

Complications of Multiple Ligament Knee Injuries

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Disclaimer

This talk is based on my
25 year experience



1987-1988



2001 - present



1988-2000

Overview

1. Principles of surgical management
2. Complications: Pearls & Pitfalls
 - Pre op
 - Intra op
 - Post op

Case Based Approach



Jack C.
Hughston, M.D.

*"Good judgment is based on experience and
experience is based on bad judgment."*

General Principles of Management

1. **Be specific with diagnosis**
 - Timing of injury
 - Anatomical classification (*grade of injury*)
 - Associated injuriesBe prepared for any and all complications!
2. **Operative Management**
 - Plan out carefully
 - When possible:
 - Do electively
 - Do in an inpatient setting
 - Do when well rested

General Principles of Management

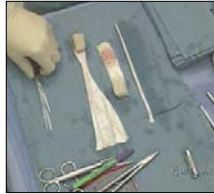
3. **Delayed and/or staged surgery is acceptable in many cases**
 - Lateral corner and certain MCL injuries should not be delayed
 - Cruciates delayed until swelling resolved



General Principles of Management

4. Graft Choices

- Allografts work well
 - decreases iatrogenic trauma
 - decreases OR time
 - multiple grafts available
- *But durability in younger patients may be a problem*



Multiple Ligament Complications

Case Examples



Case Example (1996)

23 year old dirt bike racer

* Dislocates Knee

- peroneal nerve injury
- popliteal artery injury

* Undergoes emergent vascular bypass

* Follow up 1 week later in the office



Case Example (1996)



Pre op

1 week status post

- **DX: Missed medial tibial plateau fx**
- Apparent "small" or non displaced fractures are a big deal – ORIF emergently
 - plan incisions carefully
- **Always check post reduction X-Rays**
 - day of injury and 24 hrs post reduction

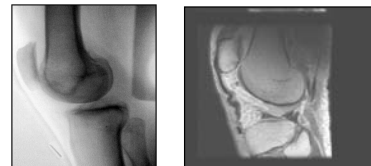
Case Example (1995)

- 17 y/o high school baseball player
- Collides with left fielder and dislocates knee
- Reduced in ER (neurovasc intact), braced and followed up 5 days later in office



Post Reduction X-Rays

Case Example



DX: missed patellar tendon rupture with fixed posterior subluxation

Pre op pearls

- **Always check post reduction X-Rays immediately and at 24 hours**
- If unstable, use external fixator

Case Example

A 22 year old college linebacker suffers a posterolateral knee dislocation during the second half of a game. On the field, he has no palpable pulse and a complete peroneal nerve injury. Which on the field treatment option would you choose?

- (A) Splint him (ie no attempt at reduction) and send him to the closest emergency room
- (B) Attempt closed reduction, splint, and send to the emergency room**

Case Example

Pearl – on field knee dislocations

Every attempt should be made to reduce a knee dislocation on the field to decrease the risk of permanent nerve and vascular injury

Case Example

He is reduced on the field and his pulse has returned, but he continues to have a complete peroneal injury. Radiographs in the emergency room show that his knee is reduced and that there are no fractures. At this point, would you obtain a vascular study?

- (A) Yes**
- (B) No

Case Example – Pre Op Eval (2010)

- 32 y/o police officer
- Hit by a car
- ACL/PCL/posterolateral corner with complete peroneal nerve injury (arteriogram is normal)
- Presents 6 days later to office with foot drop
- No DVT risk factors. Homans/calf pain are not reliable
- **Doppler obtained → popliteal DVT**
- Filter placed pre op
- Posterolateral corner surgery done 9 days post injury (cruciates deferred)

Multiple Ligament Complications

Pre op pearls – neurovasculature

- Always check ABI's but....
- **When in doubt always get vascular studies!!!**
 - CT angiogram or arteriogram
 - Valuable, pre op, intra op and post op
- **Do not forget the vein in your neurovascular evaluation!**
 - I always obtain pre op dopplers
 - in office and 24 hours prior to surgery

Case Example

A 19 year old female college soccer player dislocates her knee. Her diagnosis is acute ACL/PCL/MCL injury. Neurovascularly intact. She is healthy and takes only birth control pills. There is no family history of DVT's. She undergoes surgery one month after the injury. Postoperatively, you would:

- (A) Observe her for DVT
- (B) Use aspirin for DVT prophylaxis
- (C) Use Enoxaparin for DVT prophylaxis**
- (D) Use Coumadin for DVT prophylaxis

Case Example

A 17 year old defensive lineman suffers an ACL/PCL/posterolateral corner injury (LCL, popliteus, biceps and ITB) and a complete peroneal nerve injury. His CT angiogram is normal. His knee is reduced on the AP/lat X-Rays. He comes to your office 5 days after the injury. Which surgical scenario would you choose?

- (A) Delay surgery until swelling has decreased then reconstruct/repair all injured sutures
- (B) Perform arthroscopic ACL, PCL, lateral corner reconstruction within the first 7-14 days of the injury
- (C) Perform lateral corner surgery (repair/reconstruction) within 7-14 days and delayed ACL/ PCL reconstruction after the corner has healed**
- (D) Other

Multiple Ligament Complications

Pre op pearls – staged/delayed surgery

- Most knee dislocations do not require external fixation
- Delayed or staged surgery is acceptable in many cases
- Certain injury patterns (eg complete lateral corner, MCL) should be repaired/reconstructed in 7-10 days

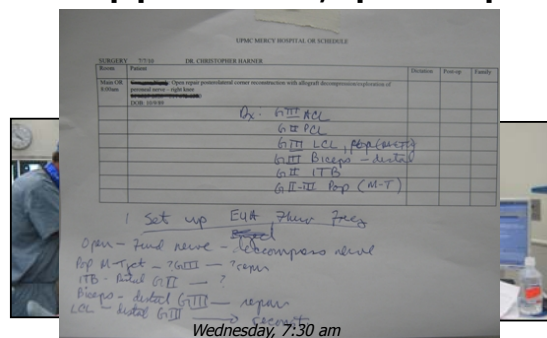
Multiple Ligament Complications

Pre op pearls – PE/MRI

- Office PE can be difficult and inaccurate for ligamentous injury
- MRI is helpful, but may be misleading
- **Exam under anesthesia is critical**
 - Use intra op fluoro to help
 - Ant/post drawer
 - Varus/valgus
 - Compare to opposite (intact) knee for final grading

Multiple Ligament Complications

Intra op pearls – EUA, operative plan



Multiple Ligament Complications

Intra op pearls - positioning



Extremities padded/Foley placed
No tourniquet!



Final prep and drape

Case Example Intra-op (2009)

- 17 y/o old male, bike accident
- Dislocated knee – October 2008
 - ACL/PCL/MCL
 - NV intact
- Undergoes 5 hr ACL/PCL/MCL surgery – March '09
 - Tourniquet time – 120 minutes
 - Post op – well leg severe pain

Case Example Intra-op (2009)

DX: Compartment syndrome well leg with loss of tib ant



Case Example – Intra op (1995)

- 17 y/o female
- Acute grade III ACL/PCL/MCL (transtibial tunnels)
- ACL/PCL reconstruction with allograft
- Tourniquet deflated at 105 min for MCL surgery
- Immediate bright red bleeding
- **DX: Iatrogenic popliteal a. injury**
 - Medial approach
 - Popliteal bleeding controlled (vascular clamp)
 - Vascular surgeon arrived in 30 min
 - Finished MCL repair
 - Outcome was good

Pearls

- beware of shaver near tibial insertion
- immediate vascular surgery back up must be available

Case Example – Intra-op (2005)

- 21 y/o wrestler
- Acute Gr III PCL/MCL
- During diagnostic arthroscopy, calf noted to be swollen
- Abandon scope
- Release superficial and deep compartments through small (~5 cm) medial based incision
- Finish case open/arthroscopic (dry)

Dx: Iatrogenic post. compartment syndrome

Pearls

- Delay surgery until capsule healed
- Have high index of suspicion with these injuries and make decisions quickly

Multiple Ligament Complications

Intra op pearls

- Carefully plan out skin incisions
- Avoid universal mid line (“TKA”) incision
- Skin failure over the patella is a disaster (1987)!!
 - Lateral hockey stick
 - if 2 incisions keep 7cm skin bridge



Multiple Ligament Complications

Post op pearls

- **Loss of motion** (almost always flexion) is most common complication I see
 - Delay initial surgery when possible
 - Do anatomic repair/reconstruction
 - ~ 10-15% have loss of flexion at 8-12 weeks. If they have an impasse perform manipulation under anesthesia between 8-12 weeks

Multiple Ligament Complications

Post op pearls

- DVT
 - **I prophylax all patients**
 - Aspirin if no risk factor
 - Enoxaparin if there is a risk factor
 - **I consider BC pills and peroneal n. injury risk factors**
- Cellulitis/deep infection
 - Be aggressive with treatment (op or non op)
 - Oral/IV antibiotics
 - Frequent evaluation

Multiple Ligament Complications

Post op pearls

- Peroneal nerve injury – **be aggressive with ROM**
 - Use foot drop/splint, PROM
- Recurrent laxity/damage to reconstruction/repair
 - **Brace in full extension for 1 month**
 - Avoid CPM
 - See back on a frequent basis (2-4 weeks) for ROM checks

Conclusions

1. Multiple ligament injuries of the knee are complex injuries involving diverse anatomical structures
 - **This is not just cruciate ligament surgery!**
2. Thorough pre operative evaluation and initial management is critical
 - Be specific with the diagnosis.
 - Do not rely solely on the MRI
 - Obtain vascular studies preop
 - Arteriogram
 - Doppler US

Conclusions

3. Initial management consists of prompt reduction and stabilization followed by reassessment of the post reduction radiographs
 - Brace in full extension
4. Many cases will present to you > 24 hours with significant swelling/pain
 - Delay surgery when possible (see back on frequent basis for reevaluation)

Conclusions

5. Timing of surgery and operative setting are critical to decrease, diagnose, and manage complications

“An ounce of prevention is worth a pound of cure”



BF 1736

Thank You



Multiple Ligament Injury

Case Example (6/10/10)

- 32 y/o police lieutenant involved in high speed chase
- He and his partner were struck by the suspect's SUV as they were preparing to shoot the miscreant
- Transported to UPMC Mercy; multiple ligament injury with patellar tendon avulsion
- Acute repair of patellar tendon done the next day
- Referred to Dr. Harner for further treatment

Case I

Clinic Presentation (6d s/p)

- L knee locked in brace in extension
- Midline incision with erythema over distal aspect of incision
- 2x2 area of eschar near tibial tubercle
- Unstable to varus stress test
- Neurovasculature intact
- - Homan's equivocal



Case I

Multiple Ligament Injuries – Imaging



Case I

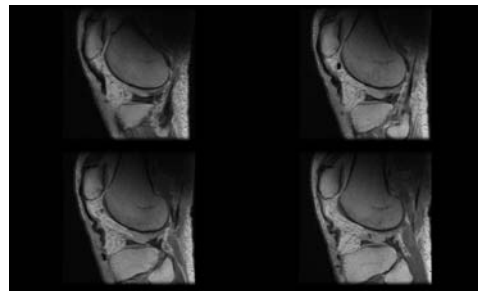
Multiple Ligament Injuries – Imaging



CTA

Case I

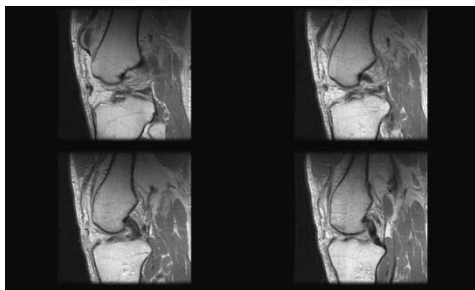
Multiple Ligament Injuries – Imaging



Patellar tendon rupture

Case I

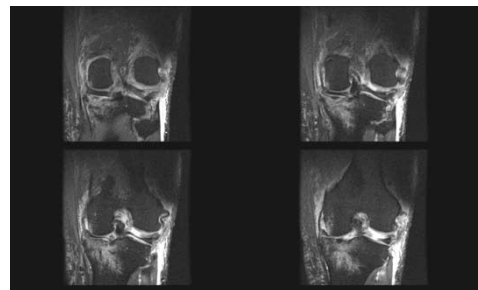
Multiple Ligament Injuries – Imaging



GR III ACL, GR I PCL

Case I

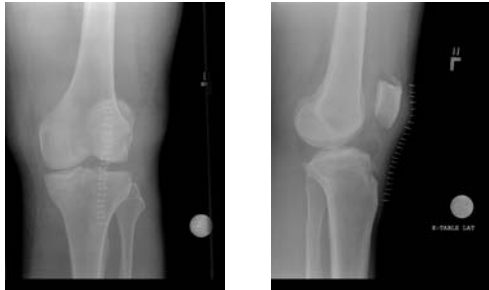
Multiple Ligament Injuries – Imaging



Grade III LCL, ITB, popliteus

Case I

Multiple Ligament Injuries – Imaging

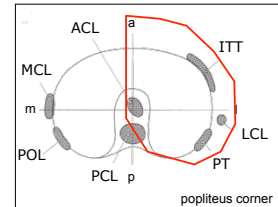


Case I

Multiple Ligament Injuries – Diagnosis

Acute (6 days s/p)

- Grade III ACL, Grade I PCL
- Grade III LCL (distal), Grade III pop tendon (avulsion prox.)
- Grade III ITB
Grade I biceps
- Patellar tendon rupture (s/p repair)



Case I

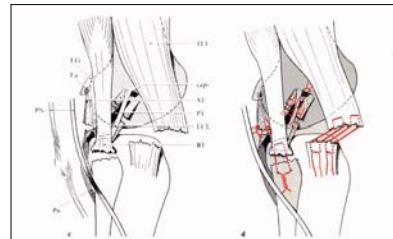
Plan

- Acute repair/reconstruction of PLC (at 10 days s/p)
 - Protect patellar tendon repair
 - Defer ACL reconstruction
- Preoperative Doppler study
 - Positive for peroneal vein DVT!
 - Admit to hospital
- **IVC filter placement 2 days preop**

Case I

Posterolateral Corner Surgery Pearls

1. With complete lateral corner injuries (popliteus, LCL, biceps, ITB), I do acute repair/reconstruction within 10-14 days



Case I

Posterolateral Corner Surgery Pearls

2. In the acute setting, consider staging
 - repair/reconstruct lateral corner first
 - wait 2-3 months before cruciates



PFL reconstruction allo

LCL reconstruction BTB allo

Case I

Exam Under Anesthesia (EUA)



10d s/p

Case I
Preop Fluoro to Assess Patellar Height



Intra Op Planning



June 20, 2010

Case I
Pre Op Set Up



10 day s/p

Case I
Measuring Skin Bridge



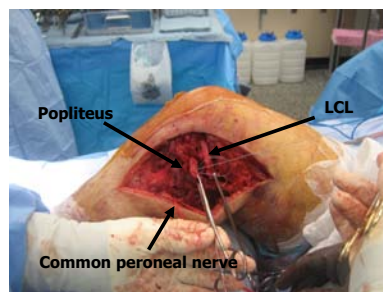
Case I
Operative Setup



No tourniquet

No leg holder

Case I
Anatomy of Posterolateral Corner



Case I

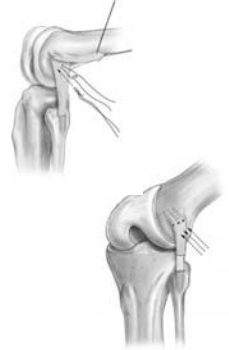
Prepared Graft for LCL Reconstruction



P. T. allograft – 10mm

Case I

Inserting K-wire Into Fibular Head



Case I

Fluroscopy of Drilling



Case I

Fluroscopy of Drilling



Case I

Drilling Over K-Wire to Create Fibular Tunnel



Case I

LCL Graft Insertion Into Fibular Head



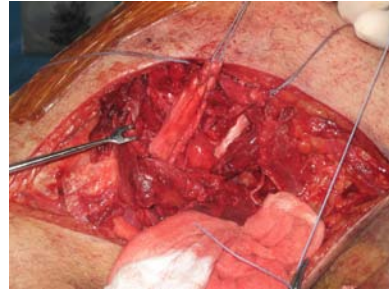
Case I

LCL Graft Distal Fixation W/Screw



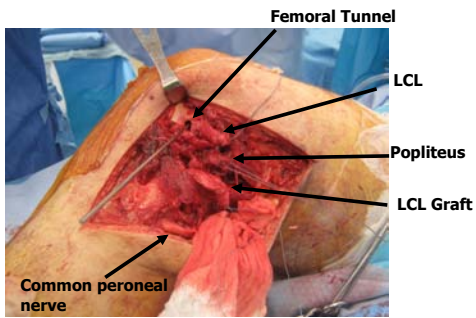
Case I

LCL Graft Distally Fixed



Case I

Popliteus Tendon Repair



Case I

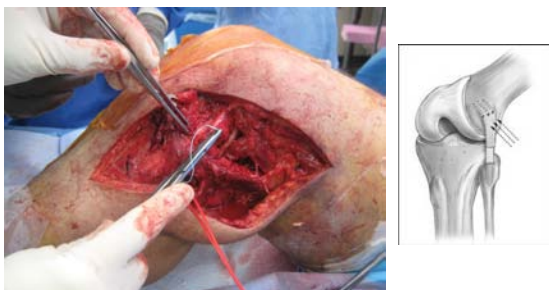
Pop. Tendon Repair/LCL Reconstruction



Video

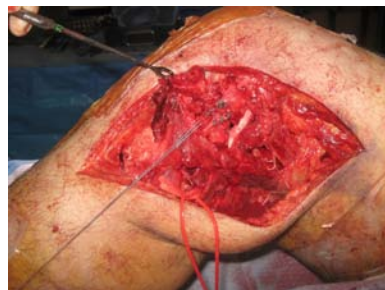
Case I

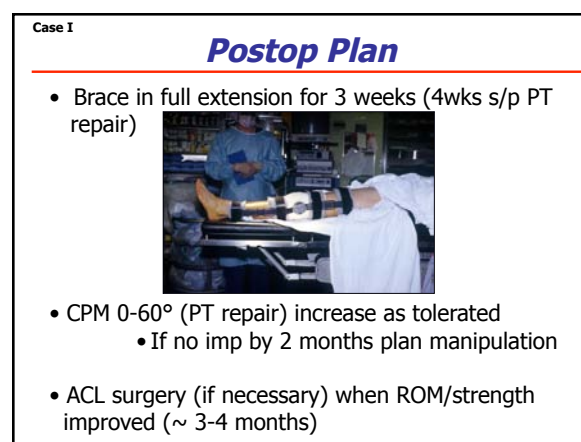
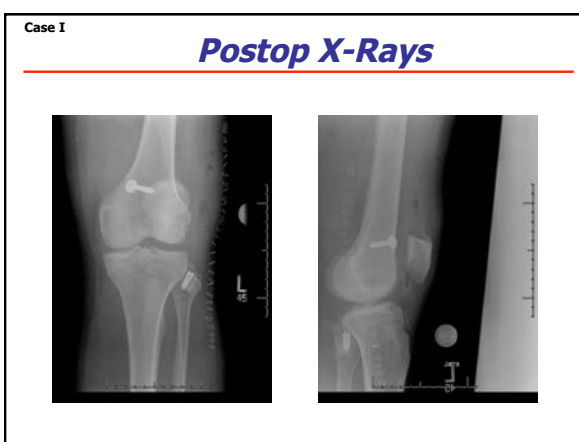
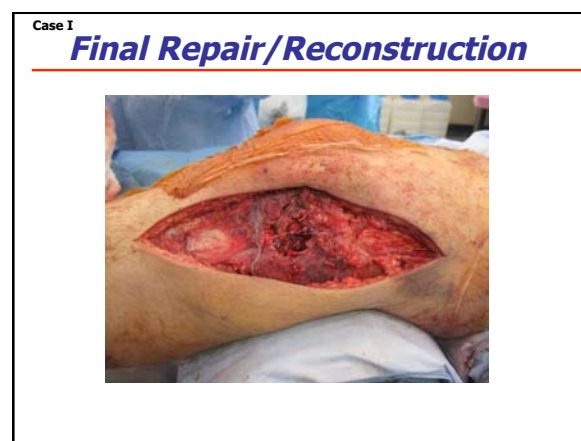
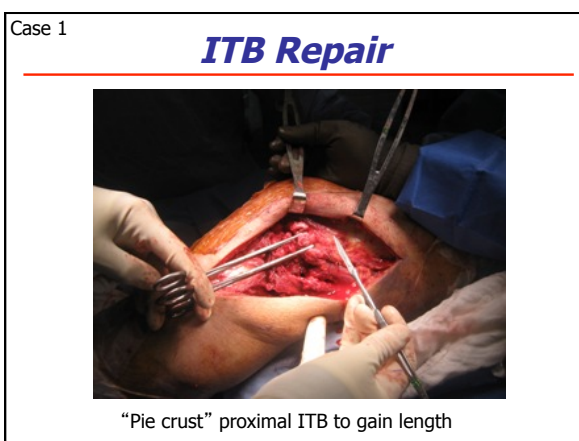
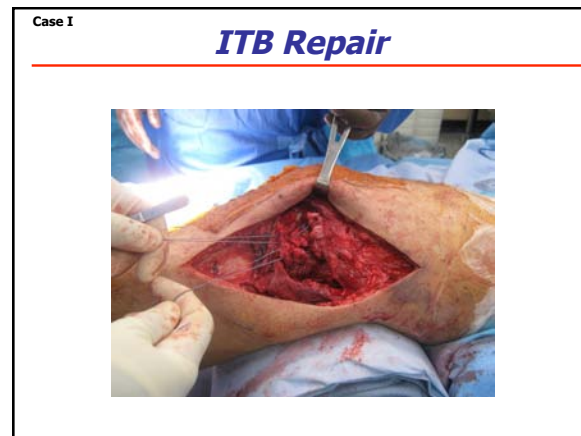
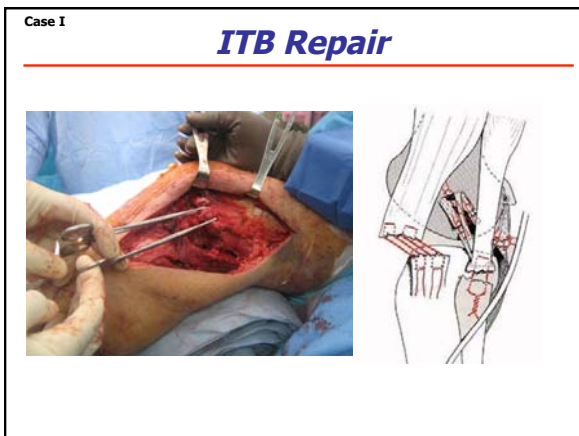
LCL Repair/Reconstruction



Case I

LCL Repair Onto Graft





7 Month Follow Up

February 1, 2010 - ROM 0-105⁰

- Underwent manipulation 9/20/10
 - pre: 0-90 (impasse)
 - post: 0-100

February 10, 2010

- Undergoes ACL reconstruction with BTB allo
 - EUA: ROM 0-110⁰
 - Lachman 3+
 - Varus extension 1+ (0)
 - 30⁰ flexion 2+ (1+)

Case I

Discussion/Questions

