

## **ICL # 8: Current Concepts in PCL Insufficiency**

ISAKOS – Tue May 17<sup>th</sup> 2011

7:30 – 9:00

Rio de Janeiro, Brazil

### **AGENDA**

- 7:30-7:42 Dr. Christopher Harner  
Anatomy/Biomechanics, kinematics, my approach to PCL
- 7:42-7:54 Dr. Fabrizio Margheritini  
Gr III PCL, Gr III PLC with LCL intact
- 7:54-8:06 Dr. Mark Miller  
Gr III PCL, Gr PLC (blow out of the lateral side with peroneal nerve injury)
- 8:06-8:18 Dr. Sung-Jae Kim  
Combined ACL/PCL injury
- 8:18-8:30 Dr. Rodrigo Maestu  
Gr III PCL, Gr III MCL
- 8:30-9:00 Q&A

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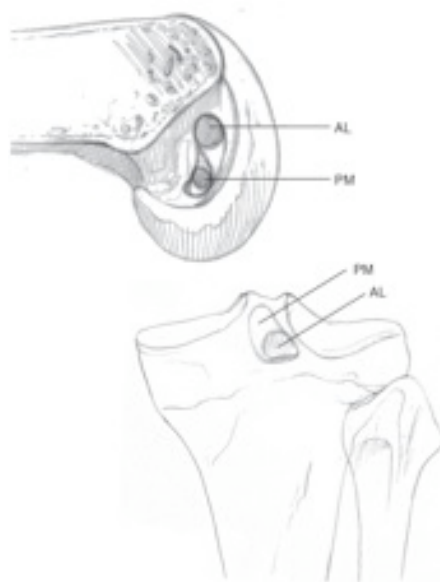
Rio de Janeiro, Brazil

Christopher D. Harner, MD - Medical Director, Center of Sports Medicine  
Professor, Department of Orthopedic Surgery  
University of Pittsburgh Medical Center

Gustavo A. Rincon, MD - Sports Medicine Research Fellow  
University of Pittsburgh Medical Center

- Anatomy/Biomechanics
  - PCL has 3 components
  - AL is largest and strongest component
  - All three components have specific insertions
  - AL and PM have reciprocal and specific tensioning patterns
- Kinematics/In situ forces (Robotic studies)
  - PCL forces change with knee flexion angle and loading
  - Posterolateral corner deficiency affects PCL graft forces
  - Double bundle restores in situ forces and kinematics better than single bundle
  - Sagittal slope – axial compression results in anterior tibial translation
    - ↑ slope, ↑ anterior translation, ↓ in situ forces
- My approach to PCL injuries:
  - Practice profile:
    - Location: academic medical center (44 residents and 6 fellows)
    - Research: Clinical, Basic Science
    - Years in practice: 23
    - Number of primary PCL's /yr: 15-20
    - Number of Revision PCL's /yr: 3-5
  - Principles of treatment:
    - Different injury patterns will dictate different approaches
    - Partial PCL injuries exist and the PCL (unlike the ACL) can heal
  - In general:
    - Isolated PCL injuries are treated non-operatively
    - Combined injuries are treated surgically

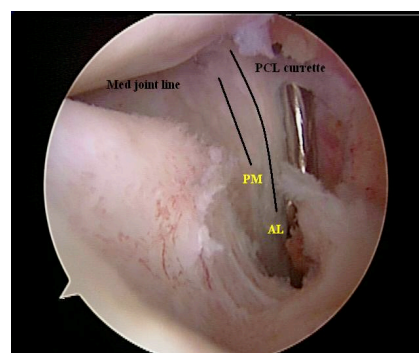
- Non operative treatment:
  - ~10-15 per year
  - GI-GII (PLC is intact)
  - Goal: Protect partially injured PCL (and PLC)
  - Brace in extension: 4 weeks
  - Followed by Quad rehab program
  - Usually 8-12 weeks to return to Sports
- Surgical approach:
  - Depends on pattern of injury
  - EUA, arthroscopy and MRI dictate surgical approach
  - Do not miss an associated PLC injury
  - Repair/reconstruct acutely when possible (esp. PLC)
  - Known the anatomic insertion sites!



#### Arthroscopic views

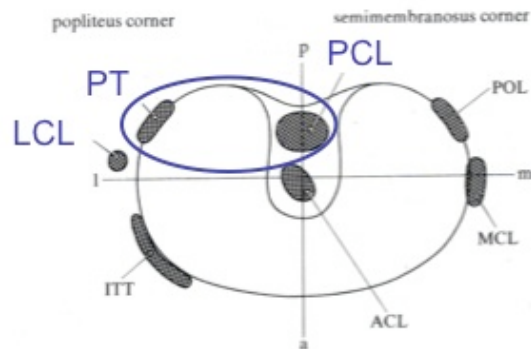


AL & PM  
femoral bundles

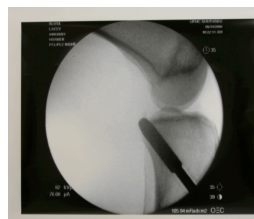


AL & PM  
tibial bundles

- PCL cases 2001 – 2004:
  - ~ 165 PCL related cases
  - 63 non op cases
    - (isolated PCL)
  - 102 operative cases
    - 46 PCL/PLC (LCL ok)
    - 21 PCL/ACL/PLC (+LCL)
    - 18 PCL/ACL/MCL
    - 17 other (4 revisions, 4 PCL/ACL/MCL/PLC)



- Current Surgical Approach
  - 3 different techniques
    - Single bundle (AL) – 40%
    - Double bundle (AL,PM) – 40%
    - Single bundle augmentation – 20%
  - I do not use a tourniquet or leg holder
  - I use intraop fluoroscopy on all cases to confirm tunnel position
  - Graft preference:
    - Allo 80% (AT, Tib ant)
    - Auto 20% (quad tendon, younger patients)



- Post-operative Management:
  - 0 – 1 weeks: Brace in full ext. and WBAT
  - 1 – 4 weeks:
    - Unlock brace for mini squats
    - Lock when ambulating
    - Brace for 6 weeks
  - 4 – 12 weeks:
    - Unlock brace
    - Quad rehab
    - Return to ADLs
  - 3 – 9 months: FROM
  - 9 – 12 months: Return to full activity
- Conclusions:
  - Not all PCL injuries are the same
  - Most isolated PCL injuries are still treated non-operatively
  - Decision regarding single bundle, double bundle and augmentation techniques are based on injury patterns and insertion site anatomy
  - Remember to address all secondary restraints

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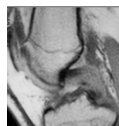
## Practice Profile

- Rome, Italy
- Practice since 1998
- 30-40 PCL reconstructions/year
- 5-10 PCL revisions/year
- 200 ACL reconstructions/year
- 100 TKRs/year

## PCL/PLC Insufficiency

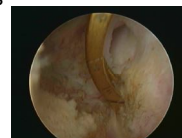
### Diagnosis

- Posterior Drawer Test
- Posterolateral Drawer Test
- ERTFA
- MRI (Acute) Gross's Classification (I,II,III)
- MRI (Chronic) PCL elongation
- Stress x-ray(subacute,chronic)



## Preferred Technique

- Arthroscopic transtibial technique, Transeptal approach
- Grade II/III "Isolated" (up to 10 mm of posterior translation) AL bundle augmentation with ST/GR
- Grade III (more than 10 mm of posterior translation) single bundle (AL) reconstruction with autologous Quadriceps tendon and preservation of the remnant and the MFL's

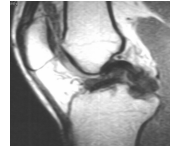


## Case Presentation

- History
  - Sports injury or MVA, trauma on the antero/medial side of the knee posteriorly directed with a combined twisting of the knee
- Physical Examination
  - Posterior Drawer 90° +++
  - Posterolateral Drawer 90° ++
  - ERTFA @30°knee flex> 15°, @90°> 15°
  - Varus stress negative

## Imaging

- MRI  
(T1, T2 weighted sequence)

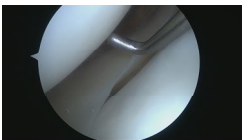


- Stress X-Ray (13 mm side to side)  
(Telos®, Hamstring's contraction, Kneeling view)



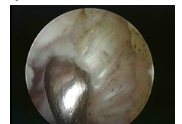
## Diagnosis

- Clinical examination
  - Grade III Chronic PCL insufficiency + Grade III PLC insufficiency (LCL intact)



## Technique of Surgery

- Transtibial arthroscopic AL bundle reconstruction using Quad Tendon
  - Supine Position, full table, tight support, tourniquet at tight no inflated
  - AL and AM standard approach and PM and PL approach with transeptal technique
  - Tibial tunnel first drilled at @90° knee flexion
  - Femoral tunnel drilled outside-in technique



## Technique of Surgery

- Quad graft harvesting (9-10mm diameter, lenght 9 cm, bone block 9x14mm)
- Graft passed from tibia to femur, bone block on tibia
- Femoral fixation first, bioabsorbable screw
- Posterolateral corner reconstruction using a modified Larson technique with ST graft
- Fixation of PLC reconstruction with bioabsorbable screw @30° knee flexion
- Tibial PCL fixation @90° knee flexion, maximum anterior drawer, anatomical tibial fixation with bioabsorbable screw (+ staple or screw as post if possible)

## Post op Care

- No weight bearing for 4 wks, then increase
- Straight knee brace (PTS) for some 6 wks day and night, then other 4 wks only night
- If possible PCL Jakob brace from week 4<sup>th</sup> p.o.
- Passive mobilization after 2 wks, no active hamstring contraction for some 5 mos
- Hydrotherapy from week 4<sup>th</sup> p.o.
- Resume full sports activity 7/8 mos

## Complications

- Stiffness (passive mobilization and early hydrotherapy)
- Graft elongation=failure (stress reduction on the graft: protection with brace, no hamstring contraction)



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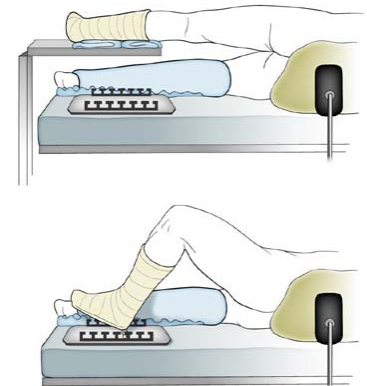
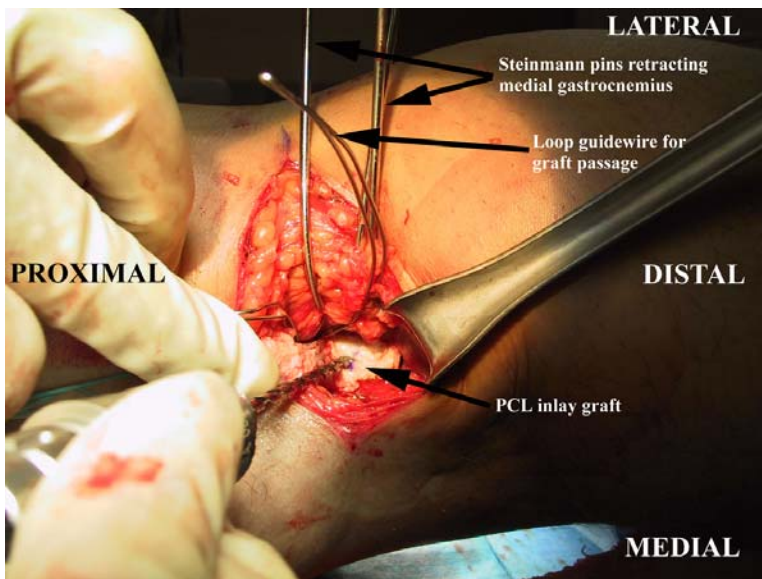
**ISAKOS 2011**  
**PCL ICL**  
**8 Minute Focus on PCL-PLC**



**Mark D. Miller MD**  
*Professor of Orthopaedics*  
*University of Virginia, USA*  
**Team Physician**  
*James Madison University*

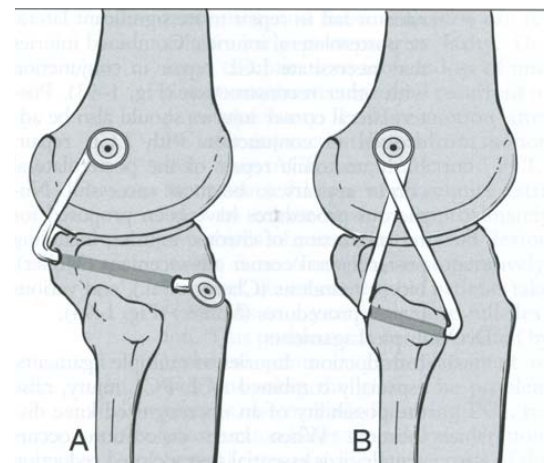


- Speaker's Preferred Technique
  - Posterior Cruciate Ligament (PCL)
    - Tibial inlay
    - Single bundle
    - Graft preference: BPTB autograft versus allograft
  - Posterolateral Corner (PLC)
    - Muller popliteal bypass & Larsen Figure 8
    - Graft Preference: semitendinosus autograft versus allograft
- PCL reconstruction—Tibial Inlay
  - Implies inlay, NOT onlay
  - Positioning is important
  - Inlay the graft onto the trough and secure with posterior to anterior screw(s) and washer



- Posterolateral Corner Injuries
  - Rarely isolated injuries
  - The posterolateral corner is made up of:
    - Biceps femoris
    - Iliotibial band

- Popliteofibular ligament
- Arcuate ligament
- Lateral collateral ligament
- Function
  - Resists external rotation and varus force
- Mechanism of Injury
  - Direct blow to anteromedial tibia
  - Hyperextension/varus
- Physical Examination
  - Varus Laxity
  - Increased External rotation (30°, 90°)
  - Posterolateral external rotation test
  - Reverse pivot-shift test
  - External rotation recurvatum
- PLC Injury Treatment
  - Partial (grade I & II Instability with a good end point)
    - Nonsurgical Treatment
    - 3 week immobilization in extension
  - Complete Acute
    - Primary repair best
    - Augment with allo/auto graft
  - Complete Chronic
    - Reconstruct Popliteus and LCL
  - Post-op rehabilitation
    - Protect vs ER and varus
- PLC Surgical Treatment
  - The peroneal nerve
    - Pre-op—document exam!
    - Intra-op—identify and protect!
    - Post-op—document exam!
    - Wait—6+ months
    - Late options for nerve damage
      - Benign neglect
      - Nerve repair
      - Tendon transfers
  - Primary Repair
    - Goal: restore anatomy (as much as possible)
    - Primary repair (with augmentation) yields the best results.
  - Reconstruction (speaker's preference)
    - Tibial and Fibular based
      - Tibial: Muller popliteal bypass
      - Fibular: Larson figure 8

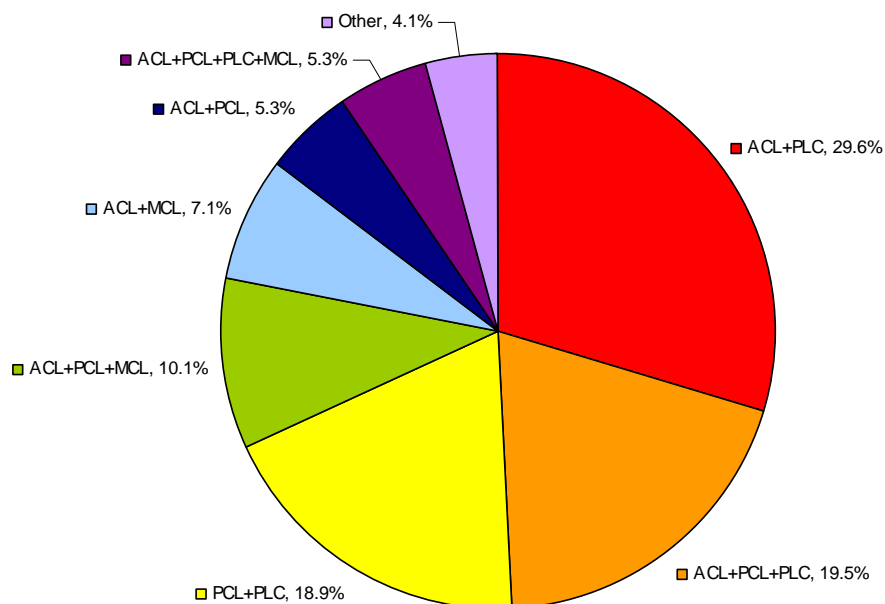


## Our Experience at UVA

<b>Reconstruction Combo</b>	<b>#</b>	<b>%</b>
ACL+PLC	50	29.6%
ACL+PCL+PLC	33	19.5%
PCL+PLC	32	18.9%
ACL+PCL+MCL	17	10.1%
ACL+MCL	12	7.1%
ACL+PCL	9	5.3%
ACL+PCL+PLC+MCL	9	5.3%
<i>Other*</i>	7	4.1%
Total	169	
<i>Other*</i>	7	4.1%
<i>ACL+PLC+MCL</i>	2	1.2%
<i>PCL+PLC+MCL</i>	2	1.2%
<i>PCL+MCL</i>	2	1.2%
<i>PLC+MCL</i>	1	0.6%

## Multiligamentous Knee Reconstruction

2000 to 2010 (n = 169)



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# *Combined PCL & ACL injury*

## 1. Introduction

- A. *Mariani et al, Arthroscopy, 2001* : combine ACL and PCL lesion are rare, usually caused by high- or low-velocity knee dislocations.
- B. Often accompanied with other injuries such as medial collateral tears or posterolateral corner injuries
  - i. Fanelli GC, *Arthroscopy* , 2002
    - 1. PCL+ ACL ; 1/ 35
    - 2. PCL+ ACL+ Posterolateral corner ; 19/ 35
    - 3. PCL+ ACL+ MCL ; 9/ 35
    - 4. PCL+ ACL+ MCL+ PLC ; 6/35
- C. Vascular and nerve injuries may complicate the already severely injured knee, making treatment a challenge.
  - i. Vascular compromise; 32~50%
  - ii. Nerve injury; 20 – 30%
    - 1. Peroneal N. or Tibial N.
- D. Surgical treatments have advanced dramatically over the years to become a mainstay for the management of this condition.
- E. However, there is a lack of consensus over proper surgical timing, order of fixation, rehabilitation, etc.

## 2. Ligament injury evaluation

- A. ACL – Lachman test
- B. PCL – Post. drawer and sag test
- C. Collateral ligaments – Varus and valgus test
- D. PLC – External rotation dial test
- E. Radiographs
  - i. to confirm reduction & look for bony injuries
- F. MRI
  - i. to visualize and characterize better the pattern of soft-tissue & occult bony injuries

## 3. Surgical Management

- *Frassica et al., Clin Orthop, 1991* : Better outcome with surgical management than with conservative management
- A. Surgical timing
  - i. Recent trend: Early surgical intervention
    - 1. *Liow RY et al., JBJS, 2003* : improved outcomes in patients treated with early reconstruction(<2 weeks after injury)
    - 2. *Harner CD et al., JBJS, 2004* : Clinical results were significant higher in the acute group
    - 3. *Chhabra A et al. JBJS, 2005* : better objective restoration of knee stability when surgery was performed within 3 weeks
    - 4. Fanelli GC, *Arthroscopy* , 2005

- A. ACL-PCL-lateral sided injuries → within 10 to 14 days
  - B. ACL-PCL-medial sided injuries → Waiting 1 or 2 months(allow for medial sided injuries to heal)
- B. Reconstruction fixation sequence
  - i. No single determined order of fixation exists
  - ii. *Wascher. D.C. et al., AJSM, 1999 :*
    1. PCL → ACL → collateral ligament
    2. PCL fixed at 90 flexion with 45 N & ACL fixed at 20 flexion with 45 N
  - iii. *Mariani. P.P. et al., Arthroscopy, 2001*
    1. ACL PCL simultaneously tensioned
  - iv. *Fanelli. G.C. et al., Arthroscopy, 2005*
    1. PCL (70 flexion with 20 Ib) → PLI (30 flexion) → ACL (70 flexion with 20 Ib) → MCL ( 30 flexion)
  - v. *Hayashi et al., KSSTA, 2008*
    1. ACL & PCL reconstruction simultaneously tensioned at 90 flexion
- C. Techniques
  - i. *Hayashi et al., KSSTA, 2008*
    1. Two-incision technique & anteromedial tibial tunnels with multi-strand STG graft for combined ACL + PCL reconstruction
  - ii. *Fanelli GC, Arthroscopy , 2002*
    1. Single incision ACL technique & single femoral tunnel-single bundle transtibial tunnel PCL technique with various auto- & allo-grafts
4. Results of various studies
  - A. *Ohkoshi et al., Clin Orthop, 2002*
    - *Postoperatively,*
      - i. *all knees showed negative Lachman test results, 66% negative posterior drawer test, 44% grade I posterior drawer test*
      - ii. KT-1000 arthrometer side-to-side difference : 2.3mm ± 1.9 mm
  - B. *Mariani. P.P. et al., Arthroscopy, 2001sj*
    - *Preoperatively & Postoperatively*
      - i. Lysholm score : 65 & 95 respectively
      - ii. HSS knee ligament rating scale score : 32 & 89 respectively
      - iii. KT-2000 arthrometer side-to-side difference(Postoperatively) : 5.8mm ± 1.1 mm
5. Rehabilitation
  - A. *Shapiro et al., AJSM, 1995*
    - i. 1<sup>st</sup> week : 0°~70° ROM
    - ii. 2<sup>nd</sup> week onward : increase ROM 10° every week
  - B. *Shelbourne et al.Orthop Rev,1991*
    - i. Full extension in early postoperative period and protected ROM exercise
  - C. *Wascher et al., AJSM, 1999*
    - i. Nonweight bearing ROM between 20°~70° in a hinged knee brace for 6 weeks
6. Our Surgical Technique

- *Posterior Cruciate Ligament*
  - *Kim SJ et al., Arthroscopy, 1994,1998,2000,2005*
  - *Kim SJ et al., Arthroscopy, AJSM,2009*
- A. Modified One-incision technique for PCL reconstruction
  - i. anterolateral tibial tunnel
    - 1. the least von Mises stress & Maximum shear stress on biomechanical study
  - ii. Comparable with two incision technique.
    - 1. No significant differences in Lysholm scale, KT-2000 arthrometer measurement
    - 2. Better HSS score : 92.6 vs 87.7(1 incision group vs 2 incision group, p=0.037)
- B. Remnant preserving technique
  - i. Preserved continuity of the attenuated PCL
  - ii. *Franchi A et al. J Arthroplasty, 1995 : Mechanoreceptors in the PCL for Control of proprioception*
  - iii. Tibial Tunnel Preparation : The remnant is laterally peeled from the tibial attachment with a narrow osteotome
  - iv. Femoral Socket Preparation :
    - 1. to preserve as much of the PCL remnant as possible: direction of rotation of the reamer is counterclockwise without wagging during reaming
- *Anterior Cruciate Ligament*
  - A. Single-Bundle
  - B. transtibial tunnel
  - C. Remnant preserving technique
    - i. *Georgoulis AD et al. KSSTA, 2001 : Potential source of re-innervation*
      - 1. *Mechanoreceptors a long time after injury in those patients who retained a large portion of the ACL remnant, readapted on the PCL*
- *Our reconstruction fixation sequence & amount of graft tensioning*
  - A. Posterolateral corner → Medial Collateral Ligament → ACL → PCL
  - B. PCL + ACL ; tension 120N
  - C. After ACL fixed at 0° flexion, PCL fixed at 90° flexion
- 7. Our rehabilitation protocol
  - A. Initial 3 weeks
    - i. immobilization in full extension
    - ii. isotmetric quadriceps sets
  - B. 3 ~ 6 weeks
    - i. passive flexion limited to 90 degrees
    - ii. partial weight bearing
  - C. 6 ~ 12 weeks
    - i. advance to full weight bearing, brace off by the end of this period
  - D. 9 ~ 12 months
    - i. return to sports activities
- 8. Conclusion
 

Combined PCL/ACL injuries which frequently occur in knee dislocation may accompany other pathologies such as medial collateral ligament injury and/or posterolateral corner injury.

**Although reconstruction fixation sequence differs according to various authors, these conditions may well be addressed with surgical techniques such as one incision & remnant-preserving technique with anterolateral tibial tunnel, especially for PCL reconstruction.**

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May 17  
Rio de Janeiro, Brasil

**IC # 8**  
**Current Concepts in PCL**  
**Insufficiency**

**Gr III PCL, Gr III MCL**  
Case based

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**Disclosure**

Consulting income: Smith and Nephew

**Practice Profile**

- ✓ Location of Practice:
  - Public: University of Buenos Aires
  - Private: Trinidad Clinic - San Isidro
- ✓ Years in Practice: 22
- ✓ Number of primary PCL surgeries/year: 24
- ✓ Number of revision PCL last year: 1 ?

**Preferred Technique in**  
**MCL GIII with PCL GIII**

- Acute lesion: Immobilization - Repair
- Chronic lesion: Reconstruction
- ✓ Graft preference: - Semitendinosus autograft
  - Anterior Tibialis allograft

**Preferred Technique in**  
**PCL GIII with MCL GIII**

- Acute lesion:
  - avulsion = Surgery
  - If not = first : nonoperative treatment
  - If fail : Reconstruction
- Chronic lesion: Reconstruction
- ✓ Double Bundle in femur
- ✓ Transtibial Single Bundle
- ✓ Graft preference: - Hamstring tendons autograft
  - Achilles allograft

**PCL History**

- Combined Injuries: Over 80 %
  - Harner C D. "Biomechanical Analysis of a Combined Double-Bundle PCL and PLC Reconstruction", Am J Sports Med, 2005
  - Fanelli G C. "Surgical Management of Combined Knee Ligament Injuries" Isakos, 2005
- Multiligament Injuries: SURGERY

**Physical Exam – Case Based**

- Injury Mechanisms: Posterior-Medial direct blow
- PAIN-Effusion
- Posterior and Medial Instability
- Combined Injuries
- Vascular status

**Physical Exam**

- ✓ Step Off
- ✓ Thumb Sign
- ✓ Godfrey
- ✓ Posterior Sag
- ✓ Quadriceps active test
- ✓ POSTERIOR DRAWER
- ✓ Reverse Pivot Shift
- ✓ MEDIAL STRESS

## Diapositiva 1

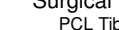
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**A1**

Admin, 18/05/2010

Imaging	Diagnosis	Treatment
<p>✓ X-ray: - Step Off - Medial (30 degrees) and Posterior Stress (90 degrees)</p> <p>- Grades: I (5mm), II (5 to 10MM) and III (over 10mm)</p> <p>✓ MRI: Associated Injuries</p> <p>Treatment of MCL Injuries Ryan G. Miyamoto, Joseph A. Bosco and Orrin H. Sherman Journal of the American Academy of Orthopaedic Surgeons, 2009</p>	<p>✓ Clinic ✓ Physical Exam ✓ Imaging</p>	<p>- Initially conservative: MCL + PCL and later reconstructed as dictated symptoms and activity level</p> <p>- MCL and PCL: intrinsic ability to heal</p> <p><b>Combined Anterior and Posterior Cruciate and MCL Injury: Nonsurgical and Delayed Surgical Treatment</b> Donald <u>Shelbourne</u> and Donald Carr AAOS Instructional Course Lectures, 2003</p>

Surgery Technique	Surgery: PCL Graft Selection	Surgery: MCL Graft Selection
<ul style="list-style-type: none"> <li>- Acute cases: 1) MCL Repair 2) PCL Reconstruction: DB femur SB tibia</li> <li>- Chronic cases: 1) PCL Reconstruction: DB femur SB tibia 2) MCL Reconstruction: superficial and oblique band ?</li> </ul>	<ul style="list-style-type: none"> <li>➤ Autografts: - <u>Hamstring Tendons</u> - Contralateral</li> <li>➤ Allografts: - <u>Achilles</u> - Anterior Tibialis - Quad</li> </ul>	<ul style="list-style-type: none"> <li>➤ Autografts: - <u>Semitendinosus</u> - Contralateral</li> <li>➤ Allografts: - <u>Anterior Tibialis</u> - Semitendinosus - Peroneus</li> </ul>

<h3>Surgical Technique</h3> <h4>PCL Tibial Tunnel</h4>  <ul style="list-style-type: none"> <li>✓ 15 mm below joint line</li> <li>✓ Lateral approach provides straighter pathway</li> <li>✓ Care post cortex</li> <li>✓ Special curette</li> <li>✓ Chamfer upper edge</li> </ul> <p><small>Fig. 4. PCL tibial tunnel drilling. Collapsed and measured from below: MD, Tennen CCE, Kuntzschgantz SC, knee position corrected against flexion, as in Fig. 3; dorsal CO, knee CO, lateral, knee surgery site 1, ligament tibiae 4, 4000x.</small></p>	<h3>PCL Femoral Tunnel</h3> <p>Anatomy and Biomechanics : AL and PM - Double Bundle</p> <ul style="list-style-type: none"> <li>✓ IC San Francisco 2001 (Fenton, Paulos, Morgan, Race, Amis, Veltri, Matthews, Noyes, Harner)</li> <li>✓ Larson and Metcalf</li> <li>✓ Markolf</li> <li>✓ Griffin, Haemmerle, Vogrin and Harner</li> </ul> <p>"Single- versus double-bundle PCL reconstruction: a biomechanical analysis." J Knee Surgery 2008</p>	<h3>PCL Femoral Tunnel</h3> <ul style="list-style-type: none"> <li>✓ ANTEROLATERAL</li> <li>✓ POSTEROMEDIAL</li> </ul> <div style="text-align: center;">↓</div> <ul style="list-style-type: none"> <li>✓ &lt; postop Laxity</li> <li>✓ + Anatomic</li> <li>✓ It is Better</li> </ul>
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### PCL Femoral Tunnels

- ✓ ANTEROLATERAL: 11 or 1 o'clock  
(High-Forward) 6-8 mm from art. cartilage
- ✓ POSTEROMEDIAL: Inferior and Deeper

- Footprint
- Bone bridge > 6 mm

### PCL Grafts Fixation

AL: 70 to 90°  
PM: 20 to 30°

### ✓ Anatomy of MCL:

- **Superficial** attachment: prox-post medial epicondyle (femur) to prox tibia semimembranosus (soft tissue) and distal crest tibia (bone)
- **Deep** attachment: Meniscocapsular structures (meniscofemoral and meniscotibial)

**Medial Knee Injury. Load Sharing Between the PCL and Superficial MCL**  
Wijdicks, Griffith, LaPrade, Spiridonov, Johansen, Armitage and Engebretn  
Am J Sports Med, 2009

### Surgical Technique MCL

- ✓ Repair: In acute cases

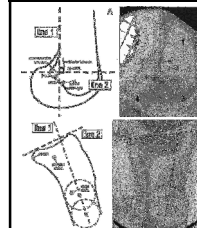
Treatment of combinad=ed ACL-PCL-medial and lateral side knee injuries  
Fanelli, Edson, Orcutt, Harris and Zijerdi  
The Journal of Knee Surgery, 2005

### Surgical Technique MCL

- ✓ Reconstruction: in chronic cases
  - POL
  - MCL: Superficial (TCL)  
Deep

Single-Achilles Allograft PCL and MCL Reconstruction: Technique note  
Christopher J. Wahl, M.D., and Gregg Nicand  
Arthroscopy, 2008

### Surgical Technique MCL



Current Concepts Review  
Injuries to the MCL and  
Associated Medial Structures of the  
Knee  
Wijdicks, Griffith, Johansen,  
Engebretn and LaPrade  
J Bone Joint Surg Am, 2010

### Postop care

- Protection from posterior forces
  - Quadricep Strengthening
  - Avoid flexion exercises

### Postop care

- Cold
- Knee Brace: 2 months
- Non-weight Bearing: 6 weeks
  - Bike - swimming
  - Proprioception
- Sports after 9 months

### Complications

- Poor results
  - Technical errors
  - Infections
  - Loss of Motion
  - Anterior Knee Pain (donor site pain)
  - Neurovascular complications: Arteriogram
  - Heterotopic ossification on the post. femur
  - Reflex Sympathetic Dystrophy
  - Osteonecrosis (Athanasian. Outside-in)
- "Long term results of the arthroscopic PCL reconstruction one incision technique", 67th AAOS Annual Meeting, 2000

Conclusion
<ul style="list-style-type: none"><li>✓ Multiligament injuries: Surgery</li><li>✓ Acute MCL: Nonoperative? or Repair</li><li>✓ Chronic MCL: Superficial and POL?</li><li>✓ PCL DB is better in objective tests and fewer ruptures</li><li>✓ PCL SB fewer grafts and easier surgery</li><li>✓ Future in our group: Tibia Inlay or double bundle in tibia</li></ul>



<p><b><i>THANK YOU</i></b></p>
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