Injured Knees: Recommendations for Improving Care

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Initial approach: determine whether injury traumatic or atraumatic; identify characteristics of pain; determine whether swelling caused by problem inside or outside of knee; ask about instability and mechanism of injury

Structures in knee: hinge joint that rotates slightly, and slides backwards and forwards; 2 collateral ligaments; anterior cruciate ligament (ACL); posterior cruciate ligament (PCL); menisci cartilage absorbs shock; articular cartilage lines joints (wear and tear leads to arthritis); capsule and muscles provide dynamic stabilization; tendons; connected to hip and ankle (check alignment, strength, flexibility, balance, and neurologic function).

Swelling in knee: intra-articular swelling — dimple on each side of knee not visible, as in, eg, advanced arthritis; prepatellar bursitis — swelling in fat pads and around kneecap; swelling in patellar tendon — can be caused by exercise; dimple usually maintained; aspiration — not necessary, unless rheumatologic cause suspected or to rule out infection; with acute swelling, fluid most likely blood

Diagnosis of acute hemarthrosis: ACL injury — most common; usually due to twisting injury; fractures — tibial plateau fracture; patellar fracture; growth plate fracture in children; supracondylar fracture; patellar dislocation — when kneecap slides out of position, tearing of soft tissue causes bleeding into knee joint; others — rare; rupture of quadriceps or patellar tendon; bone chips in younger athletes with osteochondritis dissecans; in older patients, meniscuslesion tears do not cause high amount of bleeding

Treatment of swelling: rest, ice, compression, elevation (RICE); immobilization of knee with brace; offloading with crutches; if major structural problem or fracture ruled out, then early focus on regaining motion important; prolonged immobilization of knee can lead to stiffness; physical therapy helpful; refer patient if structural or intra-articular problem suspected

Activities and forces on knee: ~2200 N of force required to tear ACL; ~2500 N required to tear PCL; ~4000 N required to tear medial collateral ligament (MCL); 750 N required to tear lateral collateral ligament; walking places ~170 N of force on knee; ACL tear or ligament injury occurs from strenuous activity or fall

ACL injury: can be partial or complete; in young athletes, can avulse growth plate (tibial eminence fracture); mechanism — usually occurs via landing from jump in knock-knee position or from pivoting; intra-articular swelling occurs within minutes; knee buckles after landing in knock-knee position; subluxation causes ACL to rip; findings — instability (“double fist sign”); feeling as though lower leg coming out from below; patient may have O’Donoghue (“unhappy”) triad (ACL tear, MCL tear, and medial meniscus tear); lateral meniscus more often torn than medial meniscus (causes tenderness on lateral joint line); range of motion limited

Testing: stress test — fix femur with one hand and pull tibia forward with 10 to 15 lb of force; Lachman test — performed while knees flexed at 20° to 30°; most sensitive test; anterior drawer test — performed while patient supine; tibia pulled forward with 2 hands; less sensitive, but highly specific;drop Lachman test — combination of Lachman and anterior drawer tests; while knees flexed at 20° to 30°, anterior drawer test performed in Lachman position; for clinicians with small hands, most sensitive and specific test; x-rays — helpful for ruling out fractures and bone chips; may appear normal; Segond fracture or avulsion fracture of lateral tibial plateau characteristic of ACL injury; magnetic resonance imaging (MRI) — highly sensitive and specific; positive findings include linear fibers oriented back-to-front on sagittal cuts and wavy lines; “question mark” configuration of PCL indicates that anterior tibia translated forward; may find bone bruise on tibia or femur

Treatment: conservative treatment — physical therapy; restoration of normal function; resolution of symptoms; ACL reconstruction — recommended for patients with active lifestyle who do not have arthritis; 90% achieve fairly good results; full recovery takes 6 to 9 mo; ~30% of patients do not require surgery

Conditions requiring referral to orthopedic surgeon within 1 wk: stable fracture; patellar dislocation; tumor; locked knee — red flag; inability to extend knee; rule out quadriceps rupture, patellar fracture, and patellar tendon rupture; consider “bucket handle” tear of medial meniscus, ACL tear, or bone chip; other causes include arthritis and MCL sprain; initial treatment — RICE; immobilization; physical therapy; pain relief

MCL injury: valgus injury; mechanism — often occurs when landing in “splits” or on outside part of leg, and going into knock-knee position; symptoms — isolated pain on inside part of knee; 5. Discuss chronic pain in the contexts of systems theory and complexity theory, and as a hypothetical construct.

Educational Objectives

The goals of this program are to improve management of knee injuries and to improve understanding of the possibilities of complementary and alternative medicine (CAM) for pain management. After hearing and assimilating this program, the clinician will be better able to:

1. Determine causes of knee swelling based on clinical findings.
2. Distinguish medial collateral ligament injuries from meniscus tears.
3. Recognize when to refer patients with knee injury to an orthopedic surgeon.
4. Describe types of CAM, such as manipulation therapy and patient-directed treatments.

Faculty Disclosure

In adherence to ACCME Standards for Commercial Support, Audio Digest requires all faculty and members of the planning committee to disclose relevant financial relationships within the past 12 months that might create any personal conflicts of interest. Any identified conflicts were resolved to ensure that this educational activity promotes quality in health care and not a proprietary business or commercial interest. For this program, the following has been disclosed: Dr. Doley is on an advisory board for and has received honoraria from Medtronic, and is on the Speakers’ Bureaus for Kaléo, Inc and Medtronic. Dr. Luke reported nothing to disclose. The planning committee reported nothing to disclose.
instability in knock-knee position; valgus stress test — while keeping ankle fixed, use heel of hand to bend knee at 20° and push across knee; check both knees; imaging studies — x-rays usually normal; MRI not necessary unless problem or swelling persists for, eg, 6 wk (rule out meniscus pathology); early treatment — pain relief; use of hinge brace; physical therapy; need for surgery rare

**Diagnosing meniscus tear and distinguishing it from MCL injury:** mechanism — in older individuals, squatting or getting up from awkward position can cause meniscus tear; in younger patients, meniscus injury usually associated with twisting injury; symptoms — catching; tenderness of medial or lateral joint line, usually over back aspect of knee (flexed position of knee places pressure on meniscus); repetitive motion can cause irritation of meniscus and swelling; joint line tenderness most sensitive symptom, but not highly specific; McMurray test — most effective; modified McMurray test involves supporting knee with one hand and twisting knee with other; flex knee as far as possible; turning knee inward places pressure on lateral side of knee (better for testing lateral meniscus); rotating and catching should reproduce pain on joint line; differential diagnosis includes arthritis; Thessaly test — while patient standing, hold patient’s hands while knees bent at 20°; ask patient to do “the twist” (rotate femur on tibia medially and laterally); sensitive and fairly specific for meniscus problems; imaging studies — x-rays to rule out arthritis; MRI best for identifying meniscus tears; all patients with significant arthritis probably have degenerative or nonfunctioning meniscus

**Treatment of degenerative meniscus:** surgery not often required; European randomized controlled trials showed similar outcomes at 6 mo between older patients who underwent physical therapy vs partial meniscectomy; ≥30% of patients in physical therapy group ultimately opted for surgery; older patient with degenerative meniscus tear and some signs of mild arthritis can be treated with physical therapy and pain relief; surgery required for patients with catching, locking, and recurrent swelling with activity; consider patient history; removal of cartilage can increase pressure on joint by nearly 300%

**PCL injury:** mechanism — landing on knee in flexed position drives tibia backward; “dashboard” injury (ie, blow to front of tibia); symptoms — patients often complain more about disability than about instability; Sag sign — hold ankles up with knees at 90°; gravity pulls tibia down; look for dimple on one side; posterior drawer test — tibia pushed backward; check for tenderness; perform MRI; important not to miss posterolateral corner injury (hyperextension leads to tear in back capsule of knee; apply posterior hinge brace and refer to surgeon); PCL injuries can be treated conservatively with hinge brace

**Knee emergencies:** require urgent referral to surgeon; neurovascular injury — knee dislocation; hyperextension often leads to tearing of ≥1 ligament; others — open unstable fracture; septic arthritis

**Patellofemoral pain:** tenderness under kneecap; Osmond-Clarke test — ask patient to contract quadriceps while quadriceps held down to prevent lifting; signs and symptoms — pain associated with excessive forces under kneecap; kneecaps too loose, highly mobile, or wobbly; shoulder problems; history of dislocation; back problems; loose joints; tight muscle joints; poor quadriceps flexibility; usually pain with bending and squatting or going up stairs; grinding or creaking when going up and down stairs; examination — move kneecap over and use both hands to locate pain under articular surface (must push hard; well tolerated); x-ray may show bone spurs on edge of patella or on condyles of femur; check alignment; check for knock-knees (measuring Q angle helpful) and bowlegs; evaluate foot arches and foot mechanics (eg, pronation); poor core and hip control can contribute to knee problems; supportive braces and taping helpful for wobbly knees; stretching and improving flexibility helpful for patients with tightness

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**Suggested Reading**


**Complementary and Alternative Medicine (CAM) for Pain**

Daniel M. Doyleys, PhD, Director and Owner of Doyleys Pain Management Clinic, Birmingham, AL

Complementary and alternative medicine (CAM): individualized treatments tend to be holistic and promote self-care and self-healing; goal of homeopathic medicine to develop or desensitize system; naturopathic medicine relies on healing power of individual (using, eg, exercise, nutrition)

**Nutrition and diet:** evidence about dietary supplements somewhat unclear (standardization insufficient); processed foods increase inflammation; omega-3 fatty acids have anti-inflammatory effect; vitamin D helpful for bone health

**Types of therapy:** manipulation therapy — Swedish massage; neuromuscular massage; chiropractic interventions; energy therapy — balancing of electromagnetic fields; data needed; mind-body interventions — hypnosis; meditation; yoga; wellness behavior (eg, smoking cessation); patient-directed treatments — some of best treatments for pain “have nothing to do with pain”; include long-term exercise-based programs, discussion of maladaptive behavior (eg, alcohol use), and involvement and participation in setting that provides reinforcement (eg, arts and crafts fair)

**Safety and efficacy of CAM:** CAM may be safe, but not risk-free for all patients; important to be aware of various types of over-the-counter products; evidence of efficacy not particularly strong and depends on particular therapy; study — looked at use of opioids, nonsteroidal anti-inflammatory drugs, antidepressants, psychological therapy, and manipulation therapy; concluded that when used alone, none of most commonly prescribed treatments sufficient for eliminating pain, and may have major effect on physical or emotional functions; “jury still out,” but in general, effects of these treatments minimal

**Mechanisms:** connectivity — manual therapy and massage therapy shown to result in brain changes at cortical level (unclear whether changes maintained or how they come about); contemporary view of placebo effect — psychobiologic phenomenon; multiple placebo effects exist (ie, no single simple placebo effect); placebo interpreted as context; contextual factors include relationships, emotions, and conditioning; altered genetic expression — genetic expression and effects can be changed and modified

**Changing views on pain:** pain considered dynamic process that acts at multiple sites ranging from peripheral nociceptors to genome of cells within nervous system, as well as in patient’s psychological milieu; pain changes over time; chronic pain may be considered lack of homeostasis, ie, as dysfunctional process that body attempting to (and may not be able to) correct; pain described as producing emotion and as having powerful motivational component (as hunger and thirst do but vision and touch do not); chronic insensitivity to pain — sensory system appears intact, but individuals lack emotional response to pain; seen in children who bite through tongue or chew through fingers; creates significant problems and shortens lifespan;
homeodynamics — suggests ongoing adaptation; important for patients to understand that pain is dynamic, day-to-day process

Applying systems theory to pain: 1) system is complex and adaptive; patient’s adaptability can be reduced by, eg, lack of exercise, high alcohol use, overweight, smoking, or emotional rigidity; less adaptive systems become more rigid and unable to fight against unforeseen events; 2) system self-organizing; involves, eg, various responses to therapy and neuroplasticity (“something happens and system reorganizes itself”); 3) system dynamic and nonlinear; pain ratings and representations of those numbers vary (eg, pain rated as 8 on pain scale does not mean that pain double that of pain rated as 4; pain ratings vary among individuals and situations); 4) system chaotic; sometimes does things that do not make sense but eventually settles in and does make sense; pain may be emergent phenomenon; pain something more than sensory and emotional phenomenon

Complexity theory: looks at disease as dysfunction rather than as pathology (eg, altered gene not defined as disease unless functioning of organism affected); based on impact, functioning, and demonstration of problem

Treatment of pain and informed consent: patient should be adequately informed of all potential complications and consequences of recommended treatment; study found that ≤30% of patients who are fully informed about potential consequences of surgery decline surgery

Expanded view of pain: pain may be constellation, collection of sensations, behaviors, feelings, emotions, and cognitions, occurring at cellular to whole organism level; pain constantly changes in accordance with experience and involves dynamic interaction of multiple physiologic, chemical, and psychological symptoms frequently associated with, but not requiring activation of peripheral nociceptive system; chronic pain as hypothetical construct — pain is emergent phenomenon with multiple parts, and sum of parts does not necessarily provide answer as to what pain is; constituent parts of chronic pain include sensory input (nociception), mood (eg, depression, anxiety), deconditioning (eg, exercise, activity), nutrition (eg, diet, obesity), social components (eg, vocation), maladaptive habits (eg, smoking, substance use), and sleep (can be influenced by nicotine, caffeine, and activity); under this construct, follow-up questionnaire asks about changes made (eg, smoking cessation, improved diet and mood); if pain assumed to be hypothetical construct, then changing constituent parts likely to help patient improve (unclear, however, whether pain would resolve)

Implications for treatment: consider looking at severity of pain as none, mild, moderate, or severe, although number ratings or visual analog scale need not be abandoned; target functional clusters (eg, physical activity; if depression improves, anxiety likely to improve); mechanism-based treatment probably has significant role in acute and nociceptive aspects of chronic pain, but insufficient on its own; self-directed neuroplasticity important (encourage patient to make changes and reinforce them); treat constituent parts of pain rather than sensory parts alone; early intervention important; self-directed epigenetics important; suggestions — avoid overreliance on acute procedures for chronic problem; avoid disciplinary isolation (ie, involve social worker, psychologist, physical therapist); allow time for patient’s narrative and listen to patient; monitor quality of life; address psychological issues; help patient establish “new normal”

Suggested Reading


Acknowledgments

Dr. Luke spoke in Maui, HI, at Primary Care Medicine: Update 2016, presented April 3-8, 2016, by the University of California, San Francisco, School of Medicine. For information about upcoming meetings from UCSF, visit www.cme.ucsf.edu/cme/. Dr. Doleys spoke in Orlando, FL, at Pain Care for Primary Care, presented July 23-25, 2015, by the American Pain Society and the Journal of Family Practice. For more information about this course, visit http://americanpain.org/annual-meeting/2016/continuing-education. The Audio Digest Foundation thanks the speakers and the sponsors for their cooperation in the production of this program.
KNEE INJURIES/PAIN MANAGEMENT

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To submit a test form by mail or fax, complete Pretest section before listening and Posttest section after listening.

1. Acute hemarthrosis of the knee is most commonly associated with which of the following injuries?
   (A) Patellar dislocation
   (B) Anterior cruciate ligament (ACL) injury
   (C) Patellar fracture
   (D) Patellar tendon rupture

2. Of the following structures in the knee, which can withstand the greatest amount of force before tearing?
   (A) ACL
   (B) Posterior cruciate ligament (PCL)
   (C) Medial collateral ligament (MCL)
   (D) Lateral collateral ligament (LCL)

3. Segond fractures or avulsion fractures of the lateral tibial plateau are characteristic of injury to the:
   (A) ACL
   (B) PCL
   (C) MCL
   (D) LCL

4. Choose the correct statement about MCL injury.
   (A) Typical x-ray findings include fractures and bone chips
   (B) Magnetic resonance imaging not necessary unless problem or swelling persists (for, eg, 6 wk)
   (C) Hinge braces should be avoided
   (D) Patient should be referred for surgery within 1 wk

5. Which of the following tests is most effective for evaluating meniscus injury?
   (A) Lachman test
   (B) Anterior drawer test
   (C) Osmond-Clarke test
   (D) McMurray test

6. Patients with injury to the _______ may complain more about disability than instability.
   (A) ACL
   (B) PCL
   (C) MCL
   (D) LCL

7. Choose the correct statement about the mechanisms involved in the use of complementary and alternative medicine (CAM) for managing pain.
   (A) Manual therapy and massage therapy have been shown to result in brain changes at the cortical level
   (B) Contemporary views of placebo describe multiple placebo effects with multiple contextual factors
   (C) Genetic expression and effects can be changed and modified
   (D) All the above

8. According to systems theory as related to pain, the system involved with pain is all the following, EXCEPT:
   (A) Adaptive
   (B) Self-organizing
   (C) Linear
   (D) Chaotic

9. Based on complexity theory, disease is defined by _______ rather than by pathology.
   (A) Dysfunction
   (B) Genetics
   (C) Emotions
   (D) Cognitions

10. When implementing use of CAM for the treatment of pain, it is suggested that the clinician:
    (A) Avoid overreliance on acute procedures for chronic problem
    (B) Avoid disciplinary isolation (ie, involve social worker, psychologist, physical therapist)
    (C) Monitor the patient’s quality of life
    (D) All the above

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