Treatment of Acute Traumatic Knee Dislocations
Angelo J. Colosimo, MD

Head Orthopaedic Surgeon University of Cincinnati Athletics
Director of Sports Medicine University of Cincinnati Medical Center
Associate Professor of UC College of Medicine
Medical Director Holmes Sports Medicine
Knee Dislocations

- Wide spectrum of severity and associated injuries
- Often secondary to high-energy trauma
- Most commonly reported cause is MVA
- Athletic injuries are the second most common cause of knee dislocations
Knee Dislocations

• High-Energy
  – Usually MVA or fall from a height
  – Dashboard injury common
  – Forced Hyperextension athletic injury
  – Athletic injuries

• Low-Energy
  – Generally from a rotational component
  – Morbid obesity is a risk factor
Knee Dislocation Video
Knee Dislocation Classification

• Based upon the position of the tibia on the femur:
  – Anterior
  – Posterior
  – Lateral
  – Medial
  – Rotary
Anterior Knee Dislocations

- Most common dislocation (30-50%)
- Frequent arterial injury (intimal tear due to traction)
- Hyper-extension most common mechanism of injury
Posterior Dislocation

- Second Most common (25%)
- Due to axial load to flexed knee (dashboard injury)
- Highest rate of complete tear of popliteal artery
Lateral Dislocation

- 13% of knee dislocations
- Due to valgus force
- Highest rate of peroneal nerve injury
- Involves ACL and PCL tears
Medial Dislocations

- Varus force
- Usually disrupts PLC and PCL

Medial, lateral and rotatory
Rotational Dislocation

- Posterolateral is most common rotational dislocation
- Usually irreducible
Presentation

• Symptoms:
  – History of major trauma with immediate deformity of knee
  – Knee pain and instability
  – In athletic competition: video review as possible
Presentation

• Appearance
  – No Obvious Deformity
    • 50% spontaneous reduce
    • Subtle signs of trauma (swelling and effusion)
  – Obvious Deformity
    • Immediate reduction
    • Monitor pulses
    • Dimple sign (irreducible posterolateral dislocation)
Reduction of Dislocations

- Do not x-ray obvious deformity!
- Immediate reduction
- Neurovascular injuries common
- Gentle inline traction
- Transport immediately after 2-3 attempts at reduction
Always check neurovascular status of the limb **before** and **after** any reduction attempts!
Physical Exam

• Deformity
• Stability
• Vascular Exam
  – Priority to rule out vascular injury
  – Present pulses does not indicate absence of arterial injury
  – Immediate exploration and surgical repair if pulses absent on NV exam
Vascular Exam

- **Pulses Present**
  - Does not rule out arterial injury
  - Monitor ABI
    - ABI > 0.9 – serial exams
    - ABI < 0.9 – duplex exam or CT arthrography

- **Pulses Absent**
  - Reduce knee/Re-examine/ABI
  - Immediate surgical exploration
    - >8 hours ischemia – 86% amputation rate
Diagnosis

- Complete and careful physical examination
- Serial neurovascular evaluations!!!!!!
- AP and lateral XR
- +/- Arteriogram
- MRI
Imaging

- **RADIOGRAPHICS**
  - May be normal if spontaneous reduction
  - Irregular joint space
  - Avulsion fractures
  - Osteochondral defects

- **MRI**
  - Required to define soft tissue injuries
FIGURE 1. Recommended algorithm for the diagnosis of vascular injury following multiple ligament knee injuries. *Modified from the University of Washington/ Harborview Medical Center (Seattle, WA).

Algorithm Summary

Known or suspected knee dislocation or multiple ligament knee injury

Reduce knee joint (if needed)

Perform physical exam including assessment of distal perfusion and ankle brachial indices

Distal pulse present and well perfused limb with ABI >.90

Admit for 24 hour observation and serial physician examinations

Arterial duplex ultrasonography prior to ligament reconstruction

Distal pulses asymmetric OR Distal pulse present and well perfused limb with ABI <.90

Arteriogram

Distal pulse absent or other hard signs of vascular injury (distal ischemia, active hemorrhage, expanding pulsatile hematoma)

To operating room for surgical exploration with or without arteriogram

Nicandri et al, page 127
Associated Injuries

• Vascular
  – 20-40% in all dislocations
  – 50-60% in AP dislocations
  – Due to tethering of the popliteal fossa

• Nerve
  – Usually common peroneal nerve (25%)
  – Tibial nerve less common

• Fractures
  – Present in 60%
  – Tibia and Femur most common
Popliteal Artery Injuries

- Occurs in 20-40% of dislocations
  - Can be as high as 50%
- Anterior dislocations cause delayed thrombosis
- Posterior dislocations cause direct intimal fracture or transection of the vessel with immediate thrombosis
Peroneal Nerve Injury

- Less common than vascular injury
- Hyperesthesia at first web space and loss of dorsiflexion of the foot
- Poor prognosis of recovery
- Medial knee dislocations cause traction injuries to the nerve
- Rotational injuries have high incidence of nerve transection
Treatment

• Closed Reduction:
  – Orthopedic emergency
  – On the field reduction
  – Preference of controlled environment
  – Post reduction knee locked in brace at 15-30 degrees of flexion
  – Confirm NV status
Treatment

- Obtain and Maintain Reduction
Treatment

- Surgical Intervention:
  - Arteriogram in OR suite if absent pulses
  - Immediate versus delayed reconstructive procedures??
Treatment

- Emergent surgical intervention
  - Vascular injury repair
  - Open fracture/open dislocation
  - Irreducible dislocation
  - Compartment syndrome
Treatment: Knee Dislocation without Vascular Injury

• Operative repair should be done within 14 days of injury
  – Waiting leads to scarring and contractures and decreased ROM

• If Staging:
  – PLC first
  – PCL before ACL
  – ACL last

• Repair versus Reconstruction
Knee Dislocation
Case Presentation
Case Presentation

- 22 y.o. collegiate quarterback sustained an injury to his left knee during a game in early September 2013
- Locked posterolateral knee dislocation after direct blow to anterior aspect of left plant leg.
- Irreducible
What would you do?
What did we do?

• Could not be reduced on-the-field
• Neurovascular status intact
• Transported to ED for reduction under anesthesia
• CT arthrogram - negative
• Kept in hospital overnight for serial neurologic exams then transported home the next day
What did we do?

• Delayed (6 days) Simultaneous ACL/PCL/PLC Reconstructions
• PLC Repair and augmented reconstruction using a semi-tendinosis allograft
• PCL – Achilles tendon allograft
• ACL – Semitendinososis and gracilis allograft
Surgical Technique

- ACL femoral tunnel
- PCL femoral tunnel
- PCL stump
- ACL tibial tunnel
- PCL tibial tunnel
- Superior aspect of proximal end of tibia
- Tibial tunnels
Surgical Technique

ACL femoral tunnel

PCL femoral tunnel

ACL tibial tunnel

PCL tibial tunnel

Medial

PCL femoral tunnel

ACL femoral tunnel

ACL tibial tunnel

PCL tibial tunnel
PLC Augmented Reconstruction
PLC Augmented Reconstruction
PLC Augmented Reconstruction
PLC Augmented Reconstruction
ACL/PCL Video
Colosimo, Carroll, Heidt, Carlonas

- Presented at AANA, April 2000
- Retrospective study of 11 knee dislocations (7 acute, 4 chronic) with arthroscopically assisted ACL/PCL reconstruction
  - 7 with BPTB autograft for the ACL and achilles tendon allograft for the PCL
  - 3 patients with ipsilateral and contralateral BPTB autografts for both ACL and PCL
  - 1 patient with BPTB allograft for the ACL and Achilles allograft for the PCL
Colosimo, Carroll, Heidt, Carlonas

• Results:
  – Average age – 29.3 years
  – Average Post-operative FU 28.4 months
  – Average Lysholm – 87.7
  – Average anterior active KT-1000 difference was 2.6
  – 10/11 returned to previous level of activity
31 patients followed for 24 months
- 9 (ACL, PCL, PLC)
- 15 (ACL, PCL, MCL)
- 7 (ACL, PCL treated only)

19/31 were treated in under 3 weeks
12/31 were treated chronically (>3 weeks)
Lysholm scores, ADL scores and sports activity scores were all higher for patients treated acutely.
Patient satisfaction scores were higher in the acutely treated group
Eranki, Bregg and Wallace 2010

- 20 Total knee dislocations, followed for 2 years
  - 6 with vascular injury
  - 6 with neurological injury
- Pts with initially lower pre-injury level of activity were able to return to their pre-injury status
- 22% of competitive athletes returned to competitive sports
- 38% of heavy level activity returned
- 67% of moderate level returned
Eranki, Bregg and Wallace 2010

- 68% of the 20 patients regularly had problems running at 2 years
- 70% had problems squatting
- 40% had persistent swelling
- 42% had problems with stairs
- Most patients had NO problems locking or giving way
- 80% of patients were satisfied
Complications

- Arthrofibrosis (38%)
- Recurrent laxity and instability (37%)
- Peroneal Nerve injury (25%)
- Vascular Compromise
Thank You!