

THE EFFECT OF FAILED POSTERIOR CRUCIATE LIGAMENT RECONSTRUCTION ON CHONDRAL INJURY

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DISCLOSURES

- Kristian Samuelsson reports a relationship with Getinge AB that includes board membership.
- James J Irrgang reports a relationship with the Journal of Orthopaedic and Sports Physical Therapy that includes serving as President of the Board of Directors.
- Volker Musahl reports a relationship with Arthrex Inc that includes funding grants. Volker Musahl reports a relationship with Smith and Nephew Inc that includes consulting or advisory and funding grants. Volker Musahl reports a relationship with OsteSys SAS that includes consulting or advisory and funding grants. Volker Musahl reports a relationship with Newclip Technics that includes consulting or advisory and funding grants.

STUDY OBJECTIVE

An anatomical illustration of a human knee joint, viewed from the front. The femur (thigh bone) is at the top, and the tibia (shin bone) is at the bottom. The patella (kneecap) is visible in the center. The posterior cruciate ligament (PCL) is highlighted in a bright red color, showing its path from the femur to the tibia. The background is a dark blue gradient.

- Evaluation of revision PCL reconstruction (PCL-R) is scarce
- Prevalence of concomitant pathology in revision PCL-R may elucidate pathology associated with chronic PCL deficiency

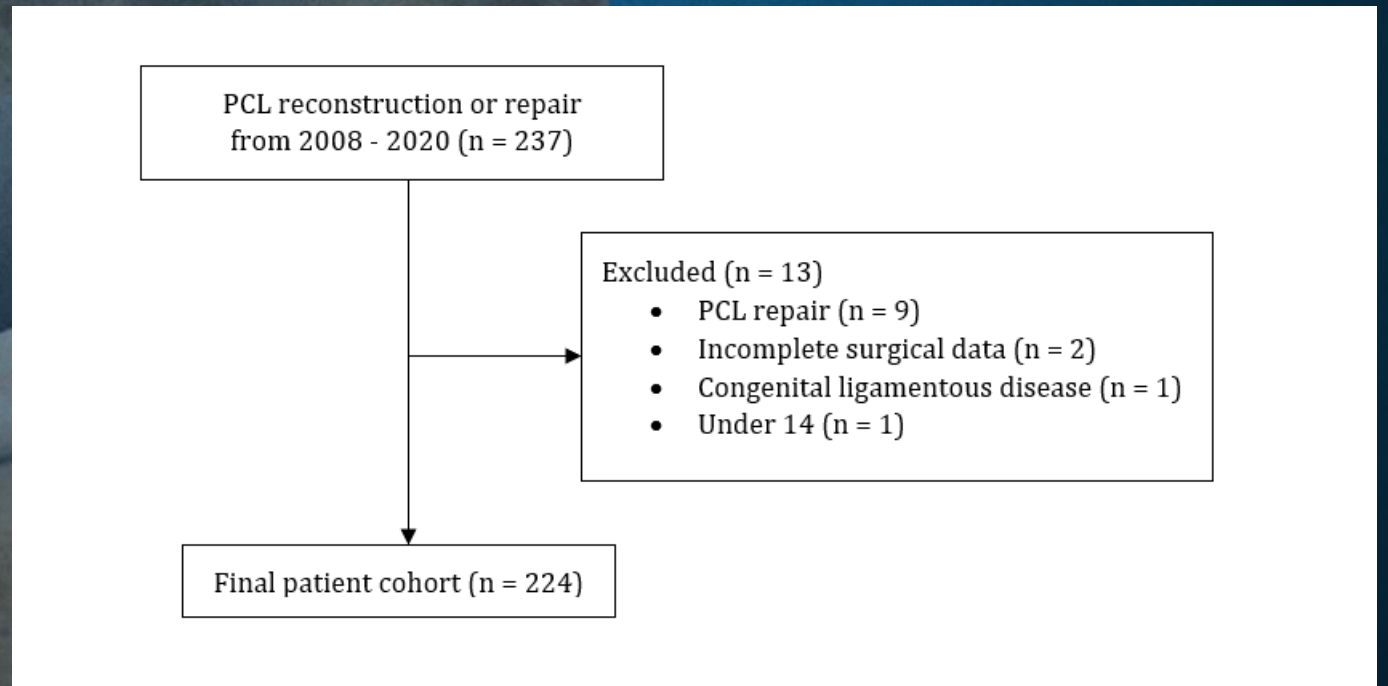
An anatomical illustration of a human knee joint, viewed from the front. The femur (thigh bone) is at the top, and the tibia (shin bone) is at the bottom. The patella (kneecap) is visible in the center. Several ligaments are highlighted in a bright red color, including the anterior cruciate ligament (ACL), posterior cruciate ligament (PCL), and the collateral ligaments. The background is a solid dark blue color.

STUDY AIM

- The aim of this study was to investigate the demographic and concomitant injury patterns in patients undergoing primary isolated, primary multiligament, and revision PCL-R.

MATERIALS AND METHODS

- Retrospective review was performed on all patients undergoing PCL-R at a single institution between 2008 and 2020.
- Exclusion criteria included: PCL repair, incomplete surgical data, congenital ligamentous disease, and patients under 14.



MATERIALS AND METHODS

An anatomical illustration of a human knee joint, viewed from the front. The femur (thigh bone) is at the top, and the tibia (shin bone) is at the bottom. The patella (kneecap) is visible in the center. The ligaments are shown in a light blue color, with the anterior cruciate ligament (ACL) and posterior cruciate ligament (PCL) highlighted in red. The background is a solid dark blue.

- **Groups:**

1. Primary isolated PCL-R

2. Primary multiligament PCL-R*

3. Revision PCL-R

*Multiligament PCL-R was defined as concurrent surgery on another knee ligament.

MATERIALS AND METHODS

1. Demographics



• Data Collected:

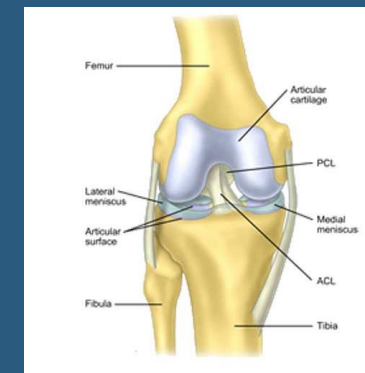
2. Injury Mechanism



3. Timing of Surgery



4. Concomitant Injuries



RESULTS

	Isolated (n=60)	Multiligament (n=151)	Revision (n=13)	p- value- overall	p-value- isolated vs multiligament	p-value- isolated vs revision	p-value- multiligament vs revision
Female, n (%)	13 (22%)	48 (32%)	2 (15%)	0.19			
Age, mean (SD), years	27 (10)	30 (13)	28 (9)	0.47			
BMI, mean (SD)	(n=59) 28 (5)	(n=149) 30 (7)	32 (6)	0.09			
Right knee, n (%)	32 (53%)	68 (45%)	5 (38%)	0.45			
Modes of Injury							
Sports-related, n (%)	26 (43%)	45 (30%)	5 (38%)	0.33			
Traffic-related, n (%)	17 (28%)	56 (37%)	3 (23%)				
Fall, n (%)	7 (12%)	33 (22%)	2 (15%)				
Other, n (%)	7 (12%)	17 (11%)	2 (15%)				
Unknown, n (%)	3 (5%)	0 (0%)	1 (8%)				

Out of 224 patients, primary isolated PCL-R was performed in 60 patients, primary multiligament PCL-R in 151 patients, and revision PCL-R in 13 patients.

RESULTS

	Isolated (n=60)	Multiligament (n=151)	Revision (n=13)	p-value- overall	p-value- isolated vs multiligament	p-value- isolated vs revision	p-value- multiligament vs revision
Previous surgery, n (%)	14 (23%)	57 (38%)	13 (100%)	0.001 , V = 0.346	0.046 , $\phi = 0.138$	0.002	0.01
PCL-R			13 (100%)	<0.001			
ACL-R	1 (2%)	2 (1%)	7 (54%)	<0.001	1.00	<0.001	<0.001
Irrigation & Debridement	4 (7%)	12 (8%)	1 (8%)	0.951			
External Fixation	2 (3%)	36 (24%)	0 (0%)	<0.001	0.001	1.00	0.11
Meniscus Surgery	6 (10%)	5 (3%)	3 (23%)	0.007	0.12	0.20	0.05
MCL Repair/Reconstruction	2 (3%)	7 (5%)	3 (23%)	0.013	1.00	0.06	0.10
PLC Repair/Reconstruction	1 (2%)	8 (5%)	1 (8%)	0.435			
Manipulation Under Anesthesia	0 (0%)	13 (8.6%)	0 (0%)	0.036	0.06	1.00	0.90
Other	4 (7%)	18 (12%)	3 (23%)	0.205			
Time from injury to surgery, weeks							
0-12	13/58 (22%)	57/147 (39%)	4 (31%)	0.01	0.01	0.25	0.25
13-24	17/58 (29%)	47/147 (32%)	2 (15%)				
25-48	6/58 (10%)	21/147 (14%)	4 (31%)				
>48	22/58 (38%)	22/147 (15%)	3 (23%)				

- The revision PCL-R group had significantly increased rates of previous surgery (p = 0.001).
- Time from injury diagnosis to surgery was significantly longer in the isolated PCL-R group compared to the multiligament PCL-R group (p = 0.01).

RESULTS

Associated ligament injury	Isolated (n=60)	Multiligament (n=151)	Revision (n=13)	p-value-overall	p-value-isolated vs multiligament	p-value-isolated vs revision	p-value-multiligament vs revision
ACL, n (%)	4 (7%)	99 (66%)	3 (23%)	<0.001	<0.001	0.102	0.0075
MCL/PMC, n (%)	5 (8%)	62 (41%)	4 (31%)	<0.001	<0.001	0.0705	0.468
LCL/PLC, n (%)	6 (10%)	88 (58%)	7 (54%)	<0.001	<0.001	0.0015	0.756
Any, n (%)	13 (22%)	151 (100%)	13 (100%)	<0.001	<0.001	<0.001	

- The multiligament PCL-R group had significantly increased rates of associated ligament injury ($p < 0.001$)
- Anterior cruciate ligament injury (66%) was the most common concomitant ligamentous injury in the multiligament PCL-R setting
- LCL/PLC injury (54%) was most common in the revision PCL-R setting

RESULTS

Associated cartilage injury	Isolated (n=60)	Multiligament (n=151)	Revision (n=13)	p-value-overall	p-value-isolated vs multiligament	p-value-isolated vs revision	p-value-multiligament vs revision
Any cartilage injury, n (%)	19/59 (32%)	52/142 (37%)	7/11 (64%)	0.14			
Medial femoral condyle, n (%)	14/59 (24%)	36/142 (25%)	7/11 (64%)	0.02, V = 0.195	0.81	0.02, ϕ = 0.317	0.02, ϕ = 0.220
Medial tibial plateau, n (%)	4/59 (7%)	27/142 (19%)	4/11 (36%)	0.02, V = 0.192	0.04, ϕ = 0.154	0.04, ϕ = 0.338	0.23
Lateral femoral condyle, n (%)	2/58 (3%)	19/142 (13%)	3/11 (27%)	0.03, V = 0.181	0.06	0.06	0.20
Lateral tibial plateau, n (%)	4/59 (7%)	28/142 (20%)	2/11 (18%)	0.07			

Patients undergoing revision PCL-R had statistically significant greater cartilage injury in:

1. Median femoral condyle
2. Medial tibial plateau
3. Lateral femoral condyle

An anatomical illustration of a human knee joint, showing the femur (thigh bone) at the top, the tibia (shin bone) at the bottom, and the patella (kneecap) in the center. The joint is rendered in a semi-transparent, greyish-blue style. A red highlight is visible on the medial compartment of the knee, indicating the area of focus for the study. The background is a solid dark blue.

CONCLUSION

- Most important findings:
 - A. Nearly two-thirds of all revision PCL-R cases had cartilage damage
 - B. Medial compartment chondral injury was more prevalent in patients undergoing revision PCL-R compared to patients undergoing primary isolated and multiligament PCL-R
- Concomitant LCL/PLC injury was most common in the revision PCL-R group, whereas ACL injury was most common in the multiligament PCL-R group.

CONCLUSION

A 3D anatomical model of a human knee joint, viewed from a slightly elevated, anterior-lateral perspective. The femur (thigh bone) is at the top, and the tibia (shin bone) is at the bottom. The patella (kneecap) is visible in the center. A red highlight is applied to the medial compartment of the knee joint, indicating the area of pathological loading discussed in the text. The background is a solid dark blue.

- This is a unique approach to providing evidence that the altered kinematics of prolonged PCL deficiency pathologically loads the medial compartment.
- In preoperative planning and patient counseling for revision PCL-R, surgeons should be aware of the high incidence of medial compartment chondral pathology.

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