Traumatic Knee Dislocations
Evaluation, Management, and Surgical Treatment

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KEYWORDS

• Knee dislocation • Multi-ligament knee injury • Multi-ligament reconstruction knee • Knee reduction

KEY POINTS

- Knee dislocation is a relatively uncommon but often missed diagnosis leading to significant morbidity.
- Serial examination of a suspected knee dislocation is essential in the prevention of missed arterial injury. Routine arteriography is not recommended.
- Augmenting primary repair of the medial and lateral ligamentous structures with graft reconstruction can be beneficial, particularly with posteromedial or posterolateral corner disruptions. Cruciate graft longevity is compromised if collateral structures are not restored.
- Currently, angiography (routine or computed tomographic angiography/magnetic resonance angiography) is recommended for patients demonstrating insufficient perfusion or any asymmetry in physical examination. Universal angiography is not recommended.
- Clinicians must be aware of the existence of an irreducible knee dislocation. Use caution during reduction and cognizant of signs (dimple sign, excessive force required for reduction, joint asymmetry after reduction attempt). The cases should undergo open reduction in the operating room.

INTRODUCTION

Incidences of knee dislocations have historically been reported as less than 0.02% of all musculoskeletal injuries.[1,2] This number is most likely an underestimate caused by spontaneous reductions and missed diagnosis.[1,3] Knee dislocations have, in recent years, become increasingly recognized because of the advances in imaging modalities and a better understanding of the dynamic nature of knee stability through 3 major ligamentous structures and the joint capsule.[4,5] Radiographic evidence of frank dislocation is not always available, and the clinician must be aware of other clues of a dislocation that may have spontaneously reduced in the field. Most knee dislocations are the result of high-energy mechanisms, and careful history and physical examination in a systematic approach will aid in identifying patients at risk for this injury.

CAUSE
Mechanism

The available literature on knee dislocations includes several retrospective studies with very few patients owing to the relatively rare nature of the injury. Incidence in males out number females

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almost 2.5:1.0; these injuries usually result from a high-energy mechanism, the most common being motor vehicle collision (up to 50% of reported cases).[6,7] The other 2 most common mechanisms include sports injuries (up to 33%) and simple falls (up to 12%).[8] Patients in the high-energy group are often polytrauma patients with associated fractures and ipsilateral joint dislocations.[9,10] A fourth subset, designated ultralow energy, has been recently described and some patterns elucidated.[8]

Classification

As with all traumatic injuries, the first description of a knee dislocation includes whether the injury is closed versus open and the time from injury to presentation. It is important for the examiner to determine if the dislocation is partial (subluxed), spontaneously reduced, or complete.[3] The classification systems used in the past for knee dislocations are summarized in **Table 1**. Kennedy described knee dislocations based on the direction of tibial translation relative to a stationary femur (**Fig. 1**). This system enables effective communication if the knee remains dislocated. The major limitation with this system is the variability in injured ligaments when only accounting for the dislocation direction.[15] McCoy and colleagues[11] and Shelbourne[12] created classification systems, and each used the energy of the injury mechanism. High-, low-, and ultralow energy mechanisms were described; higher-energy injuries have a higher incidence of vascular injury. Taking a thorough history is always important with these injuries. Palmer[13] classified knee dislocations based on the time since the injury, defining the 3-week mark as an important date. Before 3 weeks, the joint capsule has not healed and surgical intervention for ligament repair was not advised. Boisgard and colleagues[14] created a classification system that included all bicruciate ligament injuries but also included knees that did not dislocate (see **Table 1**).

Schenk developed a classification system that is based on the anatomic structures injured. This system was modified by Wascher and then Yu and is now the most widely used and accepted classification available. It accounts for injured ligaments, vascular or neurologic injury, and also whether an associated fracture is present. Schenk's classification is strictly for knee dislocations and does not include knees with bicruciate injuries that did not dislocate (**Table 2**).

Schenk's classification was later modified to include 3 letter designations. Dislocations with an associated fracture were designated *V*, those with associated arterial injury designated *C*, and those with associated nerve injury designated *N* (**Table 3**).[15]

EVALUATION

Acute Assessment

Cases of suspected knee dislocation in the acute setting are often the result of high-energy mechanisms. Initial evaluation includes the primary survey according to the Advanced Trauma and Life Support protocol before the secondary survey, which includes prompt but careful evaluation of the neurologic and vascular status of the affected limb.

The diagnosis is relatively straightforward in patients with an unreduced knee dislocation (**Fig. 2**). Proceeding in a stepwise pattern is

Table 1
Historical knee dislocation classification systems

Author, Date	Basis of Classification	Types	Drawbacks	Utility
Kennedy,[10] 1963	Direction of tibial dislocation as related to femur	1. Anterior 2. Posterior 3. Medial 4. Lateral 5. Rotatory	Difficult to identify direction of dislocation in spontaneously reduced knees	Limited: direction of dislocation not reliable predictor of injured structures
McCoy et al,[11] 1987; S helbourne,[12] 1991	Energy imparted at time of injury	1. High 2. Low 3. Ultralow	Requires detailed history and patients who are not obtunded	Higher-energy mechanisms associated with increased incidence of vascular and soft tissue compromise
Palmer,[13] 2007; Boisgard et al,[14] 2009	Period of time from injury to management	Acute vs chronic	3 wk is the division point between acute and chronic	Management recommendations based on injury acuity

Data from Refs.[10–14]