

The EM Educator Series

The EM Educator Series: Knee Dislocation Highlights

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Case#1: A 33-year-old female presents after MVC with right leg trauma and deformity. You find what appears to be a knee dislocation, with absence of distal right leg pulses.

Case#2: A 42-year-old male presents with severe left leg pain after stepping off a curb. He is obese, and to your surprise, left knee x-ray demonstrates dislocation.

Questions for Learners:

1. What do you need to know concerning knee anatomy?
2. What are mechanisms of injury that you must consider?
 - a. High vs. low energy mechanisms?
3. What complications may occur?
 - a. Fractures, nerve injuries, vascular injury, compartment syndrome
4. What should you consider with procedural sedation and reduction? What is your approach to reduction, and how do you troubleshoot difficulties?
5. What are important components in post-reduction management?

Suggested Resources:

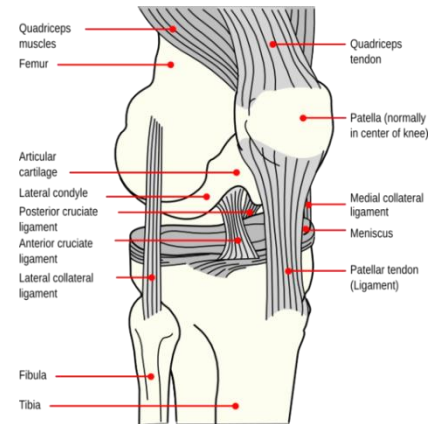
- ✓ Articles:
 - [Orthobullets EM Dislocation](#)
 - [emDocs – Knee Dislocation: Pearls and Pitfalls](#)
 - [CoreEM – True Knee + Patellar Dislocations](#)
- ✓ Podcasts:
 - [FOAMCast – Episode 22 – The Knee](#)
 - [Emergency Medicine Cases – Episode 21 Occult Knee Injuries Pearls and Pitfalls](#)
 - [EM Updates Procedural Sedation](#)

Answers for Learners:

1. What do you need to know concerning knee anatomy?

The femoral artery gives rise to the popliteal artery. The collateral blood supply system of the lower leg breaks off from the popliteal artery below the knee joint. The popliteal artery is held down firmly at either end of the knee joint, proximally by the tendinous hiatus of the adductor magnus muscle and distally by the tendinous arch of the soleus muscle. As a result, the popliteal artery is anchored down like a bowstring, placing it at risk for injury during knee dislocations.

- Osteology
 - the knee is a ginglymoid joint and consists of tibiofemoral, patellofemoral and tibiofibular articulations
- Ligaments
 - PCL, ACL, LCL, MCL, and PLC are all at risk for injury
- main stabilizers of the knee given the limited stability afforded by the bony articulations
- Blood supply
 - popliteal artery injuries occur often due to tethering at the popliteal fossa
 - proximal - fibrous tunnel at the adductor hiatus
 - distal - fibrous tunnel at soleus muscle
 - geniculate arteries may provide collateral flow and palpable pulses masking a limb-threatening vascular injury
- Biomechanics
 - the normal range of motion of 0-140 degrees with 8-12 degrees of rotation during flexion/extension



2. What are mechanisms of injury that you must consider?

a. High vs. low energy mechanisms?

Knee dislocations may occur from MVAs, high impact sports, downhill skiing, or gym exercises (leg presses with heavy loads). Most dislocations will be clinically evident, presenting with a history of trauma and have an abnormal knee examination. Given the joint has a tendency to spontaneously reduce, it is important to determine the mechanism and position of the leg immediately following the injury. The patient may report a history of the knee “popping out” and then “popping in.” Can also be from a low-energy mechanism such as a fall from standing in the morbidly obese or a seemingly more benign sports injury such as a football tackle.

3. What complications may occur?

a. Fractures, nerve injuries, vascular injury, compartment syndrome

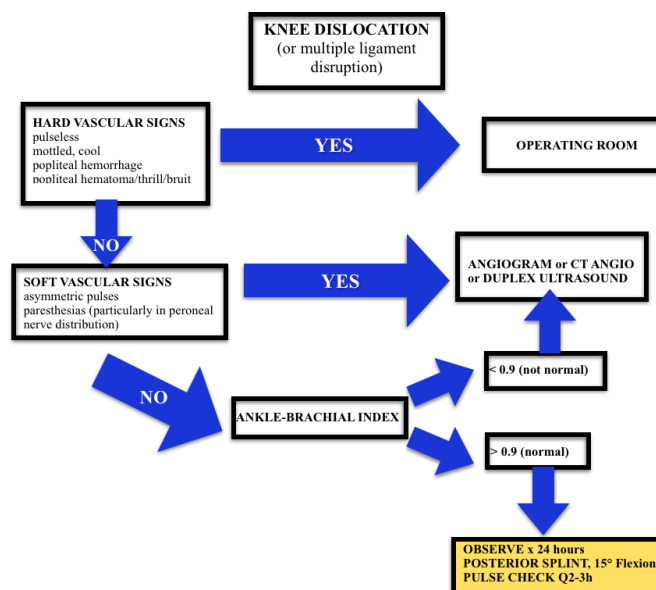
Fractures are present in 60% of knee dislocations with tibia and femur most common.

Peroneal nerve injury (“foot drop”) is the **most common neurologic complication associated with knee dislocation**. Complete nerve palsy in the acute setting portends a poor prognosis for recovery (6). The peroneal nerve provides ankle dorsiflexion, toe extension and sensation to first dorsal web space (deep peroneal nerve).

Evaluating the vascular status of the limb is the **most essential part** of the physical examination. The circulatory status of the lower leg can be assessed by palpating distal as well as popliteal pulses, obtaining Ankle-Brachial Indices (ABIs), and performing screening duplex ultrasound (if available). Emergent vascular surgery consultation is warranted in patients with “**hard**” signs of vascular injury, these include:

- Absence of pulse
- Signs of limb ischemia
 - Pale or dusky leg
 - Paresthesias and paralysis
- Rapidly expanding hematoma
- Pulsatile bleeding
- Bruit or thrill over the wound

Delay of popliteal artery repair **beyond 8 hours**, in patients with popliteal artery injury, invariably leads to limb amputation. **Physical examination alone is not reliable enough to rule out popliteal vessel injury. There is no physical exam finding that reliably rules out vascular injury.** For example, the presence of warm skin over the lower extremity has been reported in the presence of complete popliteal arterial occlusion. Full dorsalis pedis and posterior tibial pulses following reduction do not exclude vessel injury as patients may still have occult intimal tear and are at risk of thrombus formation hours to days after event.



4. What should you consider with procedural sedation and reduction? What is your approach to reduction, and how do you troubleshoot difficulties?

- Sedation: See EM Update videos → key to tailor the agent you choose in regards to your patient, procedure length of time and muscle relaxation you need. Know your pharmacology on all your drugs!
- 50% of knee dislocations will spontaneously reduce before ED arrival. Suspect dislocation in patients with significant joint swelling and laxity
- Knee reduction should not be delayed for imaging due to the risk for arterial injury
- **Knee Joint Reduction** (see [video](#))
 - Apply longitudinal traction to the tibia (this may be all that is required with severe ligament damage)
 - If traction is not successful, the next step is to reverse the direction of the dislocation.
 - Anterior dislocation: lift the distal femur and push the tibia posteriorly.
 - Posterior dislocation: place pressure over the distal femur and lift the tibia anteriorly.
 - Rotatory dislocations: rotate the tibia back towards its natural position.
 - After reduction, the knee should be immobilized in a **long leg posterior splint with the knee in 15-20 degrees of flexion.**

5. What are important components in post-reduction management?

- **Post-reduction Care**
 - Check popliteal artery, DP + PT pulses
 - Obtain emergent vascular surgery consultation if pulses are weak/absent, or if there are hard signs of an ischemic limb or vascular injury (diminished or absent pulses, pale or dusky skin, paresthesias, paralysis)
 - Obtain ankle-brachial index (ABI) and/or bedside duplex ultrasound screen
 - $ABI > 0.9$, distal pulses are strong, and normal duplex: immobilize the knee and admit for observation and serial vascular examinations.
 - $ABI < 0.9$, pulses are asymmetric, or if the duplex is abnormal: obtain an urgent arteriogram or CTA in consultation with vascular surgery