

Establishing a Diagnosis and Directing Initial Management of Knee Pain

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Abstract

A small wave or bulge on the medial aspect of the knee just inferior to the patella suggests an effusion. After assessing for warmth, bony tenderness, masses, and effusion, the clinician should palpate for areas of tenderness. Anteriorly, such palpation addresses the patella facets. To assess the patella, the clinician displaces the patella laterally and medially and palpates the facets on the under surface of the patella. Tenderness at the inferior pole of the patella may suggest apophysitis. Further, the clinician should palpate the quadriceps and patellar tendon and the tibial tubercle.

Keywords: Hip pathology; Quadriceps; Anterior knee pain; Patellofemoral joint; Collateral ligament; Positive ballottement

Introduction

Medial palpation should address the medial collateral ligament, the medial joint line, and the pesanserine. Laterally, the clinician palpates for the lateral collateral ligament, the lateral joint line, and the distal IT band. Posterior tenderness evaluation should encompass the distal hamstrings. Every patient should be able flex the hip to few degrees and internally rotate the hip to few degrees without pain [1]. Pain or inability to perform such hip motion is concerning for hip pathology. The knee should extend fully and symmetrically compared to the opposite knee. Inability to extend the knee fully suggests the possibility of meniscal tear or a loose body causing a mechanical block. The knee should be able to flex to at least few degrees. Inability to flex the knee has a broad differential diagnosis, including mechanical block from meniscal tear, loose body, or effusion; quadriceps tightness or contracture; or anterior knee pathology that inhibits knee movement due to pain. Patellar mobility can be assessed by displacing the patella laterally and medially from a midline neutral position [2]. Any restriction in motion may indicate patellofemoral syndrome, and excessive mobility could indicate instability. Hamstring, quadriceps, and IT band flexibility must be assessed. Hamstring flexibility is measured by the popliteal angle. The supine patient's hip is flexed to 90 degrees and the knee is extended until resistance is appreciated. Quadriceps flexibility is measured while the patient is prone with knee flexing. Flexibility is measured by the Ober test in which the patient lies on the opposite side with the knee flexed to few degrees and hip extended 10 degrees [3]. The clinician allows the force of gravity to adduct the extremity. Hip flexor, quadriceps, and hamstring strength can be assessed while the patient is in a sitting position. Importantly, the clinician must assess the strength of the hip abductors and external rotators; weakness of these muscles is associated with anterior knee pain.

Methodology

Gluteus minimus strength is assessed with the patient lying on his or her side and adducting the upper hip while it is in a slight amount of extension. Gluteus medius strength is assessed with the patient lying on his or her side and adducting the upper hip while it is in a slight amount of extension and maximally externally rotated. The clinician should approach special testing with potential diagnoses in mind. Patellar instability is assessed via the patellar apprehension test [4]. When the patella is laterally displaced, pain or apprehension is considered a positive apprehension test and indicative of patellar subluxation, dislocation, or chronic instability. The patellar grind test

assesses for potential patellofemoral syndrome. The patient is asked to contract the quadriceps while supine and fully extend the knee. The patient then relaxes the quadriceps, and as the clinician pinches the quadriceps tendon, effectively shortening the extensor mechanism, the patient is asked to contract the quadriceps again. Shortening the extensor mechanism places stress on the patellofemoral joint and can exacerbate underlying patellofemoral syndrome [5]. Ligamentous instability is assessed through stress testing, with pain or excessive motion with stress testing considered a positive test result. Valgus and varus stress testing assesses the medial collateral ligament and lateral collateral ligament, respectively. Valgus and varus stress testing should be performed with the knee in slight flexion to prevent false-negative results from the inherent bony stability of an extended knee. Anterior and posterior drawer testing evaluates the anterior cruciate ligament and posterior cruciate ligament, respectively. The Lachman test also assesses anterior cruciate ligament incompetency. With the quadriceps relaxed and the knee flexed to few degrees, the clinician tries to displace the tibia anteriorly upon the femur beyond the stability demonstrated on the unaffected knee [6]. Using the information gained from the history and physical examination, the clinician can establish a working diagnosis and direct subsequent evaluation and management. The initial priority in evaluation of a patient presenting with knee pain is identification of any potentially limb or life threatening conditions. These conditions include septic arthritis, osteomyelitis, primary musculoskeletal malignancies, and other systemic malignancies.

Discussion

A history of unexplained systemic symptoms, pain that awakens the patient from sleep, mass, erythema, or warmth should raise substantial concern [7]. Any concern for bacterial infection merits referral of the patient to an emergency department for radiographs, laboratory studies, possible knee aspiration with synovial fluid analysis, advanced imaging with magnetic resonance imaging, and orthopaedic

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consultation. Concern for malignancy should prompt immediate radiographs as well as possible laboratory studies, advanced imaging with Magnetic Resonance Imaging or computed tomography scan, and orthopaedic or oncologic consultation. If the clinician has no concern for limb- or life-threatening conditions, he or she should evaluate the hip as a potential source of pain that is referred to the knee as shown in (Figure 1). Concern for hip pathology, especially slipped capital femoral epiphysis, warrants an emergency evaluation. A history of hip, thigh, or medial knee pain coupled with limited hip motion on physical examination should raise suspicion for hip pathology [8]. If hip pathology is a true diagnostic possibility, the patient should be made strictly non-weight-bearing and radiographs of the pelvis obtained emergently. The presence of a slipped capital femoral epiphysis necessitates immediate referral to an emergency department. If there is no concern for a limb or life threatening condition or hip pathology, the clinician must determine if an effusion is present. An effusion is suggested by gross swelling, painful or limited flexion, and positive ballottement or swipe testing results [9]. The presence of an effusion implies intra-articular pathology that requires urgent evaluation. Among the multiple causes of intra-articular derangement causing posttraumatic effusion is fracture, cartilage injury, cruciate ligament rupture, meniscal tear, and patellar subluxation or dislocation. If the effusion is posttraumatic, the clinician should immobilize the knee, make the patient non-weight-bearing, initiate pain control, and obtain urgent radiographs. If the radiographs are non-diagnostic, urgent Magnetic Resonance Imaging without contrast is indicated. If imaging confirms intra-articular derangement, the patient should be urgently referred to an orthopaedic surgeon [10]. If the presence of an effusion is confirmed without any specific findings of intra-articular derangement, the clinician should consider pursuing the evaluation of an effusion without a history of trauma or referral to an orthopaedic surgeon for possible diagnostic arthroscopy. If imaging does not reveal any pathology, the clinician should pursue evaluation of conditions due to chronic stress on vulnerable knee structures as shown in (Figure 2). The differential diagnosis of an effusion without a history of trauma includes the previously mentioned intra-articular derangement, the juvenile idiopathic arthritis, other systemic inflammatory conditions that are associated with arthritis, and non-septic joint infection. If the effusion is a traumatic, the patient can be allowed to bear weight as tolerated. In addition, the clinician should initiate pain control, obtain knee radiographs, and order appropriate laboratory studies. Any concern for inflammatory arthritis should prompt referral to a rheumatologist for further management. Four weeks of appropriate antibiotics should



Figure 1: Possible knee aspiration with synovial fluid analysis.



Figure 2: Chronic stress on vulnerable knee structures.

be administered for Lyme arthritis [11]. Gonococcal arthritis is treated with at least few days of parenteral antibiotics with concurrent chlamydial treatment. Viral-associated arthritis can be treated with pain control and close observation. If the clinician eliminates potential limb- or life-threatening conditions, hip pathology, and effusion from the differential diagnosis, he or she should use the pain location and degree of tenderness to guide diagnosis and management. Most often, knee pain is related to acute or chronic stress on vulnerable knee structures [12]. Anterior pathology includes patellofemoral syndrome, apophysitis of the patella and tibial tubercle, quadriceps and patellar tendinopathy, and pre-patellar bursitis. Posterior pathology comprises Baker cyst and hamstring tendinopathy. Lateral pathology can encompass lateral collateral ligament sprain, IT band tendinopathy, and meniscal pathology. The primary sources of medial pathology are medial collateral ligament sprain, pesanserine tendinopathy, meniscal pathology, and osteochondritis dissecans. Once a vulnerable structure has been identified as the likely source of pain, the clinician should use other findings of the physical examination to evaluate for biomechanical factors contributing to stress on the vulnerable structure. Such biomechanical factors commonly include inflexibility and weakness. The clinician should initiate a home exercise program or physical therapy to address any deficiencies. In addition, anti-inflammatory medications, frequent brief periods of icing, and bracing should be considered [13]. If there is no improvement in few weeks with these interventions, radiographs plus MRI or referral to orthopaedics, sports medicine, or rheumatology should be considered. During the previously described evaluation, clinicians commonly identify a benign bone tumour. This frequently incidental and asymptomatic finding may be the source of the patient's knee pain. Large lesions can weaken the bone and lead to pathologic fractures. Further, some benign bone tumors can be inherently painful. Other lesions are locally aggressive. Nonossifying fibromas and osteochondromas can be monitored by the clinician, but large lesions, pathologic fractures, locally aggressive lesions, and inherently painful lesions should be referred to an orthopaedic surgeon for surgical evaluation [14]. Finally, if no other diagnosis can be established, a finding of growing pains may be considered. Growing pains typically occur in a few year old children who experiences pain in the evening or during sleep in both legs. The pain resolves by the morning and does not affect the patient during the day. Physical examination findings are normal. Growing pains can be managed with pain control and parental reassurance.

Conclusion

Osteopathic manipulative medicine aims to restore the body's self-healing capacity by decreasing allostatic load, or the physiologic effects

of chronic bodily stresses, and enhancing the immune system.

Acknowledgement

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Conflict of Interest

None

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