Knee Multiligament Rehabilitation

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Anatomy

4 Major Ligaments

- ACL
- PCL
- MCL
- LCL (PLC)

Function & MOI

- ACL – Prevents anterior tibial translation, usually injured when foot planted and individual changing direction
- PCL – Prevenst posterior tibial translation, usually injured due to anterior force driving tibia posteriorly, i.e. “dashboard” injury or landing with knee flexed 90 degrees
- MCL – Resists valgus moment, usually injured with foot planted a force applied to lateral knee
- LCL – Resists varus moment, usually injured with foot planted a force applied to medial aspect of knee

Multiligament MOI

- High energy trauma
- Automobile accidents
- Fall
- Sports Injury (football, basketball, soccer, skiing)

Can you name this injury?
What ligaments are involved?
Can you name this injury?
ACL & PCL Reconstruction Rehabilitation

ROM
• iROM Brace Locked initially
• 0-30° x 1-2 weeks
• 0-60° x 1 week
• 0-90° x 1 week
• 0-110° ~week 6

Weight Bearing
• PWB 0-2 weeks
• Progress to Full WBAT

Weeks 0-2
Goals
• ROM 0-30°
• WBAT with crutches
• Control pain, inflammation and effusion
• Restore patellar mobility
• SLR without extension lag

ACL & PCL Reconstruction Rehabilitation

0-2 weeks
Precautions
• ROM
• Weight bearing
• No HS activity (stretching or strengthening)
• No prone hangs (due to HS guarding)

Interventions
• Patellar mobs
• Ankle pumps
• Calf stretches
• Quad sets
• SLR (flex, abd, add)
• Gait training – Alter G
• Core – Single leg bridges, planks, etc

ACL & PCL Reconstruction Rehabilitation

2-6 weeks
Goals
• 0-90° week 4
• 0-110° week 6
• WBAT -> FWB
• Control pain, inflammation and effusion
• Increase quad strength
• Increase proprioception, balance, and coordination
• Normalize gait

Precautions
• No HS activity
• ROM
• Weight bearing
• No prone hangs (due to HS guarding)
2-6 weeks

**Interventions**
- **ROM/Flexibility**
  - Heel slides/Wall slides
  - Patellar mobs
  - Soft tissue mobs
  - Gastroc/Soleus Stretch

**Strength**
- Quad sets
- SLR (flex, abd, add)
- Mini squats
- Calf raises
- Leg Press
- Core

**Balance & Gait**
- Weight shifting
- Single leg balance
- Wobble board balance
- Steam boats
- Cone walking

**6-12 weeks**

**Goals**
- Full ROM
- Increase strength and endurance
- Control pain, inflammation and effusion
- Increase balance, proprioception and coordination
- Initiate gentle HS activity at week 6 (MD)
- Switch to ACL protocol ~week 8 (MD)

**ROM/Flexibility**
- Heel Slides/Wall Slides
- Gastroc/Soleus Stretch
- HS stretch
- Patellar mobs
- Soft tissue mobs

**12-16 weeks (ACL protocol)**

**Goals**
- Increase strength and endurance to 80% of uninvolved LE
- Enhance neuromuscular control
- Progress to skill training
12-16 weeks (ACL protocol)

**Precautions**
- Patellar tendon pain
- Swelling

**Strength/Flexibility**
- Continue and advance from previous
- Progress with single leg activity
- Light jogging on TM/even surfaces (track)
  - Walk/run until able to run 10-12 continuous mins with no pain or biomechanical deficits
  - HP – biomechanist
- Jump rope

16-36 weeks

- Advanced running program
- Initiate and progress lateral movements and agility work
- Speed work
- Plyometrics
- Sports specific training

Posterior Lateral Corner Anatomy

- LCL
- Popliteus tendon
- Popliteofibular ligament
- Biceps femoris
- Lateral gastroc tendon
- IT Band
- Lateral capsule
- Lateral meniscus

ACL, PCL and PLC Rehabilitation

LCL, Popliteus tendon, Popliteofibular ligament are the 3 most static stabilizers of the posterolateral knee

Together they restrain varus, ER, and combined posterior translation with ER

Bony shape of posterolateral knee with convex opposing surfaces of LFC and LTP making it inherently more unstable than medial side of knee

Isolated PLC injuries are rare (7-28%)
 ACL, PCL and PLC Rehabilitation

• 72% of PLC have concurrent cruciate ligament injury
• 15-20% of PLC injuries have associated nerve damage (peroneal nerve)
  – Weak DF, hallux extensors, foot drop
• Also associated with vascular injuries to popliteal artery in 7-40% of knee dislocations

ACL, PCL and PLC Rehabilitation

Mechanism of injury
• Hyperextension (contact or noncontact)
• Direct trauma to anteromedial knee
• Varus force to knee
• Knee dislocation

ACL, PCL and PLC Rehabilitation

• Increased success if surgery within 3 weeks to allow for swelling to decrease and address ROM deficits
• Waiting longer than 3 weeks may lead to arthrofibrosis and tissue retraction
• Ideal to perform non-staged ACL, PCL, and PLC surgery to begin rehab for ROM and decrease chances of arthrofibrosis

ACL, PCL and PLC Rehabilitation

Staged
A. PLC reconstruction

ROM
• iROM Brace locked x 1 wk
• 0-30° x 1 wk
• 0-60° x 1 wk
• 0-90° x 1 wk
• Progress as tolerated
• No forced flexion at any time

WB
• TTWB/NWB x 4 wks
• PWB x 2 wks
• PWB -> FWB x 2 wks

ACL, PCL and PLC Rehabilitation

Goals
• ROM 0-90° wk 4
• Control pain, inflammation and effusion
• Restore patellar mobility
• SLR without extension lag
• Protect the repair

Precautions
• ROM
• WB
• No HS activity x ~4 months (MD)

ACL, PCL and PLC Rehabilitation

Staged
A. PLC reconstruction

0-4 weeks

Interventions
• Ankle pumps
• Quad sets
• SLR (flexion)
• PROM
• Patella mobs
• Soft tissue mobs
**ACL, PCL and PLC Rehabilitation**

**Goals**
- ROM increase as tolerated
- WBAT
- Control pain, inflammation and effusion
- Normalize gait

**Precautions**
- ROM (no forced flexion)
- No HS activity

**Interventions**
- Quad sets
- SLR (flex, add)
- Heel slides/Wall slides
- Patella mobs
- Soft tissue mobs
- Weight shifts
- Cone walking
- Stationary bike (do not force flexion)

**Staged**

A. PLC reconstruction

4-8 weeks

**ROM**
- iROM brace locked until 1st post-op visit
- 0-30° x 3 wks
- 0-60° x 1 wk
- 0-90° x 1 wk
- Progress as tolerated, no forced flexion at anytime

**WB**
- PWB x 3 wks
- WBAT x 1-2 wks

**Non-Staged**

**ROM**
- iROM brace locked x 3-4 weeks
- 0-30° x 2 weeks
- 0-60° x 1 week
- 0-90° x 1 week
- Progress as tolerated, no forced flexion at anytime
- Focus on extension initially

**WB**
- TTWB/NWB x 2-4 wks
- PWB x 2 wks
- Progress to FWB as tolerated

**Follow PCL protocol x ~2 months, then switch to ACL protocol**

**No HS activity until ~week 6**
ACL, PCL and PLC Rehabilitation

**0-4 weeks**

**Goals**
- PWB/WBAT week 4 (MD)
- Control pain, inflammation and swelling
- Restore patellar mobility
- SLR without extension lag
- Protect the repair

**Precautions**
- ROM
- WB
- No HS activity

**Interventions**
- Quad sets
- SLRs
- Ankle pumps
- Patella mobs
- Soft tissue mobs
- Initiate gait training if WB status allows – Alter G

**4-8 weeks**

**Goals**
- Progress ROM (per MD's orders)
- 90-120° at week 8
- FWB by week 8
- Normalize gait pattern
- Control pain, inflammation and swelling
- Increase patellar & soft tissue mobility
- Restore quad control and activation
- Protect the repair

**Precautions**
- ROM
- WB
- No HS activity

**Interventions**
- Quad sets
- SLRs (flex, add)
- Progress ROM
- Calf stretches
- Gait training
- Weight shifting
- Balance/proprioceptive training
- Mini squats (at weeks 6-8)
- Calf raises (at weeks 6-8)
- Core strengthening (single leg bridges, planks, etc)

**8-12 weeks**

**Interventions**
- Increased quad strength activities
- Hip and Core strength
- Progress ROM
- Balance and proprioceptive activities
- Initiate HS strengthening
- Switch to ACL protocol at week 8

**12-18 weeks**

**Interventions**
- Continue and progress with previous strength activities
- Continue and progress with balance and proprioception
- Initiate light jogging program
- Initiate jumping rope
ACL, PCL and PLC Rehabilitation

Non-Staged
18-36 weeks

Interventions
• Progress running program
• Initiate and progress agility program
• Initiate and progress plyometric activities
• Initiate and progress sport specific activities

Management of Stiff Knee

• Patellar mobility
• Soft tissue mobility
• Scar mobility
• Focus on extension early on due to flexion restrictions
• Progress flexion as early as allowed by MD
  – Heel slides, Wall slides, flexionator, CPM
• Communication with MD is key!

In Summary...

• Goals and timelines may vary according to pt, severity of injury and MD’s orders
• Etc
• Etc

Thank You!

References