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Physical Examination of the Knee: A Review Article

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ABSTRACT

The knee is a large, modified hinge joint whose complex anatomy and multiplanar biomechanics make it vulnerable to acute trauma and degenerative disease. A careful physical examination remains the cornerstone of initial knee assessment, helping clinicians localize pathology, estimate severity, and determine the need for imaging or referral. This review summarizes clinically relevant knee anatomy and biomechanics and presents a structured approach to knee examination. The assessment begins with targeted history taking to identify the mechanism of injury, onset of swelling, symptoms of giving way or locking, and pain location. Inspection and palpation then evaluate alignment, swelling/effusion, temperature, tenderness, atrophy, scars, and periarticular masses. Active and passive range of motion are measured to detect extensor lag, fixed flexion deformity, and mechanical blocks, while rotational movements and the screw-home mechanism provide additional kinematic clues. Specific provocative tests are reviewed for common intra-articular and periarticular disorders, including Wilson's test for osteochondritis dissecans, valgus and varus stress tests for collateral ligament injury, anterior drawer and Lachman tests for ACL deficiency, posterior instability maneuvers for PCL pathology, pivot-shift–based tests for anterolateral rotatory instability, and McMurray, Apley, and Thessaly tests for meniscal tears. Effusion assessment using patellar tap and fluid displacement tests is also discussed. Because individual tests have variable sensitivity and specificity, combining multiple findings and comparing with the contralateral knee improves diagnostic confidence. A systematic, reproducible examination supports accurate bedside diagnosis, guides appropriate investigations, and optimizes subsequent management. Applicable across emergency, sports medicine, and outpatient orthopaedic settings.

Keywords: knee; physical examination; ligament injury; meniscus; diagnostic accuracy

INTRODUCTION

The knee is one of the largest and most complex joints in the human body, playing a crucial role in daily activities such as walking, running, and jumping. Its intricate anatomy makes it vulnerable to a wide range of injuries and disorders, including ligament trauma, cartilage damage, and degenerative conditions such as osteoarthritis. Physical examination of the knee represents a fundamental initial step in assessing patient complaints and establishing an accurate diagnosis. A systematic approach involving inspection, palpation, range of motion assessment, and specific clinical tests enables

clinicians to efficiently identify the source of pathology and guide further management.[1,2]

The primary objective of knee physical examination is to evaluate the anatomical structures, functional capacity, and stability of the joint. Inspection is the first step in this process, during which the clinician observes visual signs such as swelling, deformity, gait alterations, or muscular atrophy. These findings may indicate joint effusion, significant ligamentous injury, or chronic disuse atrophy. Inspection is followed by palpation, allowing the examiner to assess for tenderness, increased local temperature, or abnormalities in landmark structures such as the patella, tendons, and joint line. Assessment of range of motion (ROM) is essential in determining knee flexibility and function. Evaluation of both active and passive range of motion can help distinguish mechanical impediments, such as meniscal tears or intra-articular loose bodies, from neuromuscular dysfunction. Limitations in motion often suggest intra-articular effusion, structural derangement, or significant degenerative changes.[1,3]

Specific clinical tests are then performed to evaluate ligamentous stability and meniscal integrity. For example, tests such as the Lachman or anterior drawer maneuver are commonly used to assess the anterior cruciate ligament (ACL), while meniscal integrity is frequently evaluated using tests such as McMurray's and Apley's compression. Recent clinical studies show that while individual knee tests have variable diagnostic accuracy, combined use of multiple physical examination tests enhances diagnostic confidence in medial meniscal injuries.[1] Additionally, diagnostic studies have found that clinical assessment combining tests like Apley's, McMurray's, and joint line tenderness may show high sensitivity and specificity for medial meniscal injury when compared with arthroscopy.[1,2]

A comprehensive physical examination of the knee provides valuable diagnostic information and guides patient management. Through a structured and systematic approach, clinicians can identify the primary source of symptoms and develop an appropriate therapeutic plan. Accurate physical examination not only supports optimal recovery but may also reduce unnecessary imaging or invasive procedures, particularly when clinical findings are strongly indicative of specific pathology.

Anatomy of The Knee Joint

a. Bones

- Femur

The femur is the longest and heaviest bone in the human body, transmitting body weight from the hip bone to the tibia during standing. Its length is approximately one quarter of an individual's height. Structurally, the femur consists of a shaft and two extremities: a proximal (superior) end and a distal (inferior) end. The proximal femur comprises the head, neck, and two trochanters (greater and lesser trochanters). The femoral head is spherical, covering about two-thirds of a sphere, and is covered with articular cartilage except at the fovea, a small medial depression where the ligament of the head of the femur attaches. In early life, this ligament transmits a small artery to the epiphysis of the femoral head. The femoral neck is trapezoidal, with a narrow end supporting the head and a wider end continuous with the shaft. The proximal femur forms an angle of inclination between the head–neck axis and the shaft. This angle is greatest at birth and decreases to an adult range of approximately 115–140° (average 126°). It is typically smaller in females due to a wider pelvis, which increases the distance between the acetabula and results in a more oblique femoral shaft. The angle of inclination enhances hip joint mobility by positioning the femoral head more perpendicular to the acetabulum in the neutral position. The greater and lesser trochanters are prominent bony projections located at the junction of the neck and shaft. The greater trochanter projects laterally, superiorly, and posteriorly, serving as an attachment site for the hip abductors and rotators. The lesser trochanter, situated

posteromedially, provides insertion for the primary hip flexor muscle, the iliopsoas.[4]

- **Patella**

The patella is a large sesamoid bone that develops within the quadriceps tendon after birth. It lies anterior to the femoral midcondylar region and articulates with the femur's patellar surface. Its anterior surface is convex, while the posterior surface is smooth, covered with thick articular cartilage, and divided by a vertical ridge into a narrower medial facet and a wider lateral facet, maintaining alignment in the femoral intercondylar groove during knee extension.[4]

- **Tibia**

The tibia, the second largest bone, lies anteromedially in the leg parallel to the fibula. Proximally, it forms medial and lateral condyles creating the tibial plateau, separated by the intercondylar eminence with medial and lateral tubercles. Distally, it narrows to form the medial malleolus, articulating with the talus, while the posterior soleal line serves as the soleus muscle attachment.[4]

- **Fibula**

The fibula is a slender long bone located posterolateral to the tibia and connected to it by the interosseous membrane. It does not bear significant body weight but serves primarily as a site for muscle attachment. Distally, the fibula forms the lateral malleolus, which contributes to stability of the ankle joint.[4]

b. Joints

The knee is the largest modified hinge joint, allowing flexion, extension, and limited internal and external rotation, making it particularly susceptible to injury and osteoarthritis. It consists of three articulations: two femorotibial joints (medial and lateral) and one femoropatellar joint, while the fibula does not participate directly in the knee joint. Stability is largely provided by the coordinated action of surrounding muscles, tendons, and ligaments, compensating for the relative incongruence of the bony surfaces.[4,5] The tibia and fibula are connected via the superior tibiofibular joint, inferior syndesmosis, and interosseous membrane, whose fibers run inferolaterally from tibia to fibula. These structures resist downward traction on the fibula from attached muscles while allowing slight upward motion during ankle dorsiflexion, and contain openings for vessels such as the anterior tibial artery and perforating branch of the fibular artery. Movement at the superior tibiofibular joint is closely linked to the inferior syndesmosis, reflecting their functional interdependence.[4]

c. Muscles

Muscles play a key role in maintaining knee joint stability, with the quadriceps femoris—particularly the inferior fibers of the vastus medialis and vastus lateralis—being crucial for this function. Proper training and conditioning of these muscles can help prevent sports injuries, and even when ligaments are compromised, strong quadriceps can allow the knee to function effectively. The knee is most stable in full extension, where the articular surfaces are maximally congruent, and the collateral and cruciate ligaments are taut. Additionally, surrounding tendons provide a splinting effect that further enhances stability.[4]

d. Ligaments

The knee is stabilized by two collateral ligaments—medial (MCL) and lateral (LCL)—and two cruciate ligaments (ACL and PCL) that prevent excessive anterior, posterior, varus, and valgus movement of the tibia relative to the femur. The patellar ligament, a continuation of the quadriceps tendon, connects the patella apex to the tibial tuberosity. Additional ligaments, including the transverse, arcuate popliteal, oblique popliteal, and popliteofibular ligaments, provide further stability. Each ligament resists specific stresses: the ACL prevents anterior and rotational tibial translation, the PCL resists posterior translation, the MCL stabilizes the medial knee and resists valgus stress, and the LCL stabilizes the lateral knee, resisting varus stress and external rotation. The popliteofibular ligament

supports external rotation and posterior tibial translation, while smaller ligaments, such as capsular, anterolateral, arcuate, and posterior oblique ligaments, enhance overall joint stability and contribute to proprioception.[6]

e. Meniscus

The meniscus, derived from the Greek word *meniskos* meaning crescent, is a fibrocartilaginous structure that partially divides the knee joint and adds concavity to its surfaces. Both the medial and lateral menisci are C-shaped, triangular in cross-section, and made of dense, mostly avascular fibrous tissue. Their ends attach to the superior tibial surface, with the lateral meniscus having additional femoral attachments at the posterior end, while the anterior horns of both menisci are loosely connected. The concave edges are free, whereas the convex edge of the lateral meniscus is anchored to the tibia via the coronary ligament, and the medial meniscus attaches to the joint capsule with loose femoral and tibial connections. During knee extension, the menisci glide anteriorly over the tibial plateau and are compressed, adapting to femoral and tibial contours. Only the peripheral regions receive adequate blood supply, limiting healing potential for central tears.[7,8]

f. Joint Capsules

The knee joint capsule consists of an outer fibrous layer and an inner synovial membrane. The fibrous capsule forms localized thickenings as intrinsic ligaments but is generally thin and incomplete in some areas. Superiorly, it attaches to the femur above the condyles, posteriorly it covers the condyles and intercondylar fossa while leaving a lateral gap for the popliteus tendon, and inferiorly it attaches to the tibial plateau margins, except where the popliteus crosses. Anteriorly, the quadriceps tendon, patella, and patellar ligament replace the fibrous layer laterally and medially. The synovial membrane lines all internal joint surfaces not covered by cartilage, attaching to femoral, tibial, and patellar cartilage as well as menisci. Posteriorly, it reflects anteriorly over the cruciate ligaments and infrapatellar fat pad, forming the median infrapatellar synovial fold that nearly divides the joint cavity into right and left femorotibial compartments. Superior to the patella, the joint cavity extends into the suprapatellar bursa beneath the vastus intermedius, continuous with the synovial membrane. This bursa typically reaches about 5 cm above the patella, and the articularis genu muscle attaches to the synovial membrane to pull the bursa during knee extension.[4]

g. Bursae

The knee contains multiple bursae, four of which communicate directly with the joint cavity: the suprapatellar bursa beneath the distal quadriceps, the popliteal bursa, the anserine bursa beneath the tendons of the sartorius, gracilis, and semitendinosus, and the gastrocnemius bursa. The suprapatellar bursa is a normal synovial extension that may become prominent during effusion and can serve as a route for infection into the joint. Other bursae include prepatellar bursae between the patella and skin, and infrapatellar bursae over the tibial tuberosity or beneath the patellar ligament, often resulting from repetitive friction.[4,8] Posteriorly, popliteal fossa enlargement forms a Baker's cyst, which may or may not communicate with the joint, typically involving the semimembranosus or medial gastrocnemius bursae (Ronald McRae, 2020). In total, at least 12 bursae surround the knee, providing cushioning and reducing friction for tendons and muscles during joint movement.[4]

h. Nerve Innervation

Articular branches of the femoral, tibial, and common fibular nerves supply the anterior, posterior, and lateral aspects of the knee joint, respectively. Additionally, the saphenous nerve (cutaneous branch) provides articular branches that innervate the medial aspect of the knee joint.[4]

i. Vascularization

The knee joint receives blood from ten arteries that form peri-articular genicular anastomoses surrounding the joint. These anastomoses include genicular branches of the femoral and popliteal arteries, as well as anterior and posterior recurrent branches of the anterior tibial and circumflex fibular arteries. The middle genicular branch of the popliteal artery penetrates the fibrous joint capsule to supply the cruciate ligaments, synovial membrane, and peripheral edges of the menisci.[4]

Biomechanics of the Knee Joint

a. Rigid Four-Bar Linkage Theory

Knee kinematics were previously modeled using the "rigid four-bar linkage" theory. This framework, combining rolling and sliding motions of the femur, was considered fundamental for achieving deep knee flexion. The mechanism consists of four connected bars, two representing the cruciate ligaments and two connecting attachment points on the femur and tibia. However, the model has limitations: it restricts knee motion to a 2D projection, whereas actual movement is multi-planar, ligaments are not rigid, and tension varies across cruciate ligament bundles at different flexion angles.[9]

b. Rollback, Slide, and Rotation

Freeman and Pinskerova used dynamic MRI to study knee kinematics, showing distinct movements in the medial and lateral tibiofemoral compartments during flexion. Medially, the anterior femoral condyle contacts the tibia in full extension, then swings to the posterior condylar surface around 20° flexion, with limited movement (~1 cm) up to 110° due to PCL-mediated rollback and the relatively fixed medial meniscus. Laterally, the femur shifts ~2 cm over a more mobile lateral meniscus, contacting its posterior horn in full flexion. This asymmetry produces ~30° axial rotation, with the lateral compartment rotating around the medial compartment, causing tibial internal rotation. These movements facilitate quadriceps leverage during flexion and hamstring control during extension, optimizing knee function.[9]

c. Screw-Home

The screw-home mechanism describes the terminal external rotation of the tibia relative to the femur as the knee moves from flexion to extension. At this point, the cruciate ligaments are maximally taut, providing optimal stability. Conversely, during flexion, the tibia rotates internally, initiated by the popliteus muscle, “unlocking” the knee and allowing continued internal rotation relative to the femur through the previously described mechanisms.[9]

Physical Examination of The Knee

a. History

In knee anamnesis, patient age and sex are important, as certain conditions have typical distributions. Knee infections are rare across all ages and sexes, Reiter’s syndrome mainly affects adults of both sexes, and ankylosing spondylitis primarily affects adult males. Ligament and extensor apparatus injuries can occur in both sexes but are uncommon in children. A thorough injury history should include the force, direction, immediate functional loss, bruising, swelling, and weight-bearing ability. Reports of the knee “giving way” may indicate cruciate ligament tears, extension loss, or quadriceps atrophy, while “locking” suggests meniscal tears or loose bodies. Patients should demonstrate the locking position, as meniscal tears typically allow flexion but limit full extension with pain.[8] Pain localization and characteristics are crucial: anterior knee pain points to patella, patellar tendon, or attachments; medial or lateral joint-line pain may indicate meniscal or collateral ligament injury; posterior pain is less common and may result from Baker’s cysts, PCL issues, posterior meniscus, quadriceps tendon, or neurovascular involvement.[8,11,12] Anterior knee pain is frequent, affecting 15–33% of active adults and 21–45% of adolescents.[13]

b. General Inspection

During knee inspection, findings can offer important diagnostic clues. Localized swelling in the synovial cavity or suprapatellar pouch may indicate effusion, hemarthrosis, pyarthrosis, or intra-articular lesions, while more extensive swelling suggests infection, tumor, or severe trauma. Palpable lumps should be documented, including prepatellar bursitis ("housemaid's knee"), infrapatellar bursitis ("clergyman's knee"), meniscal cysts along the joint line, or diaphyseal aclasis, which may be multiple and familial. Chronic anterior bursa enlargement, such as "beat knee" in miners, may show overlying skin thickening. Skin changes provide further diagnostic insight: bruising indicates trauma or ligament injury, redness suggests inflammation, and scars from prior injuries or surgeries should be recorded. Sinus scars may reflect previous bone infections with potential reactivation, while psoriasis lesions can be associated with psoriatic arthritis.[8]

c. General Palpation

Knee palpation assesses local temperature and tenderness to identify underlying pathology. Warmth may indicate rheumatoid arthritis, infection, inflammation, or rapidly growing tumors, and should be compared with the contralateral knee while accounting for recent dressings. Warm knee with a cold foot may suggest popliteal artery obstruction, requiring pulse assessment. Tenderness is evaluated systematically by flexing the knee and palpating the medial and lateral joint lines, collateral ligament attachments, and surrounding structures, as pain here often indicates meniscal, collateral ligament, or fat pad involvement, sometimes accompanied by bruising or edema in acute injuries.[8] In children and adolescents, tenderness over the tibial tuberosity suggests Osgood–Schlatter disease or patellar ligament avulsion, while pain at the inferior patella or proximal patellar ligament points to Sinding–Larsen–Johansson disease. Quadriceps tendon tenderness indicates tendinitis, and patellar ligament issues can be assessed during resisted knee extension. For suspected osteochondritis dissecans, full knee flexion helps localize tenderness, especially on the medial femoral condyle.[8,14]

d. Mobilization

Knee mobilization assessment evaluates both extension and flexion by comparing the affected knee with the contralateral side. Full extension is recorded as 0°, and any deficit is noted; elastic blocks in extension may suggest a bucket-handle meniscal tear, while rigid blocks often indicate arthritis. Hyperextension, or genu recurvatum, occurs when the knee extends beyond a straight tibia-femur alignment and may be associated with patella alta, chondromalacia patellae, recurrent patellar dislocation, or ligament injuries such as ACL or MCL tears. Flexion is measured from full extension, with ≥135° considered normal, and limitations may result from effusion, arthritis, or structural injury. Flexion can also be quantified using the heel-to-buttock distance, where 1 cm approximates 1.5° of motion, allowing precise tracking of changes over time. Documenting the full range of motion, including hyperextension or fixed flexion deformities, is essential for clinical evaluation and treatment planning.[8]

Active Mobilization

- Flexion**:** Ask the patient to squat until the knees touch the floor, achieving full knee flexion.[15]
- Extension**:** Instruct the patient to rise from a seated position or sit on the examination table and fully extend the knee. Normally, the knee should reach full extension; failure in the final ~15° indicates an extensor lag, often due to quadriceps weakness. External tibial rotation relative to the femur is typically observed at full extension due to anatomical differences in femoral condyles, visible as the screw-home mechanism, where the tibial tuberosity shifts slightly laterally unless a meniscal tear is present.[15]
- Internal and External Rotation**:** Ask the patient to rotate the leg inward and

outward; normal range is approximately 10° in either direction.[15]

- **Passive Mobilization**

- Passive Flexion**:** The knee can achieve approximately 135° when the heel touches the posterior thigh.
- Passive Extension**:** Full extension to 0° should be possible in both knees, though slight hyperextension may occasionally be observed.
- Passive Internal and External Rotation**:** Passive rotation of the knee allows about 10° in either direction and is tested by holding the ankle and rotating the lower leg.[15]

e. Specific Examination

- Wilson's Test for Osteochondritis Dissecans

The Wilson test is used to detect pressure between the anterior cruciate ligament and the lateral aspect of the medial femoral condyle. The procedure involves knee flexion (a), internal rotation of the foot (b), and then full knee extension (c). The test is positive if the patient experiences pain at full extension that resolves when the foot is externally rotated, suggesting possible osteochondritis dissecans of the medial femoral condyle.[8]

- Genu Valgum and Genu Varum

Assessment of knee alignment in children and adults involves measuring genu valgum and genu varum. In children, genu valgum is usually bilateral but can be unilateral; severity is measured using the intermalleolar distance with the child standing, knees brought together, and patellae facing forward. Normal values for ages 10–16 are <8 cm in girls and <4 cm in boys, with measurements repeated every six months. In adults, genu valgum is more common in females and often associated with rheumatoid arthritis, with radiographic tibiofemoral angle (~6°) providing accurate assessment. Genu varum is assessed by measuring the distance between knees with feet evenly placed and patellae forward. Normal values for ages 10–16 are <4 cm in girls and <5 cm in boys. Radiographs help identify underlying causes: in children, rickets shows wide, irregular epiphyseal plates, while tibia vara (Blount disease) shows sharply curved medial metaphysis; infantile varum (<4 years) rarely affects the femur, whereas late-onset varum (>5 years) may involve femoral varus. In adults, genu varum is commonly linked to osteoarthritis and Paget's disease, less often to rheumatoid arthritis.[8]

- Valgus Knee Instability Test

Knee valgus instability is assessed to detect deformities from ligament injuries, primarily medial collateral ligament (MCL) tears, which may be severe if the posterior cruciate ligament (PCL) is also damaged. Other deformities include varus (lateral collateral ligament tear), anterior tibial shift (ACL tear), posterior tibial shift (PCL tear), and rotational instabilities such as anteromedial, anterolateral, posterolateral, and posteromedial subluxations. To evaluate valgus stress, palpate the medial joint line and femoral attachment for tenderness. Pain or laxity with valgus stress indicates MCL injury. Grade 1 injuries show tenderness without laxity, grade 2 shows moderate instability suggesting medial and posterior ligament involvement, and grade 3 indicates severe instability, often with cruciate ligament damage, particularly PCL. With the knee fully extended, one hand stabilizes the leg while the other applies valgus force; joint opening or a clunk upon release confirms instability. Using the hand heel and fingers along the joint line helps detect subtle opening, and comparison with the opposite knee ensures accuracy.[8,16]

- Varus Knee Instability Test

Assessment of knee varus instability starts laterally, often revealing tenderness over the fibular head or lateral joint line in acute lateral complex injuries. Varus stress is applied by placing one hand on the medial joint line and pushing the ankle medially, first with the knee fully extended and then at 30° flexion, comparing both knees. Normal lateral ligaments are slightly more lax than medial ligaments. Subtle laxity can be detected by placing the thumb along the joint

line. Varus instability in both extension and flexion may indicate combined lateral ligament and PCL injury. Stress radiographs can aid evaluation, and if examination is limited, assessment under general anesthesia is possible. Additional checks include ankle dorsiflexion to verify common peroneal nerve motor function and sensory evaluation in its distribution.[8]

- Anterior Drawer Test

Assessment of anterior knee instability involves flexing the knee to 90° with the foot forward while the examiner stabilizes the knee and holds the tibia firmly, thumbs on the tibial tuberosity, and hamstrings relaxed. The tibia is pulled anteriorly and repeated at 70° flexion, comparing with the opposite side. Significant anterior displacement, especially ≥1.5 cm, indicates ACL rupture, often with medial or lateral complex injury; a soft endpoint suggests ligament compromise.[8,16] Rotational instability is tested by externally rotating the foot 15° for anteromedial rotational instability (AMRI), where excessive medial tibial condyle movement implicates MCL and ACL involvement. Internal rotation of 30° assesses anterolateral rotational instability, with anterior lateral tibial subluxation suggesting ACL, PCL, or posterior structure injury.[8,17] False positives can occur if posterior tibial subluxation from a PCL tear exists, so knee contour should be checked first. For partial ACL tears, a more sensitive test involves the patient sitting with hips and knees at 90°, legs hanging freely, while the examiner performs rhythmic push-pull maneuvers. This uses the calf and foot as a moment arm, enhancing detection of subtle ACL laxity.[18]

- Lachman's Test

The Lachman test assesses ACL integrity and anterior tibial instability, acting as a variant of the anterior drawer test. With the knee relaxed at 15° flexion, one hand stabilizes the femur while the other moves the tibia anteriorly; a positive test shows anterior translation with a soft endpoint. The prone Lachman is useful for patients with large thighs, with the knee flexed 20° and anterior tibial translation assessed. The active Lachman involves supporting the knee at 30° flexion while the patient extends the leg, producing anterior subluxation of the lateral tibial plateau during quadriceps contraction, best observed medially. Objective quantification can be performed using arthrometers such as the KT-1000 or KT-2000 to measure ACL injury and severity.[8,15,19]

- Posterior Cruciate Ligament Test

Assessment of the posterior cruciate ligament (PCL) evaluates for rupture, laxity, or stretching. In the gravity test, the knee is flexed to 20° with a sandbag under the thigh, allowing posterior tibial subluxation that can be seen on inspection. When the patient lifts the heel, correction of subluxation during extension confirms PCL injury. Palpation across the joint line can detect tibial movement, with anterior translation of a posteriorly subluxated tibia indicating rupture. Rarely, posterior pressure reveals excessive posterior displacement in cases of PCL laxity without subluxation. Additional tests include the prone Lachman and dynamic posterior shift test (knee and hip flexed to 90°), where posterior tibial translation during hamstring tension followed by anterior return upon extension signals PCL insufficiency, potentially with posterolateral involvement.[8]

- Test for Anterior Subluxation of the Lateral Tibial Condyle

The Pivot Shift test assesses anterolateral rotational instability and anterior subluxation of the lateral tibial condyle, commonly linked to ACL deficiency. In the Macintosh technique, the knee is fully extended with internal rotation and valgus stress; subluxation occurs if unstable, and flexion to ~30° produces a noticeable reduction or "clunk," confirming ACL injury. Reduction is graded as glide (I), clunk (II), or gross (III), reflecting functional instability during activities like "giving way".[20] The Losee Pivot Shift uses a relaxed knee with valgus stress and anterior fibular pressure; partial flexion and extension provoke anterior subluxation, often replicating patient

symptoms. Modified Pivot Shift (Jerk) tests hold the leg, apply valgus and internal rotation, and flex the knee; a positive result shows the lateral femoral condyle moving anteriorly with a clunk as the tibia subluxates, then reduces on extension.[8]

- Test to Establish Posterolateral Instability

Posterolateral knee instability is assessed through several specialized tests. The posterolateral drawer test is done with the knee flexed just under 90° and the foot externally rotated; posterior force on the tibia reveals excessive lateral translation, suggesting PCL and lateral ligament complex involvement. The external rotation recurvatum test has the patient supine while the examiner lifts the leg by the great toe; a positive result shows the knee falling into external rotation, varus, and hyperextension. Jakob's reversed pivot shift starts with 90° knee flexion, external foot rotation, valgus stress, and knee extension; positivity is marked by sudden reduction of a posteriorly subluxated lateral tibial plateau around 20° extension. The standing apprehension test is performed with slight knee flexion under weight-bearing; medial pressure on the anterior lateral femoral condyle and joint line palpation produces a positive result if the condyle moves posteriorly and the patient senses the knee "giving way".[8]

- Meniscus Test

Meniscus assessment involves palpation along the joint line and testing for an elastic block in full extension, which, especially when accompanied by quadriceps atrophy, is a reliable indicator of meniscal tears. Acute injuries often present with joint line edema, while bruising is uncommon. Posterior lesions are evaluated with the knee fully flexed, placing the fingers along the joint line and the palm over the patella, while moving the heel in a U-shaped arc to detect painful clicks. Anterior lesions are assessed by palpating the medial and lateral joint lines during knee extension. Functional tests include the McMurray maneuver, which uses rotation, flexion, and extension to elicit a painful click if a tear is present; the Apley test, performed prone with the knee fully flexed and rotated internally and externally to provoke sharp pain; and the Thessaly test, where the patient stands on one leg with 5–10° knee flexion while rotating the body, positive if pain or locking occurs along the joint line, with diagnostic accuracy comparable to MRI. Dynamic provocative maneuvers, such as squatting while catching a medicine ball, can further reveal meniscal injury under load and rotational stress.[8]

- Patella Test

Patellar assessment involves observing knee flexion for femoral or tibial torsional deformities and patellar maltracking, which may predispose to recurrent dislocation or chondromalacia patellae. Knee extension is checked for smooth patellar tracking. Genu recurvatum, patellar height, and Q-angle are noted, as patella alta and knock-knee deformities increase the risk of lateral dislocation, anterior knee pain, and chondromalacia.[8] Palpation evaluates anterior patellar pain, bipartite patella tenderness, patellar ligament, quadriceps tendon, tibial tuberosity, and articular surfaces; medial-lateral patellar mobility assesses chondromalacia or retropatellar arthritis. Pain with proximal-distal compression suggests chondromalacia or osteoarthritis. The patellar apprehension test (PAT) assesses recurrent lateral dislocation risk, with a positive result indicated by patient anxiety or resistance during lateral displacement. PAT has high sensitivity and specificity, though reliability varies due to subjectivity.[8,21]

- Effusion-Related Tests

Small knee effusions are often first noted on inspection, with early signs including swelling along the patellar ligaments and loss of the medial and lateral patellar depressions, while larger effusions distend the suprapatellar pouch, reflecting synovial irritation from trauma or inflammation. The Patellar Tap (Ballottement) test detects effusion by compressing fluid from the suprapatellar pouch, allowing the patella to "float," with a click indicating fluid presence,

though minimal effusions or patellar instability may yield false negatives. The fluid displacement test identifies small effusions by stroking fluid medially and laterally, whereas the palpable fluid wave test evaluates larger effusions, particularly in obese knees, by transmitting pressure from the suprapatellar pouch through the joint.[8]

CONCLUSION

A structured knee examination that integrates focused history, inspection, palpation, range-of-motion assessment, and targeted special tests provides high clinical value in both acute and chronic presentations. Interpreting findings through the lens of anatomy and biomechanics helps clinicians differentiate intra-articular pathology (e.g., meniscal tears, cruciate ligament deficiency, osteochondral lesions) from periarticular conditions and alignment-related problems. Because no single maneuver is definitive, diagnostic confidence is strengthened by combining complementary tests, assessing effusion and stability systematically, and always comparing with the contralateral knee. Consistent documentation of alignment, tenderness, laxity, and functional limitation supports appropriate selection of imaging, timely referral when indicated, and rational planning of conservative or operative management.

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