Complications of Multiple Ligament Knee Injuries

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Disclaimer

This talk is based on my 25 year experience

Overview

1. Principles of surgical management

2. Complications: Pearls & Pitfalls
   - Pre op
   - Intra op
   - Post op

Case Based Approach

General Principles of Management

1. Be specific with diagnosis
   - Timing of injury
   - Anatomical classification (grade of injury)
   - Associated injuries
   Be 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

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**Multiple Ligament Complications**

**Case Examples**

**Pre op**

**Intra op**

**Post op**

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**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)**

- **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

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**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

**Pre op pearls**

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

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

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


- 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 pears – 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
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

Case Example

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 fluor to help
  - Ant/post drawer
  - Varus/valgus
  - Compare to opposite (intact) knee for final grading

Multiple Ligament Complications

Intra op pearls – EUA, operative plan

- 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)
### Case Example Intra-op (2009)

**DX:** Compartment syndrome well leg with loss of tib ant

![Image](99x560 to 246x670)

### 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

- **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"

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

Thank You
**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

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**Multiple Ligament Injuries – Imaging**

**Multiple Ligament Injuries – Imaging**

CTA

Patellar tendon rupture

GR III ACL, GR I PCL

Grade III LCL, ITB, popliteus
### 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)

### 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**

### Posterolateral Corner Surgery Pearls

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

### Posterolateral Corner Surgery Pearls

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

### Exam Under Anesthesia (EUA)

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

10d s/p
**Preop Fluoro to Assess Patellar Height**

**Intra Op Planning**

**Pre Op Set Up**

10 days s/p

**Measuring Skin Bridge**

**Operative Setup**

No tourniquet  No leg holder

**Anatomy of Posterolateral Corner**

- Popliteus
- LCL
- Common peroneal nerve
Case I
Prepared Graft for LCL Reconstruction

P. T. allograft – 10mm

Case I
Inserting K-wire Into Fibular Head

Fluroscopy of Drilling

Drilling Over K-Wire to Create Fibular Tunnel

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**

Case I

**LCL Repair/Reconstruction**

Case I

**LCL Repair Onto Graft**
ITB Repair

“Pie crust” proximal ITB to gain length

Final Repair/Reconstruction

Postop X-Rays

Postop Plan

• Brace in full extension for 3 weeks (4wks s/p PT repair)

• CPM 0-60° (PT repair) increase as tolerated
  • If no imp by 2 months plan manipulation

• ACL surgery (if necessary) when ROM/strength improved (~ 3-4 months)
7 Month Follow Up

February 1, 2010 - ROM 0-105 °
• Underwent manipulation 9/20/10
  - pre: 0-90 (impasse)
  - post: 0-100

February 10, 2010
• Undergoes ACL reconstruction with BTB allo
  - EUA: ROM 0-110 °
    - Lachman 3+
    - Varus extension 1+ (0)
      30 ° flexion 2+ (1+)

Discussion/Questions