Treatment of Combined Posterior Cruciate Ligament (PCL) and Medial Knee Injuries
60th Annual Edward T. Smith Orthopaedic Lectureship
November 3-5th, 2016
Robert F. LaPrade, M.D., Ph.D.
Chief Medical Officer
Steadman Philippon Research Institute
Deputy Director, Sports Medicine Fellowship Complex Knee and Sports Medicine Surgeon
The Steadman Clinic, Vail, CO
Adjunct Professor, University of Minnesota
Fulbright Faculty, Colorado State University

Disclosures
I, Robert F. LaPrade, have relevant financial relationships to be discussed, directly or indirectly, referred to or illustrated with or without recognition within the presentation as follows:
- Editorial Boards for AJSM & KSSTA
- Consultant: Arthrex, Smith & Nephew
- AOSSM Research Grant
- OREF Career Development Grant
- OREF Clinical Research Award 2013
- Health East Norway Research Grant
- Minnesota Medical Foundation Grants

The Steadman Philippon Research Institute is a 501(c)(3) non-profit institution supported financially by private donations and corporate support from the following entities:
- Smith & Nephew
- Arthrex, Inc.
- Siemens Medical Solutions USA, Inc.
- ConMed Linvatec
- Össur Americas
- Synthes
- Ceterix Orthopaedics, Inc.
- AANA
- University of Oslo
- The Steadman Clinic
- Vail Valley Medical Center

PCL/MCL Exam
- ↑ PTT on PD
- Valgus 0° / 30°
- ↑ ER on dial test / anteromedial drawer test
MRI
- MCL
  - Meniscofemoral vs. meniscotibial lesion
- PCL
  - Peel off vs. midsubstance
  *Look for MFL root tears*

Stress Radiographs
- **Valgus Stress X-rays**
  - 3.2 mm complete MCL
  - 9.8 mm MCL/POL/deep MCL
- **PCL Stress X-rays**
  - 8 mm complete PCL tear
  - > 12 mm combined PCL/PLC tear

Timing of Surgery
- Skin / vascular status
- Ideally in first 2 weeks
- PT for stiffness
History

- Severe valgus contact
- Hyperextension
- Fall on flexed knee
- Side to side instability
- Difficulty going down inclines / deceleration

Preparation for Surgery

- Review with surgical team
- Verify grafts present
- 70º scope, Gore smoother, ACL/PCL/collateral instruments
- Root repair / meniscal repair instruments
- Mini C Arm

Positioning in Surgery

- Leg holder (extra padding)
- Well leg holder abducted
- Mini c arm in place
Planned Grafts

- MCL hamstring autografts
- PCL
  - ALB Achilles allograft
  - PMB tibialis anterio

Backup MCL Graft

- Tibialis anterior
  - MCL 16 cm long
  - POL 12 cm long

Review Surgical Steps With Team

- Anteromedial approach first
- Hamstring harvest, fix to tibia
- Tag MF/MT/POL for later repair
- Femoral tunnel / tubularize hamstring graft
- Scope, prepare closed socket ALB (11 mm) and PMB (7 mm) tunnels
- Meniscal / root repairs
- Place tibial guide pin / verify on XR
- Ream tibial tunnel
- Pass PCL grafts into femur / secure
- Pass PCL grafts tibia
- Pass MCL grafts into femur
- Secure ALB/PMB to tibia
- Repair MF/MT/POL
- Secure MCL into femur
MCL / PMC Approach First

- ID structures prior to fluid extravasation
- ID tibia based injury

MCL Augmentation Reconstruction - Tibia

- Open hamstring harvester
- Secure to tibia 6 cm distal to joint line
- Pass along posterior tibial cortex at distal MCL attachment

Meniscofemoral, Meniscotibial, POL ID

- Identify deep MCL / POL injury
- Dissect from scar tissue
- Tag structures for later repair
MCLR - Femur
• Identify adductor magnus tendon (Key Landmark!)
• Adductor tubercle → medial epicondyle (12.6 mm distal, 8.3 mm anterior)
• Ream tunnel (anterolateral to avoid tunnel collisions (40 mm deep)

Hamstring Graft – Femur
• Tubularize to 30 mm in tunnel
• Closely spaced sutures on anterior aspect of graft to protect from bioscrew injury

Arthroscopy
• Large AL parapatellar portal
• Medial parapatellar portal
• Quick assessment of ACL (slack sign), cartilage, meniscus
PCL Femoral Tunnels
- Closed sockets, anterolateral portal
- ALB → 11 mm; between trochlear point and medial arch point (roof)
- PMB → 7 mm; on wall anterior edge 5.8 mm from cartilage
- Place passing sutures

MM Root Repair
- PM portal
- Very close to PCL tibial attachment
- Drill pin but don’t ream until verify PCL tunnel on fluoroscopy

PCL Tibial Tunnel
- Key part of procedure
- Too anterior = detach roots
- Too distal = non-anatomic
- Pin or reamer overpenetrates artery / nerve damage
PCL Tibial Tunnel
• One tunnel (8.9 mm distance between bundles)
• Locate at bundle ridge
• Always obtain intraop x rays

Intraoperative X-rays
(Johannsen, AJSM, 2013)
• AP → 1.6 mm distal to joint line (not 1 cm)
• Lateral → 5.5 mm from champagne glass drop off

Meniscal Root Repair
• 2 tunnel repair
• Shuttle sutures and tie over button
Ream PCL Tunnel
• 11 12 mm acorn reamer
  – (Not smooth bore)
• Large curette posteriorly
• If feel champagne glass region chatter, drop hand to avoid posterior cut out

Pass PCL Grafts into Femoral Tunnels
• PMB first (notch edge) fix with bioscrew
• ALB second (bone plug, fix with titanium screw)

Pass PCL Grafts Down Tibia
• Place sutures in eyelet of smoother
• Pull down tibia
• Manually tighten to remove slack
Verify Intra-articular Results

- Eliminate ACL slack sign with traction
- Graft not bunched up

Secure ALB / PMB on Tibia

- Screws and washers (less pain than stables)
- ALB 90º, neutral rotation, restore tibiofemoral stepoff
- PMB 0º, neutral
- Verify PD eliminated

Repair PMC Structures

- Deep MCL MF/MT – 20º, neutral rotation
- POL – Full extension
Case Summary

• Tourniquet time: 115 minutes
• Verify stability and ROM have been restored
• Subcuticular closure

Postop Rehabilitation

• Initiate POD #1
  – Prone flexion 0° - 90° x 2 weeks, then as tolerated
  – Quad activation, edema control, ankle pumps

• Place in PCL Jack Brace
  – Brace POD #3 - 5 weeks
  – NWB x 6 weeks

Postop Rehabilitation

• Week 6 - 6 months
  – Initiate WBAT

  – Cycling, single plane activities

  – Leg press to 70°

  – PCL stress / valgus stress XR at 6 months
Postop Rehabilitation
• 6 Months Onward
  – Jogging
  – Agility
  – Sports test for return to activity at 9–12 months

Summary Combined PCL / MCL Injuries
• Hybrid medial repair / reconstruction to start early ROM
• DB PCLR to restore stability
• Initiate early ROM to avoid arthrofibrosis

Thank You