

Treatment of Acute Traumatic Knee Dislocations

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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



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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



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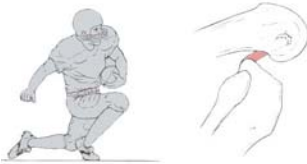
Knee Dislocation Video



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Knee Dislocation Classification


- Based upon the position of the tibia on the femur:
 - Anterior
 - Posterior
 - Lateral
 - Medial
 - Rotary



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Anterior Knee Dislocations


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



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Posterior Dislocation


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



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Lateral Dislocation

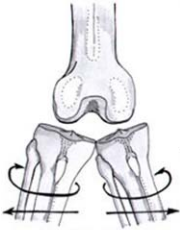

- 13% of knee dislocations
- Due to valgus force
- Highest rate of peroneal nerve injury
- Involves ACL and PCL tears



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Medial Dislocations

- Varus force
- Usually disrupts PLC and PCL




Medial, lateral and rotatory

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Rotational Dislocation


- Posterolateral is most common rotational dislocation
- Usually irreducible



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Presentation


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



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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)



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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



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Always check neuro-vascular status of the limb **before** and **after** any reduction attempts!

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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

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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



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Diagnosis

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



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Imaging

- **RADIOGRAPHS**
 - May be normal if spontaneous reduction
 - Irregular joint space
 - Avulsion fractures
 - Osteochondral defects
- **MRI**
 - Required to define soft tissue injuries

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Algorithm Summary

FIGURE 1. Recommended algorithm for the diagnosis of vascular injury following multiple ligament knee injury. Modified from the University of Washington/Harborview Medical Center (Seattle, WA).
 Clin J Sports Med, Volume 19, Number 2, March 2009
 Nicandri et al, page 127

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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

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Popliteal Artery Injuries

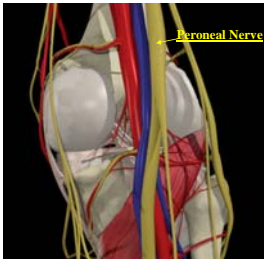
- Occurs in 20-40% of dislocations
 - Can be as high as 50%
- Anterior dislocations cause delayed thrombosis
- Posterior dislocations cause direct intimal fracture or transection of the vessel with immediate thrombosis



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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



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Treatment

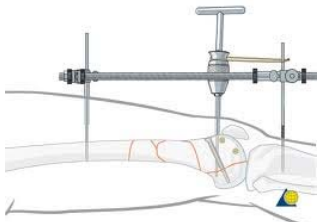
- Closed Reduction:
 - Orthopedic emergency
 - On the field reduction
 - Preference of controlled environment
 - Post reduction knee locked in brace at 15-30 degrees of flexion
 - Confirm NV status



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Treatment


- Obtain and Maintain Reduction



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Treatment

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



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Treatment

- Emergent surgical intervention
 - Vascular injury repair
 - Open fracture/open dislocation
 - Irreducible dislocation
 - Compartment syndrome

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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




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Knee Dislocation Case Presentation

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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



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Dislocation Video



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What would you do?



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What did we do?

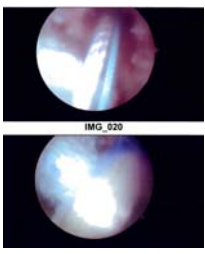
- Could not be reduced on-the-field
- Neurovascular status intact
- Transported to ED for reduction under anesthesia
- CT arthrogram - negative
- Kept in hospital overnight for serial neurologic exams then transported home the next day

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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 – Semitendinosis and gracilis allograft



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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

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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

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Harner, et al. JBJS 2004

- 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

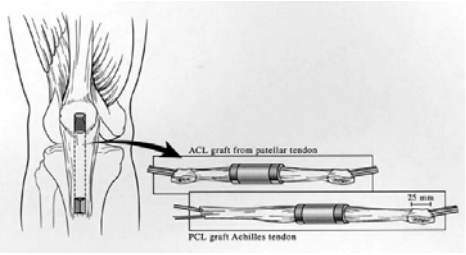
 

Eranki, Bregg and Wallace 2010

- 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

Surgical Technique

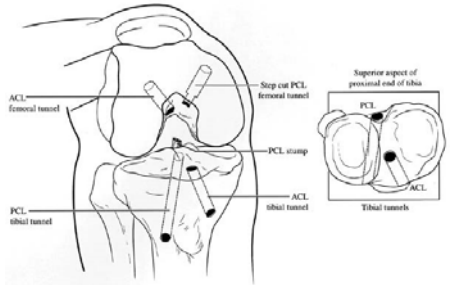


ACL graft from patellar tendon
PCL graft Achilles tendon

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This diagram illustrates the preparation of ACL and PCL grafts. On the left, a knee joint is shown with a vertical line indicating the location of the ACL graft harvest. On the right, two grafts are shown: the top one is labeled 'ACL graft from patellar tendon' and the bottom one is labeled 'PCL graft Achilles tendon'. Both grafts are shown with a 25 mm length and a 5 mm diameter.

Surgical Technique

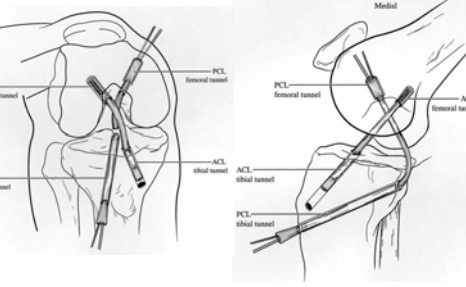


ACL femoral tunnel
PCL femoral tunnel
PCL tibial tunnel
ACL tibial tunnel
Tibial tunnels
PCL stump
Superior aspect of proximal end of tibia

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This diagram shows the placement of ACL and PCL tunnels in the knee. The ACL femoral tunnel is shown as a line from the femur to the tibia. The PCL femoral tunnel is shown as a line from the femur to the tibia. The PCL tibial tunnel is shown as a line from the tibia to the femur. The ACL tibial tunnel is shown as a line from the tibia to the femur. The tibial tunnels are shown as lines from the tibia to the femur. The PCL stump is shown as a line from the femur to the tibia. The superior aspect of the proximal end of the tibia is shown as a line from the tibia to the femur.

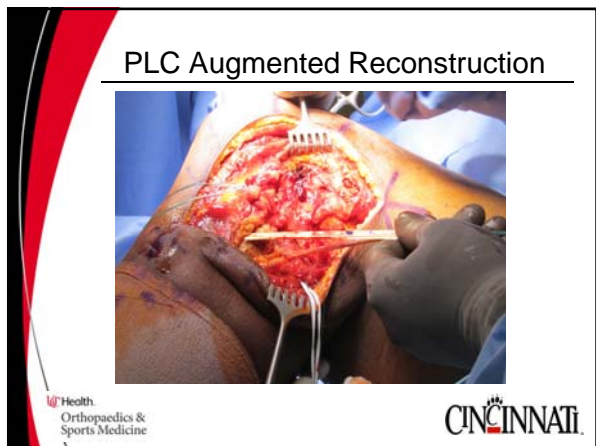
Surgical Technique



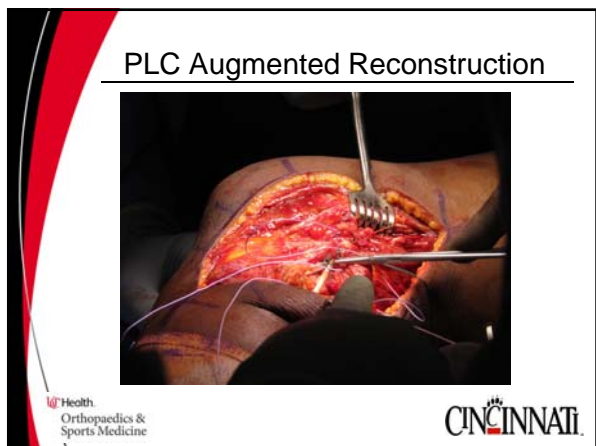
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PLC Augmented Reconstruction



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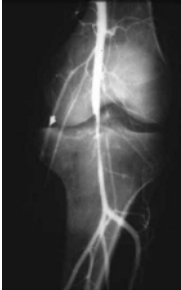
ACL/PCL Video



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Complications

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



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Thank You!



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