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Knee pain and injury: When is a surgical consult needed?

This review identifies clinical scenarios—such as unstable or displaced fractures, major tendon ruptures, and significant mechanical issues—that likely warrant surgical consultation.

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PRACTICE RECOMMENDATIONS

› *Consider surgical management, potentially emergently, for acute knee injuries that result in significant joint instability, unstable fractures, or neurovascular compromise.* (A)

› *Avoid arthroscopy for chronic, degenerative sources of knee pain, such as osteoarthritis and degenerative meniscus tears, as it is no longer routinely recommended.* (A)

› *Treat osteoarthritis surgically after nonsurgical treatments have failed.* (A)

Strength of recommendation (SOR)

(A) Good-quality patient-oriented evidence

(B) Inconsistent or limited-quality patient-oriented evidence

(C) Consensus, usual practice, opinion, disease-oriented evidence, case series

Evidence supports what family physicians know to be true: Knee pain is an exceedingly common presenting problem in the primary care office. Estimates of lifetime incidence reach as high as 54%,[1] and the prevalence of knee pain in the general population is increasing.[2] Knee disability can result from acute or traumatic injuries as well as chronic, degenerative conditions such as osteoarthritis (OA). The decision to pursue orthopedic consultation for a particular injury or painful knee condition can be challenging. To address this, we highlight specific knee diagnoses known to cause pain, with the aim of describing which conditions likely will necessitate surgical consultation—and which won't.

Acute or nondegenerative knee injuries and pain

Acute knee injuries range in severity from simple contusions and sprains to high-energy, traumatic injuries with resulting joint instability and potential neurovascular compromise. While conservative treatment often is successful for many simple injuries, surgical management—sometimes urgently or emergently—is needed in other cases, as will be detailed shortly.

Neurovascular injury associated with knee dislocations

Acute neurovascular injuries often require emergent surgical intervention. Although rare, tibiofemoral (knee) dislocations pose a significant challenge to the clinician in both diagnosis and management. The reported frequency of popliteal artery injury or rupture following a dislocation varies widely, with rates ranging from 5% to 64%, according to older studies; more recent data, however, suggest the rate is actually as low as 3.3%.[3] Vascular injury can lead to irreversible tissue damage and even limb loss if not promptly identified. Identifying a knee disloca-

FIGURE 1

Displaced tibial plateau fracture

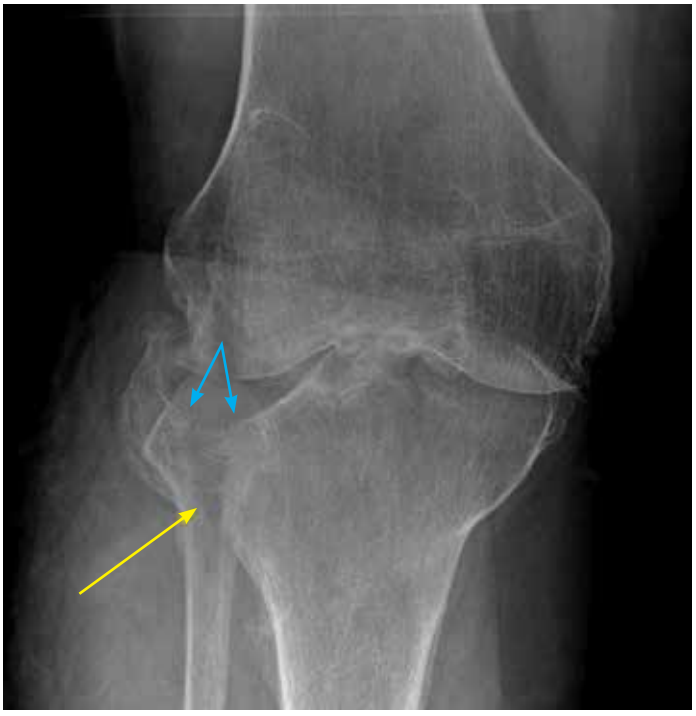

IMAGE COURTESY OF DAVID M. SIEBERT, MD, AND CHRISTOPHER KWEON, MD

This x-ray revealed a displaced lateral tibial plateau fracture (yellow arrow) with disruption of the tibial articular surface (double blue arrow) and lateral displacement of the fracture fragment. Surgical consultation was requested.

tion can prove challenging, as spontaneous joint reduction occurs in as many as 50% of cases, potentially shrouding the severity of the injury on initial evaluation.[4]

Immediate immobilization and emergency department transport for monitoring, orthopedics consultation, and vascular studies or vascular surgery consultation is recommended in the case of a suspected knee dislocation. In one cross-sectional cohort study, the surgical management of knee dislocations yielded favorable outcomes in > 75% of cases.[5]

Tibial plateau fracture

This fracture often occurs as a result of high-energy trauma, such as contact sports or motor vehicle accidents, and is characterized by a proximal tibial fracture line with extension to the articular surface. X-rays often are sufficient for initial diagnosis. Computed tomography can help rule out a fracture line when clinical suspicion is high and x-rays are nondiagnostic. As noted earlier, any suggestion of neurovascular compromise on physical exam requires an emergent orthopedic surgeon consultation for a possible displaced and unstable (or more complex) injury (**FIGURE 1**).[6-8]

Nondisplaced tibial plateau fractures without supraphysiologic ligamentous laxity on valgus or varus stress testing can be managed safely with protection and early mobilization, gradual progression of weight-bearing, and serial x-rays to ensure fracture healing and stability. Surgical management and fixation are required emergently for open fractures or gross joint instability with vascular or neurologic compromise. Suspicion of these complications is raised by distal neuropathic symptoms of paresthesia or skin anesthesia, progressively worsening pain distal to the knee, or vascular signs of pallor, delayed or lost capillary refill, or decreased or absent distal pulses.

Gross joint instability identified by positive valgus or varus stress testing, positive anterior or posterior drawer testing, or patient inability to tolerate these maneuvers due to pain similarly should raise suspicion for a more significant fracture at risk for concurrent neurovascular injury. Acute compartment syndrome also is a known complication of tibial plateau fractures and similarly requires emergent operative management. Urgent surgical consultation is recommended for fractures with displaced fracture fragments, tibial articular surface step-off or depression, fractures with concurrent joint laxity, or medial plateau fractures.[6-8]

Patella fractures

These fractures occur as a direct blow to the front of the knee, such as falling forward onto a hard surface, or indirectly due to a sudden extreme eccentric contraction of the quadriceps muscle. Nondisplaced fractures with an intact knee extension mechanism, which is examined via a supine straight-leg raise or seated knee extension, are managed with weight-bearing as tolerated in strict immobilization in full extension for 4 to 6 weeks, with active range-of-motion and isometric quadriceps exercises beginning in 1 to 2 weeks. Serial x-rays also are obtained to ensure fracture displacement does not occur during the rehabilitation process.[9]

High-quality evidence guiding follow-up care and comparing outcomes of surgical and nonsurgical management of patella fractures is lacking, and studies comparing different surgical techniques are of lower methodological quality.[10] Nevertheless, displaced or comminuted patellar fractures are referred urgently to orthopedic surgical care for fixation, as are those with concurrent loose bodies, chondral surface injuries or articular step-off, or osteochondral fractures.[9] Inability to perform a straight-leg raise (ie, clinical loss of the knee extension mechanism) suggests a fracture under tension that likely also requires surgical fixation for successful recovery. Neurovascular injuries are unlikely in most patellar fractures but would require emergent surgical consultation.[9]

Ligamentous injury

Tibiofemoral joint laxity occurs as a result of ligamentous injury, with or without tibial plateau fracture. The anterior cruciate ligament (ACL), posterior cruciate ligament (PCL), medial collateral ligament (MCL), and lateral collateral ligament (LCL) comprise the 4 main ligaments of the knee. The ACL resists anterior tibial translation and rotational forces, while the PCL resists posterior tibial translation. The MCL and LCL resist valgus and varus stress, respectively.

Ligament injuries are classified as Grades 1 to 3[11]:

- **Grade 1 sprains**. The ligament is stretched, but there is no macroscopic tearing; joint stability is maintained.
- **Grade 2 sprains**. There are partial macroscopic ligament tears. There is joint laxity due to the partial loss of the ligament's structural integrity.
- **Grade 3 sprains**. The ligament is fully avulsed or ruptured with resultant gross joint instability.

The decision to pursue surgical repair of a knee sprain depends heavily on the likelihood of keeping or regaining and maintaining functional joint stability during the injury recovery and postinjury time periods. Injuries that do not result in joint instability or injuries with a high likelihood of returning to a stable state with conservative measures often do not require surgical intervention.

ACL tears occur most commonly via a noncontact event, as when an individual plants their foot and suddenly changes direction during sport or other physical activity. Treatment hinges on patient activity levels and participation in sports. Patients who do not plan to engage in athletic movements (that require changes in direction or planting and twisting) and who otherwise maintain satisfactory joint stability during activities of daily living may elect to defer or even altogether avoid surgical reconstruction of isolated ACL tears. One pair of studies demonstrated equivalent outcomes in surgical and nonsurgical management in 121 young, nonelite athletes at 2- and 5-year follow-up, although the crossover from the nonsurgical to surgical groups was high.[12,13] Athletes who regain satisfactory function and stability nonoperatively can defer surgical intervention. However, the majority of active patients and athletes will require surgical ACL reconstruction to return to pre-injury functional levels.[14]

PCL sprains occur as a result of sudden posteriorly directed force on the tibia, such as when the knee is hyperextended or a patient falls directly onto a flexed knee. Patients with Grade 1 and 2 isolated sprains generally will recover with conservative care, as will patients with some Grade 3 complete tears that do not fully compromise joint stability. However, high-grade PCL injuries often are comorbid with posterolateral corner or other injuries, leading to a higher likelihood of joint instability and thus the need for surgical intervention for the best chance at an optimal outcome.[15]

MCL sprain. Surgical management is not required in an isolated Grade 1 or 2 MCL sprain, as the hallmarks of recovery—return of joint stability, knee strength and range of motion, and pain reduction—can be achieved successfully with conservative management. Isolated Grade 3 MCL sprains are also successfully managed nonoperatively[16] except in specific cases, such as a concurrent large avulsion fracture.[17]

LCL sprain. Similarly, isolated Grade 1 and 2 LCL sprains generally do not require surgical intervention. However, Grade 3 LCL injuries usually do, as persistent joint insta-

Vascular injury can lead to irreversible tissue damage and even limb loss if not promptly identified.

bility and poor functional outcomes are more common with nonsurgical management.[18-20] Additionally, high-grade LCL injuries frequently manifest with comorbid meniscus injuries or sprains of the posterolateral corner of the knee, a complex anatomic structure that provides both static and dynamic tibiofemoral joint stability. Surgical repair or reconstruction of the posterolateral corner frequently is necessary for optimal functional outcomes.[21]

Multiligamentous sprains frequently lead to gross joint instability and necessitate orthopedic surgeon consultation to determine the best treatment plan; this should be done emergently if neurovascular compromise is suspected. A common injury combination is simultaneous ACL and MCL sprains with or without meniscus injury. In these cases, some surgeons will choose to defer ACL reconstruction until after MCL healing is achieved. This allows the patient to regain valgus stability of the joint prior to performing ACL reconstruction to regain rotational and anterior stability.[20]

Patellar dislocations represent a relatively common knee injury in young active patients, often occurring in a noncontact fashion when a valgus force is applied to an externally rotated and planted lower leg. A chief risk factor for a patellar dislocation is a history of prior dislocation. If rehabilitation following a dislocation is insufficient to regain patellofemoral joint stability, or if certain risk factors for recurrent dislocation are present, surgical intervention, such as medial patellofemoral ligament (MPFL) reconstruction or tibial tubercle transfer, is considered.[22] A systematic review concluded that MPFL reconstruction following a first-time dislocation yielded lower redislocation rates of 7% compared to 30% with nonoperative treatment.[23]

Surgical management and fixation are required emergently for open fractures or gross joint instability with vascular or neurologic compromise.

Major tendon rupture

Patellar tendon ruptures occur when a sudden eccentric force is applied to the knee, such as when landing from a jump with the knee flexed. Patellar tendon ruptures frequently are clinically apparent, with patients demonstrating a high-riding patella and loss of active knee extension. Quadriceps tendon ruptures often result from a similar injury mechanism in older patients, with a similar loss of active knee extension and a palpable gap superior to the patella.[24]

Partial tears in patients who can maintain full extension of the knee against gravity are treated nonoperatively, but early surgical repair is indicated for complete quadriceps or patellar tendon ruptures to achieve optimal outcomes. Prompt diagnosis and treatment are critical, as repair delayed beyond 1 to 2 weeks postinjury is associated with worse outcomes.[25-28]

Even with prompt treatment, return to sport is not guaranteed. According to a recent systematic review, athletes returned to play 88.9% and 89.8% of the time following patellar and quadriceps tendon repairs, respectively. However, returning to the same level of play was less common and achieved 80.8% (patellar tendon repair) and 70% (quadriceps tendon repair) of the time. Return-to-work rates were higher, at 96% for both surgical treatments.[29]

Locked knee and acute meniscus tears in younger patients

In some acute knee injuries, meniscus tears, loose cartilage bodies or osteochondral defects, or other internal structures can become interposed between the femoral and tibial surfaces, preventing both active and passive knee extension. Such injuries are often severely painful and functionally debilitating. While manipulation under anesthesia can acutely restore joint function,[30] diagnostic and therapeutic arthroscopy often is pursued for definitive treatment.[31] Compared to the gold standard of diagnostic arthroscopy, preoperative magnetic resonance imaging (MRI) carries positive and negative predictive values of 85% and 77%, respectively, in identifying or ruling out the anatomic structure responsible for a locked knee.[32] As such, MRI has been proposed as a method to avoid performing arthroscopy on a patient with a "pseudo-locked" knee, or loss of range of motion due to pain but without a true mechanical block.[32]

Depending on the location, size, and shape of an acute meniscus tear in younger patients, surgical repair may be an option to preserve long-term joint function. In one case

series of patients younger than 20 years, 62% of meniscus repairs yielded good outcomes after a mean follow-up period of 16.8 years.[33]

Osteochondritis dissecans

Osteochondritis dissecans is characterized by subchondral bone osteonecrosis that most often occurs in pediatric patients, potentially causing the separation of a fragment of articular cartilage and subchondral bone into the joint space (**FIGURE 2**). In early stages, nonoperative treatment consisting of prolonged rest followed by physical therapy to gradually return to activity is recommended to prevent small, low-grade lesions from progressing to unstable or separated fragments. Arthroscopy, which consists of microfracture or other surgical resurfacing techniques to restore joint integrity, is pursued in more advanced cases of unstable or separated fragments.

High-quality data guiding the management of osteochondritis dissecans are lacking, and these recommendations are based on consensus guidelines.[34]

Septic arthritis

Septic arthritis is a medical emergency caused by the hematogenous spread of microorganisms, most often staphylococci and streptococci species. Less commonly, it arises from direct inoculation through an open wound or, rarely, iatrogenically following a joint injection procedure. Clinical signs of septic arthritis include joint pain, joint swelling, and fever. Passive range of motion of the joint is often severely painful. Synovial fluid studies consistent with septic arthritis include an elevated white blood cell count greater than 25,000/mcL with polymorphonuclear cell predominance.[35] The knee accounts for more than 50% of septic arthritis cases, and surgical drainage usually is required to achieve infection source control and decrease morbidity and mortality due to destruction of articular cartilage when treatment is delayed.[36]

Chronic knee injuries and pain

Surgical intervention for chronic knee injuries and pain generally is considered when patients demonstrate significant functional impairment and persistent symptoms despite pursuing numerous nonsurgical treatment options. A significant portion of chronic knee pain is due to degenerative processes such as OA or meniscus injuries, or tears without a history of trauma that do not cause locking of the knee. Treatments for degenerative knee pain include supervised exercise, physical therapy, bracing, offloading with a cane or other equipment, topical or oral anti-inflammatories or analgesics, and injectable therapies such as intra-articular corticosteroids.[37]

Other common causes of chronic knee pain include chronic tendinopathy or biomechanical syndromes such as patellofemoral pain syndrome or iliotibial band syndrome. Surgical treatment of these conditions is pursued in select cases and only after exhausting nonoperative treatment programs, as recommended by international consensus statements,[38] societal guidelines,[39] and expert opinion.[40] High-quality data on the effectiveness, or ineffectiveness, of surgical intervention for these conditions are lacking.

CONTINUED

FIGURE 2

Unstable and displaced osteochondral lesion

IMAGE COURTESY OF DAVID M. SIEBERT, MD, AND CHRISTOPHER KWEON, MD

This x-ray revealed an unstable and displaced osteochondral lesion (arrow) that separated from the femoral condyle and warranted surgical consultation.

TABLE

When to consider surgical intervention for acute or nondegenerative knee pain[3-10,12-36]

Injury group or type	Example diagnoses
Neurovascular injury following dislocation[3-5]	• Popliteal artery rupture[a]
Unstable fractures[6-10]	• Displaced or depressed tibial plateau fracture • Patella fracture with loss of knee extension mechanism
Joint instability or laxity[12-23]	• ACL rupture • Multiligamentous knee injury • Recurrent patellar dislocations
Major tendon rupture[24-29]	• Patellar tendon rupture • Quadriceps tendon rupture
Locked knee or meniscus tear[30-33]	• "Bucket handle" meniscus tear • Meniscus tear types amenable to repair, such as certain peripheral tears
Osteochondritis dissecans[34]	• Medial femoral condyle lesion • Lateral femoral condyle lesion
Septic arthritis[35,36]	• *Staphylococcus aureus* infection[a]

ACL, anterior cruciate ligament.
[a] Emergent consultation required.

Despite being one of the most commonly performed surgical procedures in the United States,[41] arthroscopic partial meniscectomy treatment of degenerative meniscus tears does not lead to improved outcomes compared to nonsurgical management, according to multiple recent studies.[42-45] Evidence does not support routine arthroscopic intervention for degenerative meniscus tears or OA,[42] and recent guidelines recommend against it[46] or to pursue it only after nonsurgical treatments have failed.[37]

Surgical management of degenerative knee conditions generally consists of partial or total arthroplasty and is similarly considered after failure of conservative measures. Appropriate use criteria that account for multiple clinical and patient factors are used to enhance patient selection for the procedure.[47]

Takeaways

Primary care clinicians will treat patients sustaining knee injuries and see many patients with knee pain in the outpatient setting. Treatment options vary considerably depending on the underlying diagnosis and resulting functional losses. Several categories of clinical presentation, including neurovascular injury, unstable or displaced fractures, joint instability, major tendon rupture, significant mechanical symptoms such as a locked knee, certain osteochondral injuries, and septic arthritis, likely or almost always warrant surgical consultation (**TABLE**[3-10,12-36]). Occasionally, as in the case of neurovascular injury or septic arthritis, such consultation should be emergent. JFP

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A chief risk factor for a patellar dislocation is a history of prior dislocation.

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