Disclosure

Disclosure Information
The following relationships exist:

Stryker, Smith Nephew, Mitek, Biomet - Institutional Support

Biomet Sports Medicine - Consultant, Royalties

Elesevier - Book Royalties
PCL: Anatomy & Function

- 38mm long; 13 mm diam.
- Medial femoral condyle to tibial sulcus
- Blood supply: middle geniculate
- Meniscofemoral
  - Humphrey (anterior)
  - Wrisberg (posterior)

Juxtaposed to posterior horn
PCL Complex

- Is the primary restraint to the posterior drawer - provides 95-100% of resistance to posterior translation.
  - 90 degrees flexion- 100% resisted by PCL.
  - 30 degrees flexion- 55% resisted by PCL.
  - 0 degrees flexion- 10% resisted by PCL
Biomechanical Properties of PCL

- **Anterolateral Bundle**  
  - Taut with knee flexion  
  - Lax in extension

- **Posteromedial Bundle**  
  - Lax in flexion  
  - Taut in extension
PCL Mechanism of Injury

- Posterior Blow to Proximal Tibia
- Foot Plantarflexed
- Hyperflexion
- Hyperextension
- MVA > Sports
PCL- Epidemiology

- 3-7% of knee ligamentous injuries
- Pain, mild to moderate
- 20-40% instability
- PCL deficiency appears well-tolerated for many athletes
Natural History of PCL Injuries

• Majority of athletes are able to return to sports
• 2% of NFL combine prospects noted to have chronic PCL deficiency, yet played at highest level
• Degenerative changes can occur but do not necessarily correlate with degree of PCL laxity
Exam – Posterior Drawer

Posterior force on tibia at 90 degrees flexion
Exam – Posterior Drawer

Grade I - partial PCL tear
0 – 5 mm
anterior to condyle

Grade II - complete PCL tear
6 – 10 mm
flush with condyle

Grade III - PCL and Posterior Lateral Corner injury
> 10 mm translation
posterior to condyle
Combined PCL / Posterolateral Corner: Dial Test

- Prone
- ER at 90 and 30 deg
- Increased ER (>10deg) at 30 and none at 90 indicates PLC injury
- Ensure tibia is reduced on femur

Jazrawi L, Bravman J, Walker P AAOS 2006
Stress Radiographs (Telos):

- < 10 mm increased posterior translation compared with uninjured side correlates with isolated PCL tear
- 12 mm suggests combined PCL / PLC injury
MRI
PCL Treatment
Controversy

- Who Should We Treat Non-operative and Who Might Benefit from a Reconstruction?

- Unknown whether 8, 10, 12 mm of translation alone is a surgical indication
Literature

Cochrane Database Review

*Interventions for treating posterior cruciate ligament injuries of the knee in adults*

*Peccin et al, 2005*

- Lack of high quality evidence for treatment of PCL injuries of the knee
- Observational studies suggest isolated PCL injuries can be treated conservatively with a good prognosis
- More severe injuries with PCL and other ligaments involved, surgical intervention suggested
- Recommendations must be treated with caution based on observational studies alone
Positive results non-operative management

- Fowler and Messier 1987
- Parolie and Bergfeld 1986
- Trog, et al 1989
- Shino, et al 1995
- Boynton and Tietjiens 1996
- Shelbourne, et al 1998
- Patel, et al 2007
- Shelbourne, et al 2013
43 patients with PCL injury
  – 14 with isolated PCL
  – 29 with combined ligamentous injury
6.3 yr f/u
Isolated PCL deficient knees did well
PCL with combined laxities did not fare as well and more likely to have develop degenerative changes
The Nonoperative Treatment of Acute, Isolated (Partial or Complete) Posterior Cruciate Ligament-Deficient Knees: An Intermediate-term Follow-up Study

Dipak V. Patel, MD, MSc Orth., MS Orth., FCPS Orth., Asworth A. Allen, MD, Russell F. Warren, MD, Thomas L. Wickiewicz, MD, Peter T. Simonian, MD

HSS Journal 2007

• 58 knees with Isolated PCL injuries
  – 41 had complete PCL tears
• 6.9 year mean f/u
• 92% Good/Excellent results
• 6 patients continued playing several years in NFL
Subjective Results of Nonoperatively Treated, Acute, Isolated Posterior Cruciate Ligament Injuries

K. Donald Shelbourne, M.D., and Yegappan Muthukaruppan, M.D.
Arthroscopy 2007

• 215 Isolated PCL injuries
• 7.8 year mean f/u
• PCL laxity did not correlate with outcomes
• 80% with good/excellent outcomes
• 68 Isolated PCL injuries
  – All completed outcomes questionnaires
  – 44/68 also completed x-rays and exam
• 17.6 year mean f/u (14.3 years for exams)
• Quad strength 97% of contralateral side
• 89% with normal/near normal x-rays
• Most patients remained active
PCL Rehab-Non Op TX

• Exercises:
  – rehab focus on-QUADS!!!!!!!!!!!!!!
  – Isometric quads, SLR, Hip ADD/ABD
  – Knee ext (60-0)
  – Multi-angle isometrics (quads)
  – Mini-squats, leg press (0-45)
  – E-stim to quads

Avoid- gravity induced posterior tibial sag and flexion exercises (hamstrings)
Guidelines for Return to Play

- Monitor physical examination
  - effusion
  - atrophy
  - stability
  - AROM
  - gait (running)

- Muscle strength/endurance (85% RULE?)
  - Isokinetic ??
  - functional: one-legged hop

- Sport-specific

- Time frame  2 weeks to 4 months
What About Surgery?

Why do PCL surgery?

• Good Question:

  “To restore stability”

  – The results are good but not great
  – Most studies demonstrate improvement on laxity, but surgery does not normalize the knee
What About Surgery?

“To Prevent Degenerative changes”

– Studies have not demonstrated this

– 59% med. jt. narrowing at 9.1 yrs Hermans et al, AJSM 2009

– 36% OA at 10 yrs Jackson et al, JBJS (Br) 2008
Isolated PCL: Surgery vs No Surgery

OUTCOMES

• Results of Non-op Treatment
  – Overall: Good.....Not Great

• Results of Surgery on PCL
  – Overall: Good.....Not Great
Isolated PCL: Surgery vs No Surgery

Prevention of DJD

- Results of Non-op Treatment
  - Does not prevent it

- Results of Surgery on PCL
  - Does not prevent it, % of knees might be higher
Isolated PCL: Surgery vs No Surgery

• Complications from PCL Non-Op management
  – None

• Complications from PCL Surgery
  – Infection
  – Stiffness
  – Vascular Injury
  – Arthrofibrosis
  – Medial condyle AVN
PCL Surgery

• Huge OPEN Inlay surgery by Miller
PCL Surgery

• Double bundle surgery by Laprade
PCL Surgery

• Arthroscopic by Levy
ACUTE-PCL Treatment

• When is Surgery appropriate?
ACUTE-PCL Treatment

• SURGERY (ACUTE)
  – Multiple ligamentous injury (PCL/PLC)
  – Tibial avulsion fracture-screw fixation
  – Femoral peel off – usually seen with multiple ligament injury
  – Age and activity level
Summary Treatment
Isolated PCL Injury

• Review of literature
  – Retrospective
  – Mixed acute and chronic
  – Poor definition of physical findings

• What is clear
  – Significant percentage do well with no surgery (85%)
  – Small number
    • Develop symptoms of instability
    • Develop arthritic changes
      – Medial joint/ patellofemoral appear most sensitive

• Results of surgical procedures inconsistent
Thank you

Eric.McCarty@ucdenver.edu