

Presoaking the hamstring graft with vancomycin does not jeopardize the biomechanical properties and does not elongate the graft

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Postoperative infection after ACLR

- Incidence
 - 0.14 – 1.7%
- Risk factors
 - Obesity, type of graft
 - **Graft contamination during harvest, preparation**
- Pathogen
 - **m/c coagulase-negative staphylococci**

Greenburg, JBJS, 2010

Indelli, CORR, 2002

Maletis, AJSM, 2013

Baron, JBJS, 2019

Brophy, JBJS, 2015

Kursumovic, JBJS, 2020

Sonnery-Cottet, AAOS, 2014

Kursumovic, BJJ, 2016

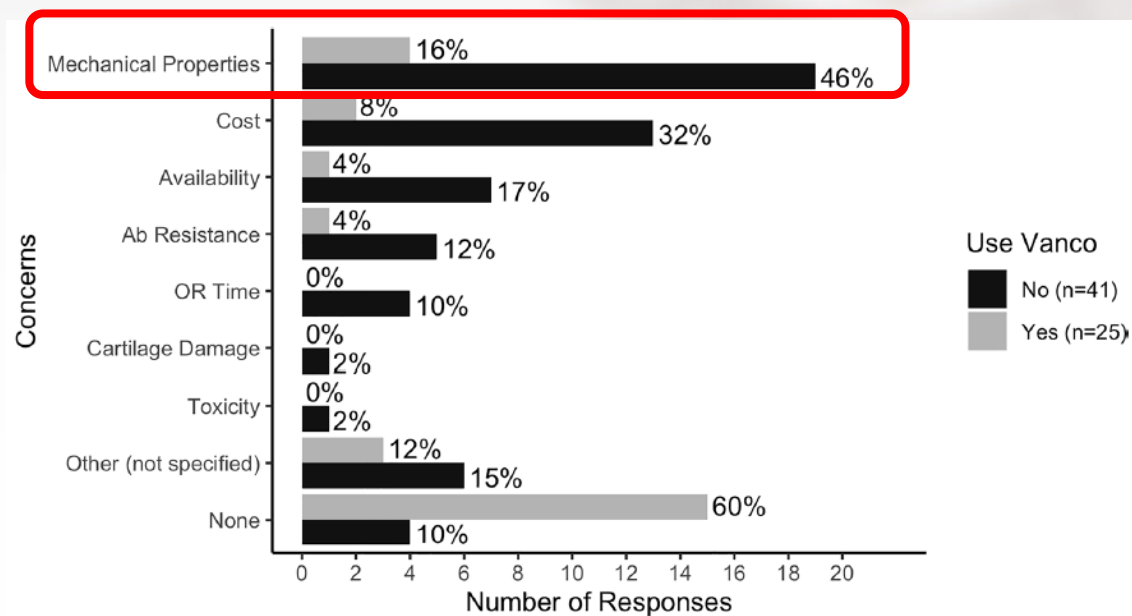
Pros and Cons in presoaking technique

- Presoaking the graft with vancomycin before implantation
- Pros
 - Clinical studies
 - ✓ Reduce the infection after ACLR
 - ✓ Xiao, Arthroscopy, 2020, meta-analysis
 - 0.013 % vs 0.77%, OR 0.07, $P < 0.001$

Baron, JBJS, 2019
Kursumovic, JBJS, 2020
Vetullo, Arthroscopy, 2012
Xiao, Arthroscopy, 2021

Pros and Cons in presoaking technique

- Cons
 - Concerns in biomechanical properties after presoaking
 - Xiao, KSSTA, 2020
 - ✓ Online survey, 116 OS surgeon



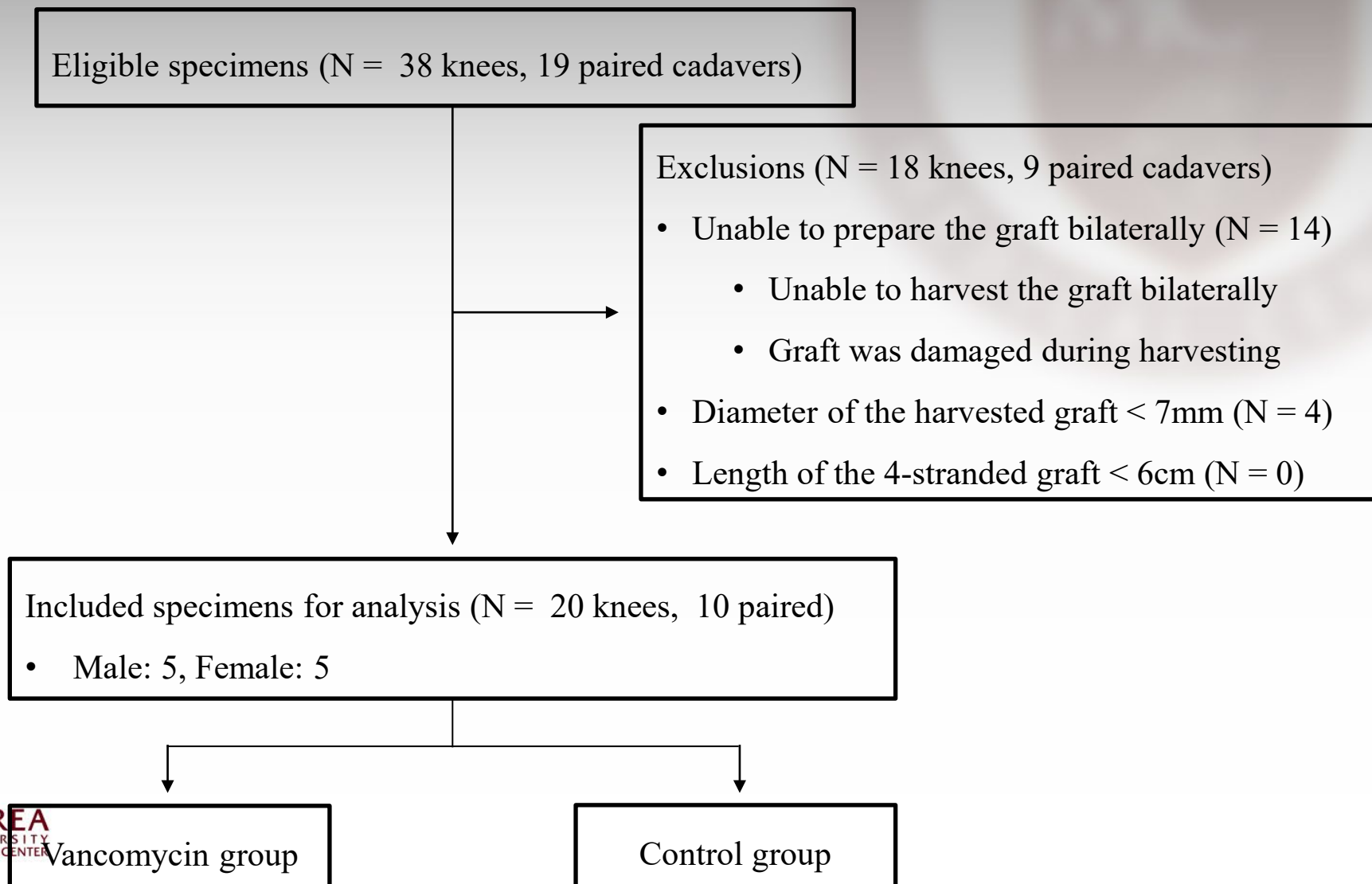
Xiao, KSSTA, 2020

Purpose

- To determine
 - whether presoaking the graft with vancomycin **jeopardized the biomechanical properties** after cyclic loading
 - whether vancomycin presoaking **elongated** the graft

Method

Subjects



Specimen preparation

- Graft harvest
 - Skin incision
 - ✓ Anteromedial portion of proximal tibia
 - Sartorius fascia
 - Gracilis, Semitendinous tendon
 - ✓ was harvested using tendon stripper (ConMed Linvatec, Largo, Florida)
 - 4-stranded graft
 - ✓ Length > 6cm, Diameter > 7mm
- Vancomycin group vs Control group

Antibiotic exposure

- No standardized protocol of presoaking technique
 - Method: Wrap vs Soaking
 - Duration: 5min, 10min, ETC (15min)
 - Concentration: 5mg/mL, 10mg/mL, ETC

Xiao, KSSTA, 2020

- Principle of selection
 - Previously proven method
 - Maximal exposure to antibiotics
 - ✓ Soaking, 15min, 5mg/mL

Table 1 Techniques and concentrations used to pre-soak ACL grafts in vancomycin

	n (%)
Technique	
Wrap graft in vancomycin-soaked gauze prior to implantation	14 (56%)
Soaking time	
5 min	1 (4%)
10 min	2 (8%)
Variable time	14 (56%)
Rinse graft in saline prior to implantation	3 (12%)
Concentration	
5 mg/mL	17 (68%)
10 mg/mL	2 (8%)
16.6 mg/mL	1 (4%)
80 mg/mL	1 (4%)
Unknown	4 (16%)

Biomechanical testing

- Dynamic tensile testing machine (Instron, Model 5567, Norwood, Massachusetts)
 - Proximal: customized jig via metal loop
 - Distal: jaw of the Instron
 - Length of the graft (6cm)
 - ✓ Femoral tunnel (3cm)
 - ✓ + Intra-articular length (3cm)



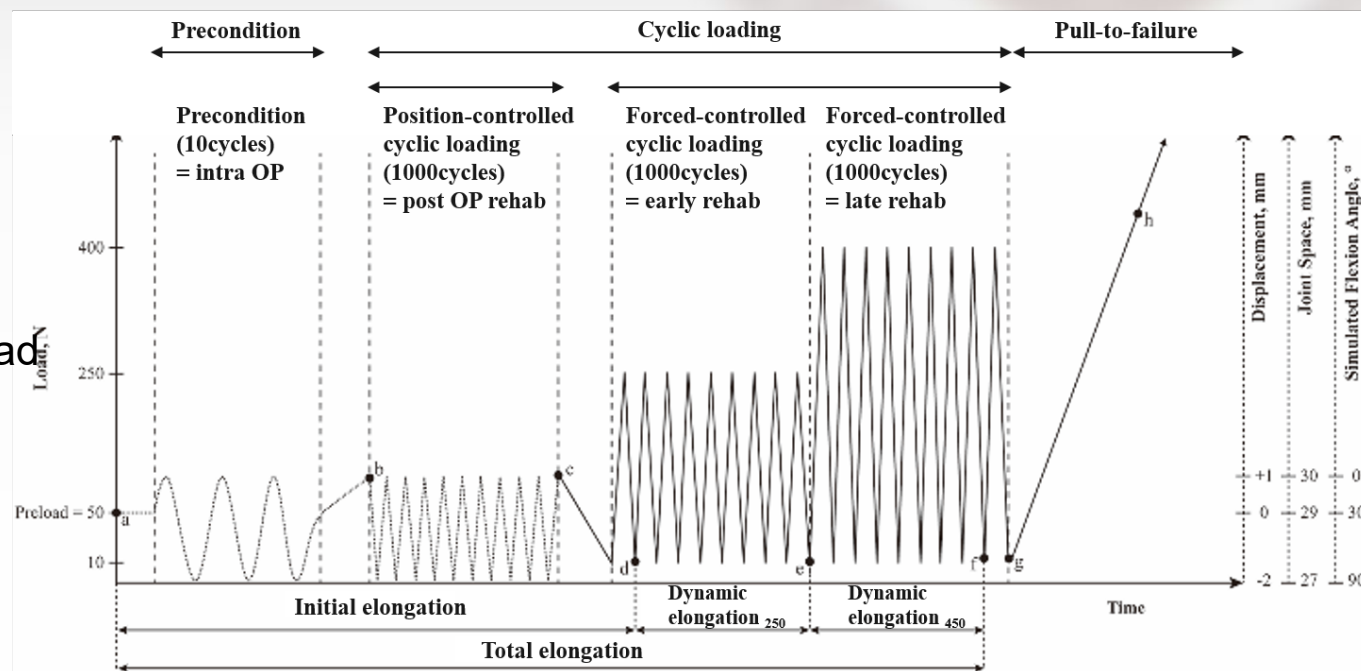
Biomechanical testing

- Cyclic loading protocol
 - To reflect in vivo situation after ACLR

Vertullo, AJSM, 2019

#. Variables

- Cyclic loading
 - Elongation
 - Young's modulus
- Pull-to-Failure
 - Ultimate failure load
 - Ultimate tensile displacement
- Mode of failure



Results

Not violated the biomechanical properties

- The presoaking with vancomycin did not jeopardize the biomechanical properties of the graft.

	Control (N = 10)	Vancomycin (N = 10)	<i>P</i> value
Young's modulus, MPa	35116.10 ± 3806.07	36126.57 ± 4768.46	0.182
Ultimate failure load, N	1669.00 ± 585.67	1653.00 ± 533.75	0.142
Ultimate tensile displacement, mm	8.12 ± 1.38	7.77 ± 2.12	0.912
Mode of failure			
Graft slippage	0	0	
Intra-substance tear	10	10	
Proximal	0/10 (0%)	0/10 (0%)	
Middle	3/10 (30%)	0/10 (0%)	
Distal	7/10 (70%)	10/10 (100%)	

Not elongated

- The vancomycin presoaking did not elongate the graft.

	Control (N = 10)	Vancomycin (N = 10)	<i>P</i> value
Initial elongation, mm	0.13 ± 0.19	0.11 ± 0.14	0.531
Dynamic elongation, total, mm	0.88 ± 0.15	0.76 ± 0.10	0.063
Dynamic elongation 250, mm	0.55 ± 0.12	0.48 ± 0.08	0.527
Dynamic elongation, 450, mm	0.33 ± 0.03	0.28 ± 0.04	0.498
Total elongation, mm	1.01 ± 0.27	0.87 ± 0.23	0.457

Discussion

Cyclic loading

- Biomechanical study about ACLR
 - Cyclic loading to reflect in vivo situation
- Biomechanical study about vancomycin presoaking
 - No difference in biomechanical properties
 - No cyclic loading
- No difference in biomechanical properties even after cyclic loading

Johnson, AJSM, 2014
Glasbrenner, KSSTA, 2019
Vertullo, AJSM, 2019

Lamplot, Arthroscopy, 2021
Jacquet, Arthroscopy, 2020

Elongation

- Laxity after ACLR
 - <3mm: successful outcome
 - >5mm: surgical failure
 - 3-5mm
 - ✓ Lindanger, AJSM, 2021
 - ✓ 151 athletes, primary ACLR, laxity at 6m → 25y f/u
 - ✓ 3-5mm associated with poor outcome
- No difference in elongation
- Elongation (1.07 ± 0.27 vs 0.87 ± 0.23) was <3mm

Conclusion

- Presoaking the graft with vancomycin
 - does not jeopardize the biomechanical properties
 - does not elongate the graft even after cyclic loading.
- Therefore, it is a safe way to reduce surgical site infection following ACLR.



*Thank you for your
kind attention !!*

