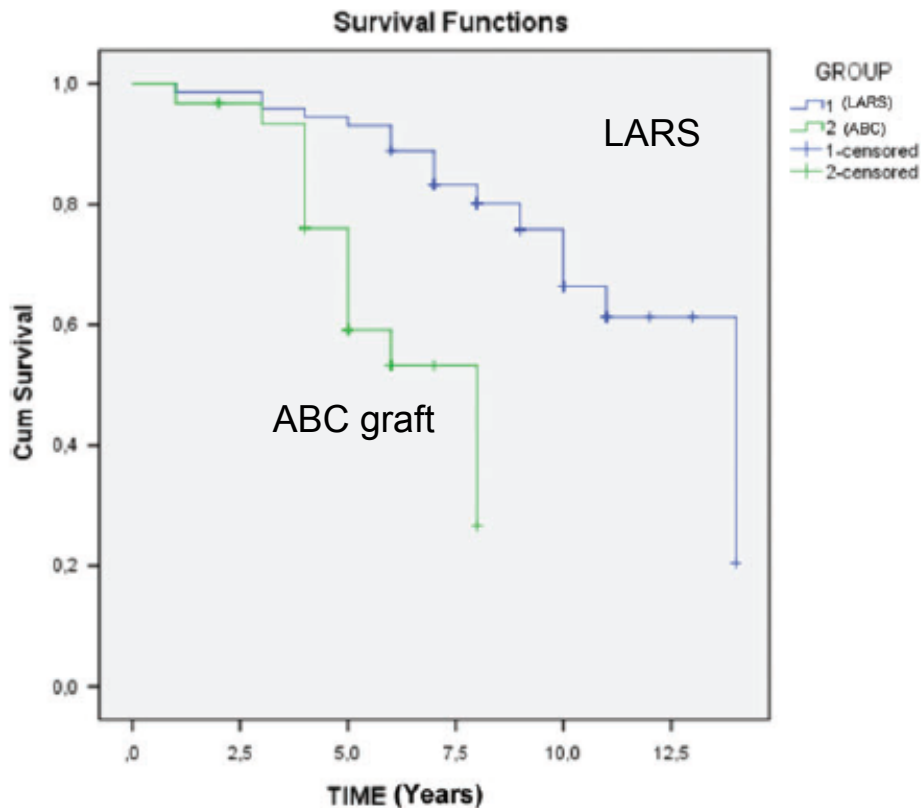
Artificial grafts



- Artificial
- No biology
- Not biologically replaced
- No ligamentization process
- Structural tie

Lubowitz J, Arthroscopy 2015

Artificial grafts

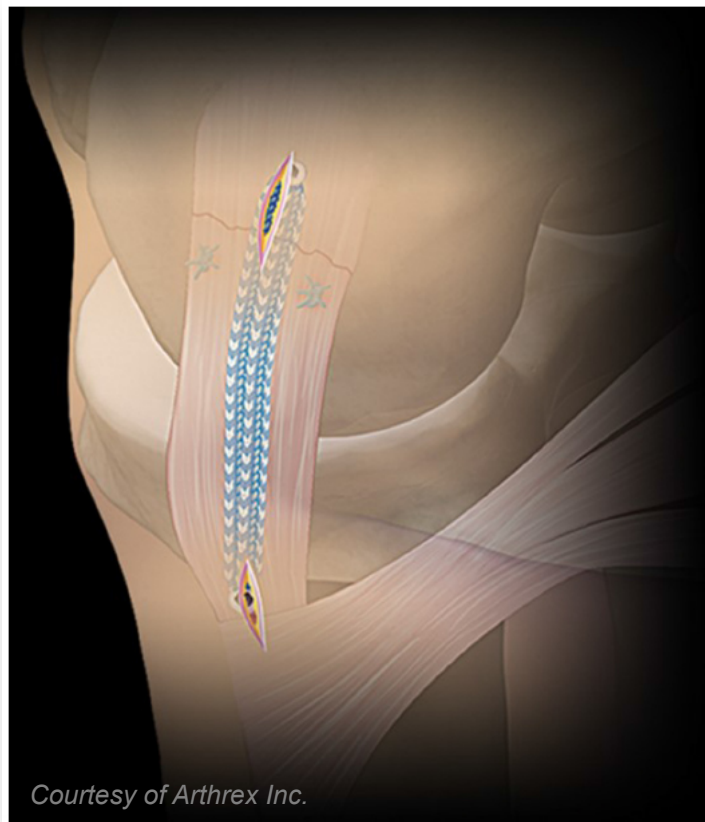


- Not for reconstruction in chronics
- Insufficient evidence
- Specific risks
- Good results in short term
- Better than earlier generations
- ACL: >30% retear rates @ 7 y. in young & active patients

(Iliadis, OJSM 2016)

From: Iliadis, OJSM 2016

Ligament augmentation



Ligament augmentation ?

- Not for reconstruction in chronics
- Insufficient evidence
- Specific risks



Harvesting site morbidity

✧ Hamstrings:

Infrapatellar branch saphenous nerve
40-88%

✧ Patellar tendon:

Anterior knee pain 46%

Correlated to sensory deficit

→ Can be improved with double incision

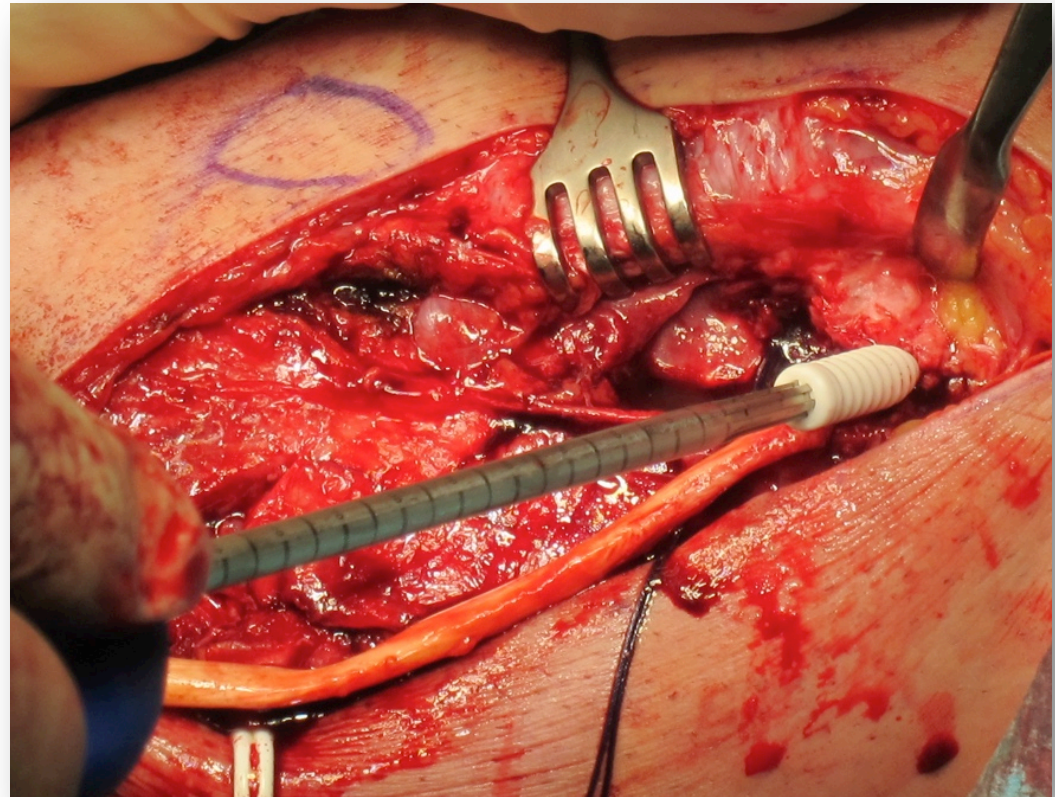
Hardy A, OTSR 2017

Harvesting site morbidity



- ✧ Graft-related complication rate ?
- ✧ Multi-harvested sites
- ✧ Osteoporosis
- ✧ Re-harvesting ?

Graft damage



Section of soft-tissue graft on cortical bone (tibia)

Summary & conclusions

Graft choice depending on:

- ✧ Previously used grafts /surgical history
- ✧ Patient profile
- ✧ Patient information (contralateral)
- ✧ Planning is key (allografts as backup)
- ✧ Surgeon familiar with every graft type
- ✧ Avoid allografts in < 20 years old patients
- ✧ Avoid synthetics
- ✧ Good results for every graft type reported



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