Posterolateral corner injury

Robbert van Dijck

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Rotterdam, 24 april
“Injuries to the posterolateral corner (PLC) of the knee though infrequent, often present the most complex problems and can result in severe disability because of the relationship between rotatory instability, other ligamentous injury and cartilage degeneration”
Posterolateral corner injury

- Anatomy and function of PLC
- Diagnosis and mechanism injury
- Treatment for PLC injury
Posterolateral corner injury

- LCL
- Popliteus
- Popliteo-fibula ligament
  - Arcuate ligament
  - Posterolateral capsule
  - ITBand
  - Biceps femoris
  - Lateral head gastrocnemius
Posterolateral corner injuries

- Lateral collateral ligament (III) in sup lamina
- Arcuate ligament (III) in deep lamina
- Lateral inferior geniculate a.
- Fabellotibular ligament (III)

Anatomical diagram showing layers and structures of the knee joint.
Posterolateral corner injuries

The anatomy of the PLC is significantly variable


Posterolateral corner injury

• The PLC serves as the primary restraint to both varus and external rotation forces, with the PCL acting as a secondary restraint.

• The LCL plays the greatest role in resisting varus stress, while the other components of the PLC play a larger role in resisting external rotation of the lateral side of the tibia on the femur.
Posterolateral corner injury

• Sports injuries / high energy trauma account for most mechanisms of PLC injury

• Posterolaterally directed blow to the medial tibia with the knee in extension is the most common mechanism
Posterolateral corner injury

- Be aware in freestyle snowboard knee injury

- Noncontact hyperextension, external tibial rotation and varus stresses are also common mechanisms.
Posterolateral corner injury

- Isolated PLC 1 - 2% knee injuries (DeLee 1983)

- 50-60% PCL injuries have PLC

- Pacheco et al 2011: 68 cases over 5 years
  - 12% isolated
  - 42% with ACL
  - 28% with PCL
  - 16% ACL and PCL
  - ACL reconstruction failure
    - 1 Malposition tunnel
    - 2 Missed posterolateral instability
Posterolateral corner injury

• Pain posterolateral

• Transient altered sensation in the lower leg

• Rotational giving way symptoms

• Instability feeling going downstairs

• Symptoms may progress over time as the PLC gradually “stretches out”
Swelling and bruising around the posterolateral corner

Walking with varus / hyperextension thrust

Varus stress test

Varus laxity at 30 degrees: LCL injury
Varus laxity at 0 degrees: LCL and cruciate ligament injury

External recurvatum test

With a PLC injury, the knee falls into varus and recurvatum and the tibia externally rotates
Posterolateral corner injury

• Dial test
  
  • a 10 degrees difference in external rotation between limbs at 30 degrees is evidence of PLC injury
  
  • when there is further increased external rotation at 90 degrees, then a combined PLC / PCL injury is present
Posterolateral corner injury

- Reverse pivot shift

- Posterior drawing sign
  - A positive result occurs when the lateral tibial plateau rotates posteriorly and externally relative to the medial plateau

- Neurovascular status
Posterolateral corner injury

* Grade I
injuries have minimal instability (either varus 0-5mm opening or rotational instability 0° to 5°)

* Grade II
injuries have moderate instability (6 to 10mm or 6° to 10°)

* Grade III
injuries have significant instability (>10 mm or >10°)

* Type A
isolated rotational injury to the PFL and popliteus tendon complex

* Type B
rotational injury with a mild varus component representing injury to PFL and popliteus tendon complex as well as attenuation of the LCL.

* Type C
significant rotational and varus component secondary to complete disruption of the PFL, popliteus tendon complex, LCL, lateral capsule, and cruciate ligament or ligaments.

Grading system not validated
Posterolateral corner injury

- Plain radiographs
- Medial segond fracture
- Fibular head fracture
- Arcuate sign
Posterolateral corner injury

- X-ray
- Varus stress X-ray
- Suspect isolated LCL injury if opening increases by approximately 2.7 mm
- Suspect grade III PLC injury if increase by approximately 4.0 mm

LaPrade et al JBJS 2008

Can stress radiography of the knee help characterize posterolateral corner injury?

Gwathmey FW Jr, Tompkins MA, Gaskin CM, Miller MD.

Department of Orthopaedic Surgery, University of Virginia

Varus stress radiography correlated to MRI findings for posterolateral corner injury. The injuries we treated with reconstruction were associated with increased varus opening. In patients with partial posterolateral corner injury on MRI, we used degree of opening on varus stress radiography to aid the decision for stabilization.
Posterolateral corner injury

- 72% not recognised at initial presentation
- Easier if multiligament
- MRI 14/15 acute, 4/15 when > 12 weeks
Posterolateral corner injury

- Positive drive-through sign

Arthroscopy: Drive Through Sign

8mm opening: Grade 2
Posterolateral corner injury

AJSM 2003

The Posterolateral Attachments of the Knee
A Qualitative and Quantitative Morphologic Analysis of the Fibular Collateral Ligament, Popliteus Tendon, Popliteofibular Ligament, and Lateral Gastrocnemius Tendon

Robert F. LaPrade, MD, PhD, Thuan V. Ly, MD, Fred A. Wentorf, MD, and Lars Engebretsen, MD, PhD

From the Department of Orthopaedic Surgery, University of Minnesota, Minneapolis, Minnesota, and the Department of Orthopaedic Surgery, University of Oslo, Oslo, Norway

JBJS(A) 2007

The Anatomy of the Posterior Aspect of the Knee
An Anatomic Study

By Robert F. LaPrade, MD, PhD, Patrick M. Morgan, MD, Fred A. Wentorf, MD, Steinar Johansen, MD, and Lars Engebretsen, MD, PhD

Investigation performed at the University of Minnesota, Minneapolis, Minnesota

The Effect of a Proximal Tibial Medial Opening Wedge Osteotomy on Posterolateral Knee Instability
AJSM 2009

A Biomechanical Study

Robert F. LaPrade, MD, PhD, Lars Engebretsen, MD, PhD, Steinar Johansen, MD, Fred A. Wentorf, MS, and Chad Kurtenbach

From the Department of Orthopaedic Surgery, University of Minnesota, Minneapolis, Minnesota, and the Department of Orthopaedic Surgery and Faculty of Medicine, Rikshospitalet, University of Oslo, Oslo, Norway

JBJS(A) 2010

Outcomes of an Anatomic Posterolateral Knee Reconstruction

By Robert F. LaPrade, MD, PhD, Steinar Johansen, MD, Julie A. Grot, MA, May Arna Risberg, PT, PhD, Havard Mogstad, PT, and Lars Engebretsen, MD, PhD
Posterolateral corner injury

• Grade I and moderate grade II injuries can be treated nonoperatively with good results.

• Grade III treated nonsurgically reported fair functional outcomes, poor strength and persistent instability.

Conservative treatment

• Immobilizing the knee in full extension
• Non weight bearing 3-4 weeks
• After immobilization exercises improving range of motion and begin weight bearing on crutches
• Quadriceps strengthening exercises
• No isolated hamstring exercises for 6-10 weeks after injury
• Re-evaluation at week 10
Posterolateral corner injury

Proximal tibial opening wedge osteotomy as the initial treatment for chronic posterolateral corner deficiency in the varus knee: a prospective clinical study.

Arthur A, LaPrade RF, Agel J.
Sports Medicine and Shoulder Division, Department of Orthopaedic Surgery, University of Minnesota, 2450 Riverside Avenue, R200, Minneapolis, MN 55454, USA.

Proximal tibial opening wedge osteotomy can be an effective first method of treatment for patients with chronic combined posterolateral knee injuries and genu varus alignment. Patients with low-velocity knee injuries and isolated chronic posterolateral knee injuries may not require a second-stage soft tissue ligament reconstruction after healing the osteotomy.
Posterolateral corner injury

• Surgical treatment
  • Non anatomic (based on fibula head)
    • Hughston advancement
    • Larson (2001)
    • Verma (2005)
  • Anatomic on femur (double tunnel femur, sling fib head +/- tibia)
    • LaPrade (2004)
    • Arciero (2005)
3 Lateral Windows for lateral exposure
Biceps bursa – pull on LCL to identify origin
Posterolateral corner injury

• Grade III injury
• require early surgery
• ideally within 2 weeks
• reconstruction associated injury

Outcomes of treatment of acute grade-III isolated and combined posterolateral knee injuries: a prospective case series and surgical technique.

Geeslin AG, LaPrade RF. Department of Orthopaedic Surgery, Michigan State University/Kalamazoo Center for Medical Studies, 1000 Oakland Drive, Kalamazoo, MI 49008, USA.

Treatment of grade-III posterolateral knee injuries with acute repair of avulsed structures, reconstruction of midsubstance tears, and concurrent reconstruction of any cruciate ligament tears resulted
It is too dangerous
2004 - 2008: 15 patients with posterolateral corner reconstruction according McGuire and PCL reconstruction

A.W.F.M. Fievez, R.A.H.E. van Dijck, W.J. Willems, J.W. van Ommeren

• Mean follow up 4.8 years
• All patients had less than 5 mm posterior step off
• Tegner pre-operative 2, final follow-up 5
• Lysholm score pre-operative 24, final follow-up 83
• Range of motion reduced by 15 degrees
• 11 of 15 patients had negative dial and varus stress tests (73%)
• IKDC scores improves significantly, final follow up 10/15 (67%) group A or B
Posterolateral corner injuries

Comparison of 2 surgical techniques for reconstructing posterolateral corner of the knee: a cadaveric study evaluated by navigation system.

Ho EP, Lam MH, Chung MM, Fong DT, Law BK, Yung PS, Chan WY, Chan KM.

Department of Orthopaedics and Traumatology, Prince of Wales Hospital, Faculty of Medicine, The Chinese University of Hong Kong, Hong Kong, China

PLC reconstruction by a double-femoral tunnel technique achieves better rotational control and resistance to posterior translation.


Combined PCL and PLC reconstruction in chronic posterolateral instability.

Zorzi C, Alam M, Iacono V, Madonna V, Rosa D, Maffulli N.

Department of Orthopaedics and Traumatology, Knee Surgery Centre, Hospital "Sacro Cuore-Don Calabria", Negrar, Verona

Subjectively, the knee stability achieved allowed daily activities. However, there were remaining abnormalities in range of motion, posterior drawer and rotational laxity, suggesting that normal knee laxity was not restored.
Posterolateral corner injury

LaPrade reconstruction
Posterolateral corner injury

Criticisms of LaPrade technique

• Extra exposure
• Reconstructs dynamic popliteus muscle tendon unit as fixed structure
• PFL limb not in same direction as PFL
• Possible over constraint PL corner: abnormal internal rotation tibia (Nau 2005, Markolf 2007)
• PFLig insertion site on fibula to popliteus insertion femur is isometric (Siddles, Larson 1988)
• May not be necessary cf Larson (Aspingi and AMis 2009)
Outcomes of an Anatomic Posterolateral Knee Reconstruction

By Robert F. LaPrade, MD, PhD, Steinar Johansen, MD, Julie Agel, MA, May Arna Risberg, PT, PhD, Havard Moknes, PT, and Lars Engebretsen, MD, PhD

Investigation performed at the Department of Orthopaedic Surgery, University of Minnesota, Minneapolis, Minnesota, and the Department of Orthopaedic Surgery, Ullevaal University Hospital, University of Oslo, Oslo, Norway

**Background:** Chronic posterolateral knee injuries often result in substantial patient morbidity and functional instability. The clinical stability and functional outcomes following anatomic reconstructions in patients with a chronic posterolateral knee injury have not been determined, to our knowledge.

**Methods:** A two-center outcomes study of sixty-four patients with grade-3 chronic posterolateral instability was performed. The patients were evaluated subjectively with the modified Cincinnati and International Knee Documentation Committee (IKDC) subjective scores and objectively with the IKDC objective score.

**Results:** Eighteen patients had an isolated posterolateral knee reconstruction, and forty-six patients underwent a single-stage multiple-ligament reconstruction that included reconstruction of one or both cruciate ligaments along with the posterolateral knee reconstruction. The average duration of follow-up was 4.3 years. The fifty-four patients who were available for follow-up had an average total Cincinnati score of 65.7 points. A significant improvement was found between the preoperative and postoperative IKDC objective scores for varus opening at 20°, external rotation at 30°, reverse pivot shift, and single-leg hop.

**Conclusions:** An anatomic posterolateral reconstruction resulted in improved clinical outcomes and objective stability for patients with a grade-3 posterolateral knee injury.

**Level of Evidence:** Therapeutic Level IV. See Instructions to Authors for a complete description of levels of evidence.
Posterolateral corner injury

Novel approach for reconstruction of the posterolateral corner using a free tendon graft technique.

Bicos J, Arciero RA.
Department of Orthopaedic Surgery, University of Connecticut Health Center, 10 Talcott Notch Road, Suite 100, Farmington, CT 06034-4037, USA.
This reconstruction of the posterolateral corner of the knee with concomitant cruciate ligament reconstruction restores varus and rotational stability at a minimum of 2 years postoperatively.
Surgical management of traumatic knee dislocation with posterolateral corner injury.

Razik Ibrahim SA, Ghafar S, Salah M, Mohamed MA, Al Misfer A, Farouk HF, Alharan HA, Khirai S.

Al Razi Orthopaedic Hospital, Sports Medical Centre, Clinical Tutor Medical School, Kuwait University, Kuwait.

By using the described method of arthroscopically assisted reconstruction of the cruciate ligaments and the posterolateral corner, 80% of the patients had good subjective results and functional stability, and according to the IKDC scale, 45% of knees were nearly normal, 45% were abnormal, and 10% were severely abnormal. No patient’s rating returned to normal.
Posterolateral corner injury

- LCL femur: 5 mm posterior and proximal to epicondyle
- LCL fibula: level with anterior fibula head 8 mm back
- Popliteus to LCL 11-18 mm but easy landmark

Brinkman JBJS(B) 2005, Laprade AJSM 2003, Yang KSSTA 2011
Posterolateral corner injury

- Understand importance of postero-lateral corner
- Recognise the mechanism of injury!!!!
- Clinical signs
- Think about options for early repair
- Understand anatomy to allow surgical reconstruction
- My preference: Arciero technique

www.vumedi.com
- Anatomic posterolateral knee reconstruction
- Rob La Prade
- 2012 November
Fysiotherapeutische interventie

- (Vroege) diagnostiek
- Revalidatie
Diagnostiek

• Trauma
• Geen hydrops
• Hematoom lateraal
• Testen
Revalidatie

• ROM
• Belasten
• Gefaseerde opbouw
ROM

- week 1 t/m 3: gefixeerd in 45 graden flexie
- week 4 t/m 6: gefixeerd in 20 graden flexie.
- week 7 t/m 12: brace afwennen waarbij de brace functioneel wordt losgezet van 10 tot 90 graden flexie. Passief mobiliseren van 0 tot 120 graden.
Belasten

- Bij het staan mag de voet op de grond rusten.
- Na ongeveer 6-8 weken zonder krukken lopen.
Gefaseerde opbouw

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<td>Reduceren Haemarthrosis en Pijn</td>
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<td>ROM 45</td>
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<td>ROM 0-120</td>
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<td>Herstellen normaal gangpatroon zonder krukken</td>
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<td>NB: geen open keten hamstring activiteit</td>
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THANK YOU FOR YOUR ATTENTION