

JUDUL KETERAMPILAN KLINIS SISTEM MUSKULOSKELETAL

Penulis: dr. Dwi Prayogi, Sp.OT

I. Tingkat Kompetensi Keterampilan

Berdasarkan standar kompetensi dokter yang ditetapkan oleh KKI tahun 2020, maka tingkat kompetensi pemeriksaan muskuloskeletal adalah seperti yang tercantum dalam tabel 1.

Tabel 1. Tingkat kompetensi ketrampilan pemeriksaan fisik sistem muskuloskeletal (KKI, 2020)

No	Keterampilan	Tingkat Keterampilan
	<i>Pemeriksaan Fisik</i>	
1	Inspeksi <i>gait</i>	4
2	Inspeksi tulang belakang saat berbaring dan bergerak	4
3	Inspeksi tonus otot ekstremitas	4
4	Inspeksi sendi ekstremitas	4
5	Inspeksi postur tulang belakang/ pelvis	4
6	Inspeksi posisi scapula	4
7	Inspeksi fleksi dan ekstensi tulang belakang	4
8	Penilaian fleksi lumbal	4
9	Penilaian fleksi ekstensi, adduksi, abduksi dan rotasi panggul	4
10	Menilai atrofi otot	4
11	Penilaian ligamen krusiatatus dan kolateral lutut	4
12	Penilaian meniscus	3
13	Inspeksi postur dan bentuk kaki	4
14	Penilaian fleksi dorsal/plantar, inversi dan eversi kaki	4
15	<i>Palpation for tenderness</i>	4
16	Palpasi untuk mendeteksi nyeri diakibatkan tekanan vertical	4
17	Palpasi tendon dan sendi	4
18	Palpasi tulang belakang, sendi sakro-iliaka dan otot-otot punggung	4
19	<i>Percussion for tenderness</i>	4
20	Penilaian <i>range of motion (ROM)</i> sendi	4
21	Menetapkan ROM kepala	4
22	Tes fungsi otot dan sendi bahu	4
23	Tes fungsi sendi pergelangan tangan, metacarpal dan jari-jari tangan (Tanda Phallen, Tanda Tinnel, Tanda Luthy, Tanda Gower, dll)	4
24	Pengukuran panjang ekstremitas bawah	4

Keterangan:

Tingkat kemampuan 1 Mengetahui dan Menjelaskan

Tingkat kemampuan 2 Pernah Melihat atau pernah didemonstrasikan

Tingkat kemampuan 3 Pernah melakukan atau pernah menerapkan di bawah supervisi

Tingkat kemampuan 4 Mampu melakukan secara mandiri

II. Tujuan Belajar

1. Mahasiswa mampu menjelaskan konsep pengetahuan tentang pemeriksaan fisik sistem muskuloskeletal (jenis keterampilan pada tabel 1).
2. Mahasiswa mampu melakukan pemeriksaan fisik sistem muskuloskeletal dengan benar dan menginterpretasi hasil pemeriksaan fisik sistem muskuloskeletal

III. Prerequisite knowledge

Sebelum memahami konsep pemeriksaan fisik sistem muskuloskeletal, mahasiswa harus:

1. Memahami anatomi anggota gerak atas, anggota gerak bawah, dan tulang belakang
2. Memahami fisiologi anggota gerak atas, anggota gerak bawah, dan tulang belakang
3. Mengenal alat bantu diagnostik pada pemeriksaan fisik sistem muskuloskeletal
4. Memahami kelainan patologi pada sistem muskuloskeletal

IV. Kegiatan Pembelajaran

Pembelajaran dilakukan dalam tahapan sebagai berikut:

Tahapan pembelajaran	Lama	Metode	Pelaksana/ Penanggung Jawab
Praktikum Keterampilan Klinik	2 x 100 menit	Demonstrasi/audiovisual, Role play, feedback	Dosen Pakar
Praktikum keterampilan klinik mandiri	Tentative	Role play dengan Asisten Laboratorium (Aslab)	Aslab
Evaluasi	Tentative	Evaluasi dilakukan pada akhir semester dalam bentuk OSCE	Tim OSCE

V. Sumber belajar

Fisiologi Sistem Muskuloskeletal

Reaksi inflamasi ditandai oleh serangkaian proses biokimia sebagai respon terhadap injuri akibat trauma atau tindakan pembedahan, metabolik atau proses infeksi. Tanda – tanda klinis inflamasi (*Cardinal sign*) meliputi erythema (rubor), oedema lokal (tumor), peningkatan temperature dalam jaringan (calor), dan nyeri (dolor).

Vasodilatasi lokal yang mengakibatkan ekstrasvasasi cairan menuju ruang ekstra selular dan ekstra vascular, serta terhambatnya aliran system limfatik berperan dalam terjadinya erythema, oedema local dan peningkatan temperatur dalam jaringan. Tanda klinis inflamasi yang keempat berupa nyeri timbul sebagai akibat pembengkakan jaringan yang secara mekanik menekan jaringan lunak sekitarnya dan iritasi kimia yang ditimbulkan oleh mediator inflamasi pada reseptor saraf sensoris.

Fase inflamasi akut berlangsung segera setelah terjadi injuri dan berlangsung selama 24 sampai 48 jam meskipun dalam beberapa kondisi dapat berlangsung sampai 3 minggu.

Fase proliferaatif dapat terjadi pada awal fase inflamasi, meskipun sebagian besar terjadi pada hari ke-21 paska injuri.

Fase remodeling atau formasi matriks mulai terjadi pada minggu ketiga dan dapat berlangsung selama dua tahun.

Panduan Tata Cara Pemeriksaan Sistem Muskuloskeletal

Anamnesis dan pemeriksaan klinis merupakan serangkaian proses yang sistematis yang perlu dipelajari, dilatih dan diterapkan dalam rangka mendapatkan diagnosis dan tata laksana yang tepat. Proses ini memerlukan waktu dan latihan yang berulang-ulang.

Dengan memperhatikan kondisi pasien pada saat masuk ke dalam ruang pemeriksaan dapat memberikan gambaran secara umum tentang kondisi pasien dan kadang-kadang pemeriksa dapat mengetahui kepribadian pasien. Memperkenalkan diri kepada pasien, menanyakan nama pasien dan pengantar, serta hubungan antara pasien dan pengantar

Dokter harus mendengarkan dan memperhatikan setiap perkataan pasien dan mendokumentasi setiap pernyataan pasien yang berhubungan dengan kondisi pasien. Dokter sebaiknya mengarahkan alur pembicaraan dengan menghindari pertanyaan yang mengarahkan pasien.

Dalam pemeriksaan klinis, dokter senantiasa menjelaskan setiap pemeriksaan yang akan dilakukan dan mengapa pemeriksaan tersebut perlu dilakukan untuk mengurangi kecemasan pasien. Pemeriksaan klinis terhadap pasien harus dilakukan secara gentle tanpa menimbulkan nyeri dan dalam kondisi yang nyaman bagi pasien.

Anamnesis meliputi keluhan utama, riwayat seputar keluhan utama, riwayat sebelumnya, riwayat pengobatan, riwayat keluarga, riwayat sosial dan pekerjaan, riwayat pribadi, dan harapan pasien terhadap kondisinya.

Pemeriksaan klinis meliputi :

1. Pemeriksaan kondisi umum

Meliputi pemeriksaan pasien secara menyeluruh. Keadaan umum, status mental, ada tidaknya anemia, jaundice, cyanosis, clubbing, perubahan kulit dan kuku, pedal oedema, demam, deformitas pada sendi dan tulang yang multiple dan manifestasi klinis yang lain.

2. Pemeriksaan status lokalis

Meliputi pemeriksaan

- Inspeksi (Look),
- Palpasi (Feel),
- Movement (gerak), meliputi pemeriksaan gerak aktif dan pasif, pengukuran ruang lingkup gerak sendi (Range of Movement) dengan menggunakan goniometer
- Pengukuran dengan alat bantu
- Status neurovascular

Pemeriksaan pada kondisi bengkak atau swelling, meliputi :

- Lokasi
- Ukuran
- Warna



- Suhu
- Tenderness
- Bentuk
- Permukaan; halus, irregular, berbungkul
- Tepi; tegas, tidak tegas
- Konsistensi; lunak, padat kenyal, keras
- Redusibilitas
- Fluktuasi
- Pulsatile
- Transiluminasi
- Hubungan dengan jaringan sekitar
- Fiksasi terhadap tulang atau kulit
- Pembesaran Kelenjar Getah Bening regional
- Status neurovaskular, sendi dan tulang

Pemeriksaan pada kondisi Ulkus, meliputi :

- Lokasi
- Ukuran dan bentuk
- Warna

- Suhu
- Tenderness
- Dasar luka
- Tepi ulkus
- Kedalaman ulkus
- Discharge
- Pembesaran Kelenjar Getah Bening regional
- Status neurovaskular, sendi dan tulang

Pada kasus trauma, pemeriksaan klinis mengacu pada kaidah-kaidah di dalam **Advanced Trauma Life Support (ATLS)**, yang mengidentifikasi dan secara simultan melakukan penatalaksanaan secara dini pada kondisi atau keadaan yang mengancam nyawa.

Table 2.1: ATLS® approach to managing the trauma patient

Primary survey

1. Airway with cervical spine control
2. Breathing
3. Circulation with hemorrhage control
4. Disability
5. Exposure
6. Re-evaluation
7. Adjuncts to the primary survey

Secondary survey

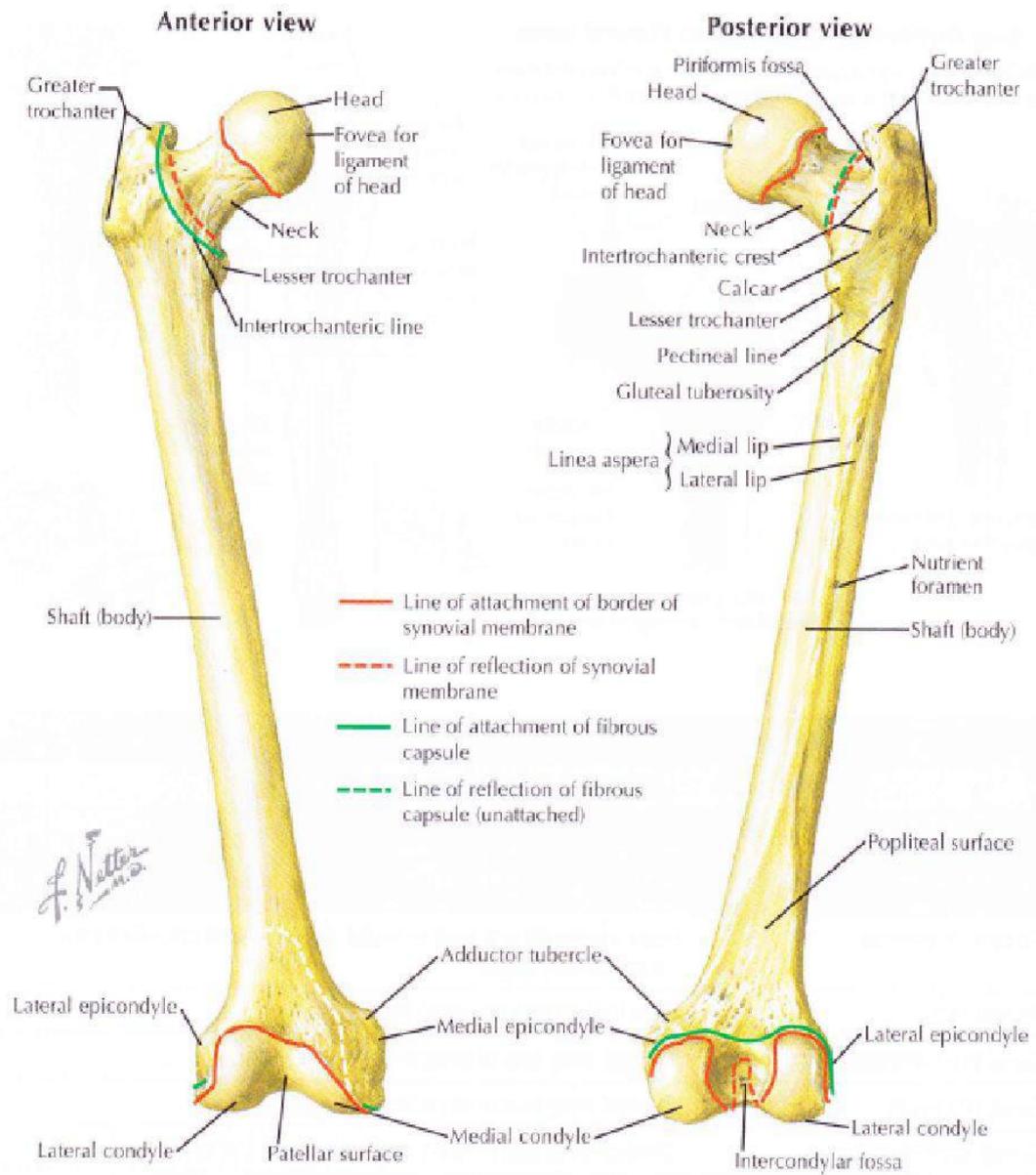
1. History
2. Examination
3. Adjuncts to the secondary survey

Secara umum, pemeriksaan sistem muskuloskeletal mengikuti pola sebagai berikut :

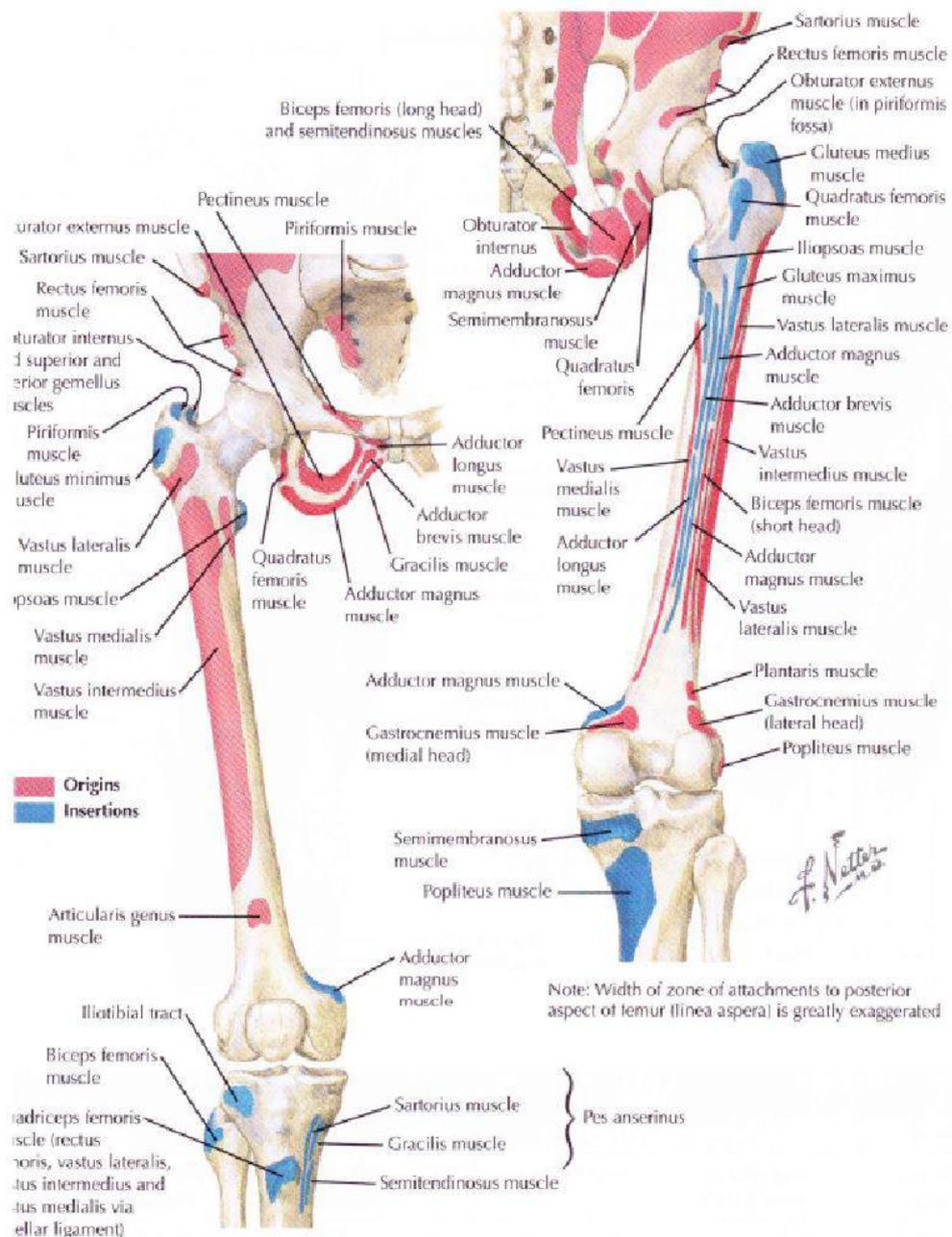
1. Inspeksi (Look)
2. Palpasi (Feel)
3. Movement, meliputi gerak aktif dan pasif
4. Pemeriksaan klinis khusus, meliputi pemeriksaan ligamen, pemeriksaan status neurologis
5. Pemeriksaan Tambahan, meliputi radiografi, ultrasound, CT scan, MRI, Doppler, pengukuran tekanan kompartemen

Anatomi Anggota Gerak Bawah

A. Pinggul / Hip



Gambar A1. Anatomi Osteologi Pinggul dan Paha

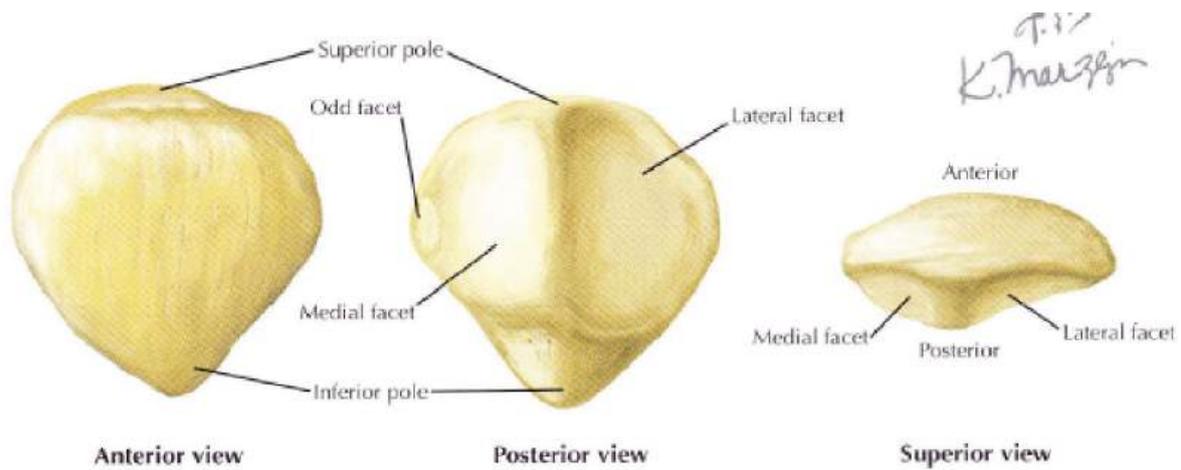


PUBIC RAMI (ASPECT)	GREATER TROCHANTER	ISCHIAL TUBEROSITY	LINEA ASPERA/ POSTERIOR FEMUR
Pectineus (pectineal line/sup) Adductor magnus (inferior) Adductor longus (anterior) Adductor brevis (inferior) Gracilis (inferior) Psoas minor (superior)	Piriformis (anterior) Obturator internus (anterior) Superior gemellus Gluteus medius (posterior) Gluteus minimus (anterior)	Inferior gemellus Quadratus femoris Semimembranosus Semitendinosus Biceps femoris (LH) Adductor magnus*	Adductor magnus* Adductor longus Adductor brevis Biceps femoris (SH) Pectineus Gluteus maximus Vastus lateralis Vastus medialis

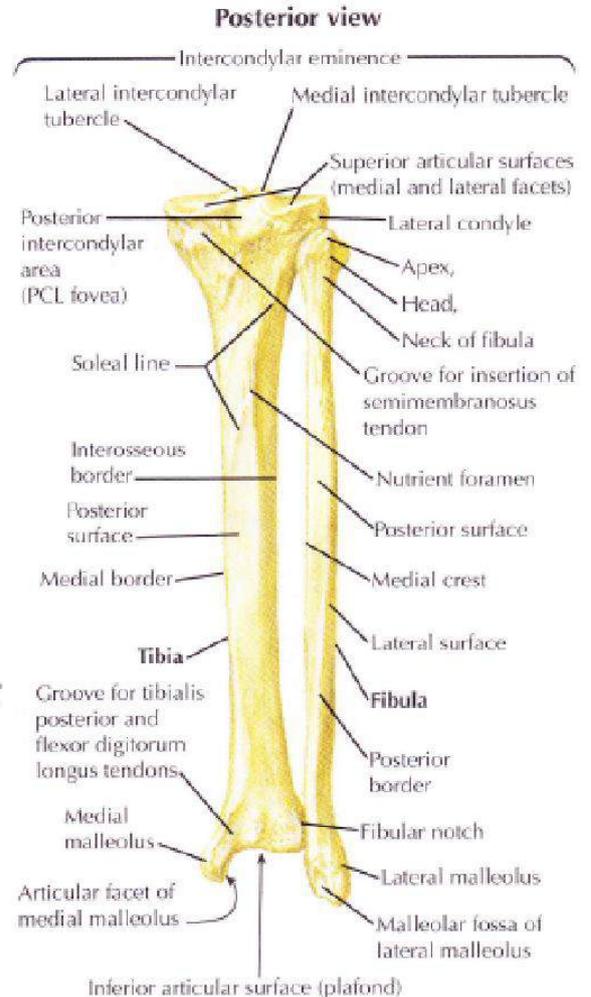
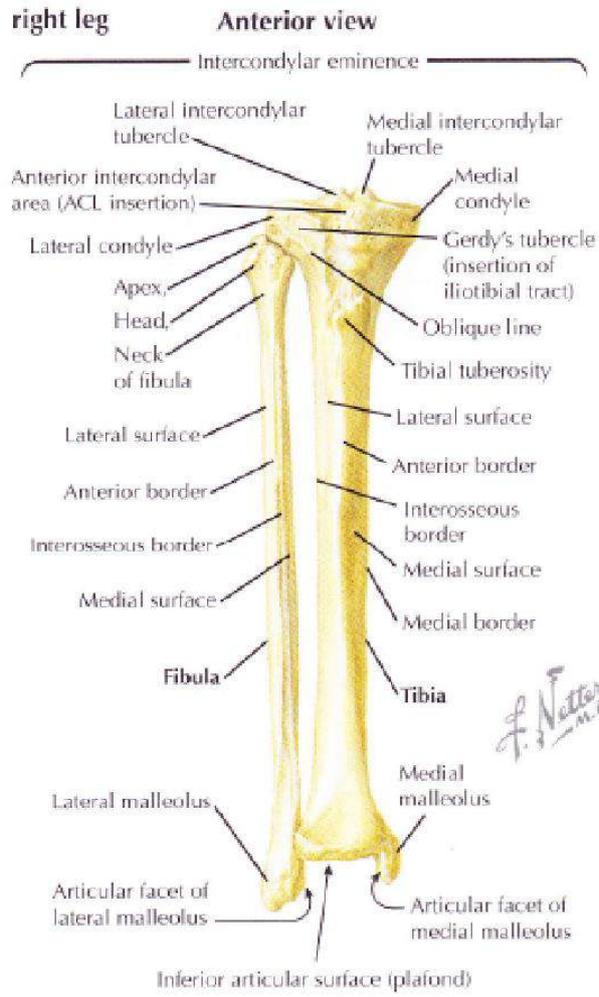
*Adductor magnus has two origins.

Gambar A2. Origo dan Insertio Otot-otot Paha dan Pinggul

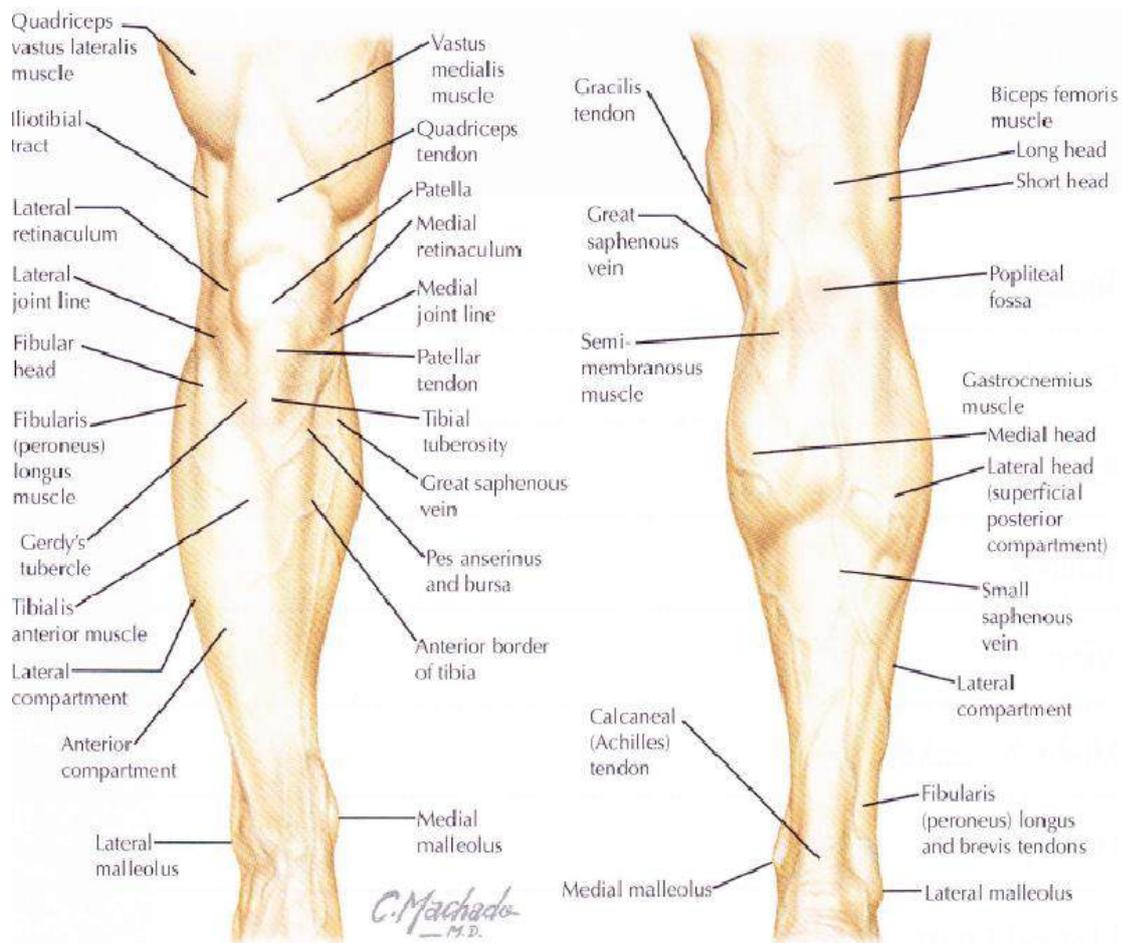
B. Lutut dan Tungkai Bawah



Bones of right leg



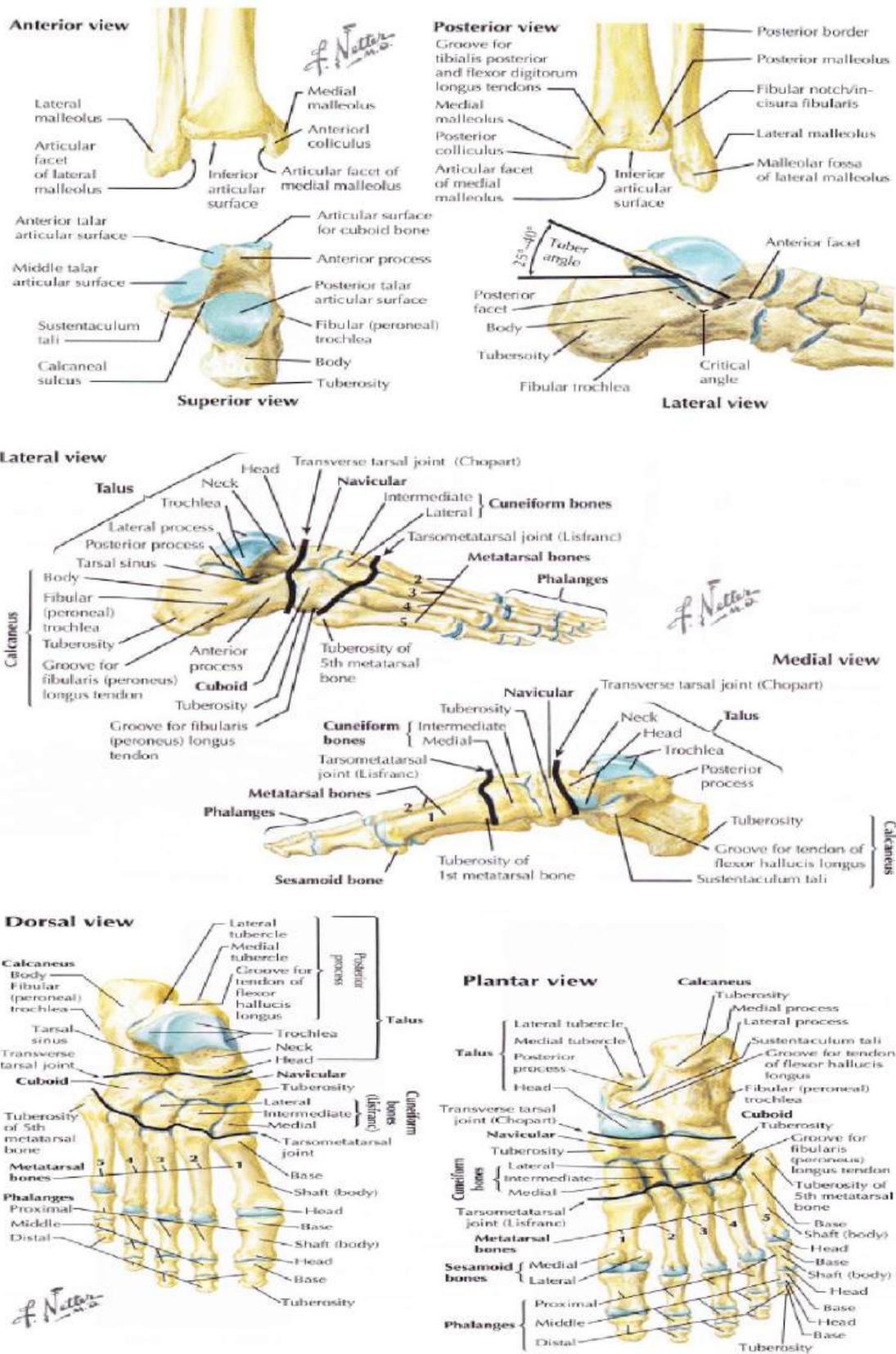
Gambar B1. Osteologi Lutut dan Tungkai bawah



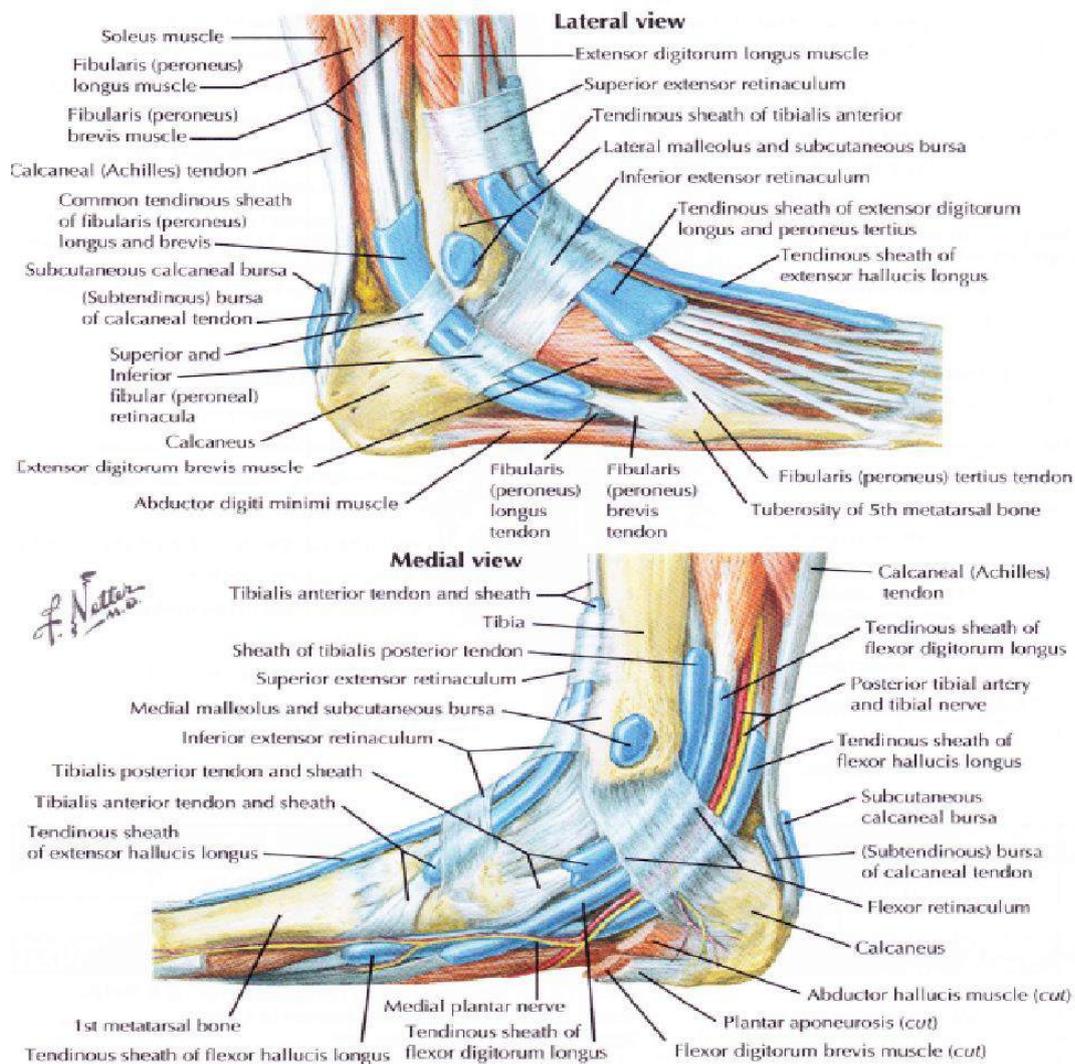
STRUCTURE	CLINICAL APPLICATION
Iliotibial tract (band)	Tightness can cause lateral knee and/or thigh pain.
Quadriceps muscle	Atrophy can indicate an injury and/or contribute to knee pain.
Quadriceps tendon	Can rupture with eccentric loading. Defect is palpated here.
Patella	Tenderness can indicate fracture; swelling can be prepatellar bursitis.
Patellar tendon	Can rupture with eccentric loading. Defect is palpated here.
Patellar retinaculum	Patellar femoral ligaments palpated here. They can be injured in patellar dislocation. Plicae can also be palpated here.
Joint line	Tenderness here can indicate meniscal pathology.
Tibial tubercle	Tender in Osgood-Schlatter disease.
Pes anserinus & bursa	Insertion of medial hamstrings. Bursitis can develop. Site of hamstring tendon harvest.
Gerdy's tubercle	Insertion of the iliotibial tract (band).
Popliteal fossa	Popliteal artery pulse can be palpated here.
Muscle compartments	Will be firm or tense in compartment syndrome. Anterior most common.

Gambar B2. Topografi dan aplikasi Klinis

C. Pergelangan Kaki dan Kaki (Ankle & Foot)



Gambar C1. Anatomi Osteologi Foot & Ankle



Gambar C2. Anatomi Tendon Foot & Ankle

Fisiologi Anggota Gerak Bawah

A. Pinggul / Hip

MUSCLE	ORIGIN	INSERTION	NERVE	ACTION	COMMENT
ANTERIOR					
Articularis genu	Distal anterior femoral shaft	Synovial capsule	Femoral	Pulls capsule superiorly in extension	May join with vastus intermedius
Sartorius	ASIS	Prox. med. tibia (pes anserinus)	Femoral	Flex, ER hip	Can avulse from ASIS (avulsion fracture)
Quadriceps					
Rectus femoris	1. AIS 2. Sup. acetab. rim	Patella/tibial tubercle	Femoral	Flex thigh, extend leg	Can avulse from AIS (avulsion fracture)
Vastus lateralis	Gr. trochanter, lat. linea aspera	Lateral patella/tibia tubercle	Femoral	Extend leg	Oblique fibers can affect Q angle
Vastus intermedius	Proximal femoral shaft	Patella/tibia tubercle	Femoral	Extend leg	Covers articularis genu
Vastus medialis	Intertrochanteric line, med. linea aspera	Medial patella/tibia tubercle	Femoral	Extend leg	Weak in many patello-femoral disorders
MEDIAL					
Obturator externus	Ischiopubic rami, obturator memb	Piriformis fossa	Obturator	ER thigh	Insertion at start point of IM nail
Hip Adductors					
Adductor longus	Body of pubis (inferior)	Linea aspera (mid 1/3)	Obturator	Adducts thigh	Tendon can ossify
Adductor brevis	Body and inferior pubic ramus	Pectineal line, linea aspera	Obturator	Adducts thigh	Deep to pectineus
Adductor magnus	1. Pubic ramus 2. Ischial tub.	Linea aspera, add. tubercle	1. Obturator 2. Sciatic	Adducts & flex/extend thigh	Muscle has two separate parts
Gracilis	Body and inferior pubic ramus	Prox. med. tibia (pes anserinus)	Obturator	Adduct thigh, flex/ER leg	Used in ligament reconstruction
Hip Flexors					
Pectineus	Pectineal line of pubis	Pectineal line of femur	Femoral	Flex and adducts thigh	Part of femoral triangle floor
POSTERIOR: HAMSTRINGS					
Semitendinosus	Ischial tuberosity	Proximal medial tibia (pes anserinus)	Sciatic (tibial)	Extend thigh, flex leg	Tendon used in ligament reconstructions (ACL)
Semimembranosus	Ischial tuberosity	Posterior medial tibial condyle	Sciatic (tibial)	Extend thigh, flex leg	A border in medial approach
Biceps femoris: long head	Ischial tuberosity	Head of fibula	Sciatic (tibial)	Extend thigh, flex leg	Can avulse from origin (avulsion fx)
Biceps femoris: short head	Linea aspera, supracondylar line	Fibula, lateral tibia	Sciatic (peroneal)	Extend thigh, flex leg	Shares tendon insertion with long head

Gambar A3. Fungsi Otot-Otot pada Pinggul dan paha

B. Lutut dan Tungkai Bawah

KNEE
Structure
<ul style="list-style-type: none"> Comprises 3 separate articulations <ul style="list-style-type: none"> Medial & lateral femorotibial joints (2)—condyloid (hinge) joints. Femoral condyles articulate with corresponding tibial plateaus. Patellofemoral joint (1)—sellar (gliding) joint. Patella articulates with femoral trochlear groove. 3 compartments in the knee: medial, lateral, patellofemoral Capsule surrounds entire joint (all three articulations/compartments) and extends proximally into the suprapatellar pouch. <ul style="list-style-type: none"> The capsule has a synovial lining that also covers the cruciate ligaments (making them intraarticular but extrasynovial) Articular (hyaline) cartilage (type II collagen) covers the femoral condyles, tibial plateaus, trochlear groove, and patellar facets. Menisci are interposed in the medial & lateral femorotibial joints to: 1. protect the articular cartilage, 2. give support to the knee. Knee axis (line drawn between weight-bearing portion of medial & lateral femoral condyles) is parallel to the ground. <ul style="list-style-type: none"> Mechanical axis of the femur is 3° valgus to the vertical axis, allowing the larger MFC to align with the LFC parallel to the ground. Mechanical axis of the tibia is 3° varus to the vertical axis (87° to knee axis).
Kinematics
<ul style="list-style-type: none"> Inherently unstable joint. Bony morphology adds little stability. Stability primarily provided by surrounding static and dynamic stabilizers. (Dynamic stabilizers may compensate when static stabilizers are injured [e.g., complete or partial ACL rupture].) <ul style="list-style-type: none"> Medial: Static—superficial and deep medial collateral ligaments (MCL), posterior oblique ligament (POL). Dynamic—semimembranosus, vastus medialis, medial gastrocnemius, PES tendons Lateral: Static—lateral collateral ligament (LCL), iliotibial band (ITB), arcuate ligament. Dynamic—popliteus, biceps femoris, lateral gastrocnemius Not a simple hinge joint. The knee has 6 degrees of motion: <ul style="list-style-type: none"> Extension/flexion, IR/ER, varus/valgus, anterior/posterior translation, medial/lateral translation, compression/distraction Flexion & extension are the primary motions in the knee. <ul style="list-style-type: none"> Flexion is a combination of both "rolling" and "sliding" of the femur on the tibia in varying ratios depending on the degree of flexion. Rolling: equal translation of tibiofemoral contact point & joint axis. Rolling predominates in early flexion. Gliding: translation of tibiofemoral contact point without moving the joint axis. Increased gliding is needed for deep flexion. The cruciate ligaments control the roll/glide function. The PCL alone can maintain this function (e.g., PCL retaining TKA). Normal motion: Extension/flexion: -5 to 140°. 115° needed to get out of a chair; 130° needed for fast running. IR/ER: about 10° total through arc of motion. Tibia IRs in swing, and ERs in stance via "screw home mechanism." <ul style="list-style-type: none"> Screw home mechanism: larger MFC ERs tibia in full extension, tightening cruciates and stabilizing the knee in stance. Popliteus IRs the tibia to "unlock" the knee, loosen the cruciates, which allows the knee to initiate flexion. Other motions: Medial/lateral translation: minimal in normal knees <ul style="list-style-type: none"> Anterior/posterior translation: dependent on tissue laxity, usually within 2mm of contralateral side in normal knees Varus/valgus: approximately 5mm of gapping laterally or medially when stressed in normal knees

Gambar B3. Struktur dan kinematik lu

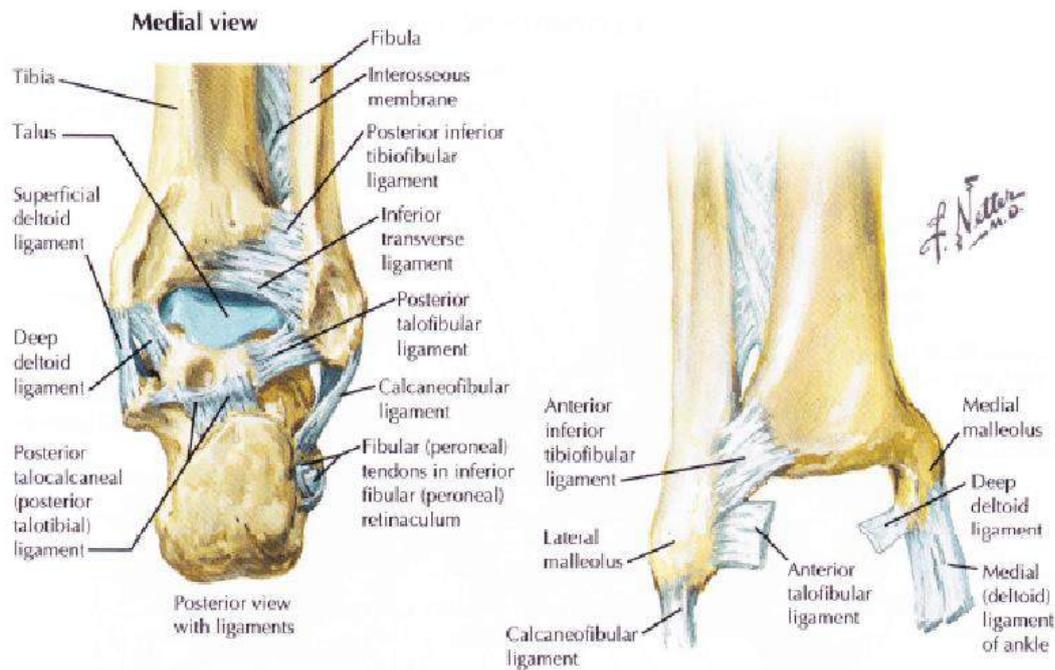
LIGAMENTS	ATTACHMENTS	FUNCTION/COMMENT
KNEE		
Femorotibial Joint—Anterior Structures		
Anterior cruciate ligament (ACL) Anteromedial bundle Posterolateral bundle	Posteromedial aspect of lateral femoral condyle to anterior tibial eminence	Primary restraint to anterior tibial translation; secondary restraint to varus (in extension) & IR Tight in knee flexion, lax in extension Tight in knee extension, lax in flexion
Transverse meniscal ligament	Connects both anterior horns of menisci to tibia	Stabilizes menisci; can be torn/injured
Other Structures		
Ligamentum mucosum (anterior plica)	Distal femoral articulation to anterior tibial plateau	Synovial remnant. Covers anterior notch (ACL); may need to be debrided for full visualization
Infrapatellar fat pad	Posterior to patellar tendon, anterior to intercondylar notch	Cushions patellar tendon. Can become fibrotic or impinged on, causing knee pain (Hoffa syndrome)

tut

KNEE		
Femorotibial Joint—Posterior Structures		
Posterior cruciate ligament (PCL)	Lateral aspect (in notch) of medial femoral condyle to post. proximal tibia (below joint line)	Primary restraint to posterior tibial translation Secondary restraint to varus, valgus, and ER
Anterolateral bundle	Ant. origin on condyle, lat. on tibia	Tight in knee flexion, lax in extension
Posteromedial bundle	Post. origin on condyle, med. on tibia	Tight in knee extension, lax in flexion
Menisiofemoral ligaments	Posterior lateral meniscus to MFC and/or PCL, either:	Variably present. Rarely are both present
Ligament of Humphrey	Anterior to PCL	Contributes to PCL function & stabilizes meniscus
Ligament of Wrisberg	Posterior to PCL	Contributes to PCL function & stabilizes meniscus
Oblique popliteal ligament (OPL)	Origin on semimembranosus insertion on posterior tibia; inserts on posterior LFC & capsule	Tightens posterior capsule when semimembranosus contracts; considered part of "posteromedial" corner
Femorotibial Joint—Lateral and Posterolateral Structures		
First Layer—Superficial		
Iliotibial band (tract) (ITB)	3 insertions: 1. Gerdy's tubercle, 2. patella and patellar tendon, 3. supracondylar tubercle	Stabilizes lateral knee—"accessory anterolateral ligament." Post. in flexion (ERs fibia), ant. in extension
Scope femoris	2 heads insert on fibular head, lateral to LCL	Lateral stabilizer, also externally rotates tibia
Second Layer—Middle		
Lateral patellofemoral ligament	Lateral femur to lateral edge of patella	May need release if tightened and causing patella tilt and abnormal lateral articular cartilage wear
Lateral patellar retinaculum	Vastus fascia to tibia & patella	
Third Layer—Deep		
SUPERFICIAL LAMINA		
Lateral collateral lig. (LCL)	Lateral epicondyle to medial fibular head	Primary restraint to varus stress, also resists ER
Fabellofibular ligament	Fibula head to fabella, usually with arcuate lig.	Variably present, also called "short collateral"
DEEP LAMINA		
Popliteus muscle and tendon	Inserts anterior and distal to LCL origin	Resists tibia ER, varus, and posterior translation
Popliteofibular ligament (PFL)	Popliteus musculotendinous jun to fibula head	Primary static restraint to external rotation (ER)
Capsule	Femur to tibia. Extends 15mm below joint line	Reinforced by other structures; resists varus & ER
Arcuate ligament	Lateral arm: fibular head to posterior femur Medial arm: post-lat femur, blends with OPL	Variably present, Y-shaped; two arms. Lateral arm covers popliteus supporting posterolateral knee
Other		
Lateral meniscus	To lateral plateau via coronary ligaments	Gives concavity to the convex lateral plateau
Lateral head of gastrocnemius	Origin is on posterior lateral condyle	Acts dynamic support to posterolateral knee
<ul style="list-style-type: none"> The inferior lateral geniculate artery passes between the superficial and deep lamina of the third layer of the posterolateral corner. The LCL, popliteus, and popliteofibular ligament are the most consistent structures and are the focus of surgical reconstruction. Most of the posterolateral structures act as stabilizers to varus & ER forces. They also are secondary stabilizers to posterior translation. Arcuate "complex" refers to posterolateral stabilizing structures including: LCL, arcuate ligament, popliteus, & lateral gastrocnemius. 		
Femorotibial Joint—Medial Structures		
First Layer—Superficial		
Sartorius	Becomes fascial layer at insertion at Pes	Covers other tendons at Pes insertion
Fascia	Deep fascia from thigh continues to knee	Blends with retinaculum (ant.) & capsule (post.)
Second Layer—Middle		
Superficial medial collateral (MCL)	Medial epicondyle to tibia (deep to Pes) Broad insertion is 5-7cm below joint line	Primary restraint to valgus force (esp. at 30°) Secondary stabilizer to anterior translation & IR
Posterior oblique ligament (POL)	Adductor tubercle (post. to MCL) to posterior tibia, PH of med. meniscus, & capsule	Static stabilizer against valgus. Lax in flexion but tightens dynamically due to semimembr.
Medial patellofemoral ligament (MPFL)	Medial patella to medial femoral epicondyle	Primary static stabilizer against patella lateralization; may need repair/reconstruction after dx
Medial patellar retinaculum	Continuous w/vastus fascia to tibia & patella	Can also be injured in lateral patellar subluxation
Semimembranosus	Inserts posteromedial on tibia	Gives posteromedial support
Third Layer—Deep		
Deep medial collateral (MCL)	Inserts on medial meniscus & tibia plateau	Stabilizes meniscus. Also known as medial capsular ligament or middle 1/3 capsular ligament
Menisiofemoral fibers	Femur to meniscus	
Menisiotibial fibers	Tibia to meniscus	
Capsule	Femur to tibia, extends 15mm below joint	Reinforced by other posteromedial structures
Other		
Medial meniscus	Attached firmly to medial tibial plateau via coronary ligaments	Posterior horn is secondary stabilizer to anterior translation. Becomes 1° in ACL
Medial head of gastrocnemius	Origin on the posteromedial femur	Provides some minor additional dynamic support
<ul style="list-style-type: none"> Gracilis and semitendinosus tendons are between layers 1 and 2 and act as secondary dynamic medial stabilizers. The POL is a confluence of layers 2 and 3 tissues that are indistinct in the posteromedial aspect of the knee. 		

Gambar B4. Struktur dan Fungsi Ligamen pada lutut

C. Pergelangan Kaki dan Kaki (Ankle & Foot)



LIGAMENTS	ATTACHMENTS	COMMENTS
DISTAL TIBIOFIBULAR		
Syndesmosis	Primary support of ankle	Injured in Weber C fx & "high" ankle sprains
◦ Anterior inferior tibiofibular (AITFL)	Anterior tibia (ant. tubercle) to distal fibula	Strong, oblique ligament. Avulsion yields "Tillaux" fracture/fragment
◦ Posterior inferior tibiofibular (PITFL)	Posterior tibia to distal fibula	Weaker; originates on posterior malleolus
◦ Inferior transverse ligament (ITL)	Inferior & deep to PITFL	Gives posterior support to ankle mortise
◦ Interosseous ligament (IOL)	Lateral tibia to medial fibula	Strong distal thickening of interosseous memb.
If the syndesmosis is torn, the ankle mortise is disrupted. The fibula (& firmly attached talus) will displace laterally.		
ANKLE		
The ankle is a ginglymus, or hinge joint. It primarily provides plantarflexion & dorsiflexion motion. ROM: DF 20°, PF 50°		
Capsule	Tibia and fibula to talus	Gives varying amount of support to the ankle
Lateral	Lateral malleolus to:	ATFL & PTFL are capsular thickenings
◦ Anterior talofibular (ATFL)	Neck of talus	Resists anterior translation. #1 injured ligament in ankle sprains.
◦ Calcaneofibular (CFL)	Calcaneus (peroneal tub.)	Deep to peroneal tendons. Resists inversion. #2 in ankle sprains.
◦ Posterior talofibular (PTFL)	Talus (posterior process)	Strong. Rarely torn. Attaches to lateral tubercle of posterior process.
Medial: deltoid ligament (4 parts)		Origin on medial malleolus (MM)
Superficial deltoid	Anterior colliculus of MM to:	Resists eversion of the ankle
◦ Anterior tibiotalar	Anteromedial talus	Weak ligament. Can cause impingement
◦ Tibionavicular	Navicular tuberosity	Restraint to medial migration of talar head
◦ Tibiocalcaneal	Sustentaculum tali	Strongest portion of the superficial deltoid, resists valgus
Deep deltoid	Posterior colliculus of MM to:	Resists external rotation and lateral migration
◦ Posterior tibiotalar	Medial talus & medial tubercle	Nearly horizontal; strongest portion of deltoid

Gambar C3. Struktur Ligamen Pada Ankle

Panduan Tata Cara Pemeriksaan Anggota Gerak Bawah

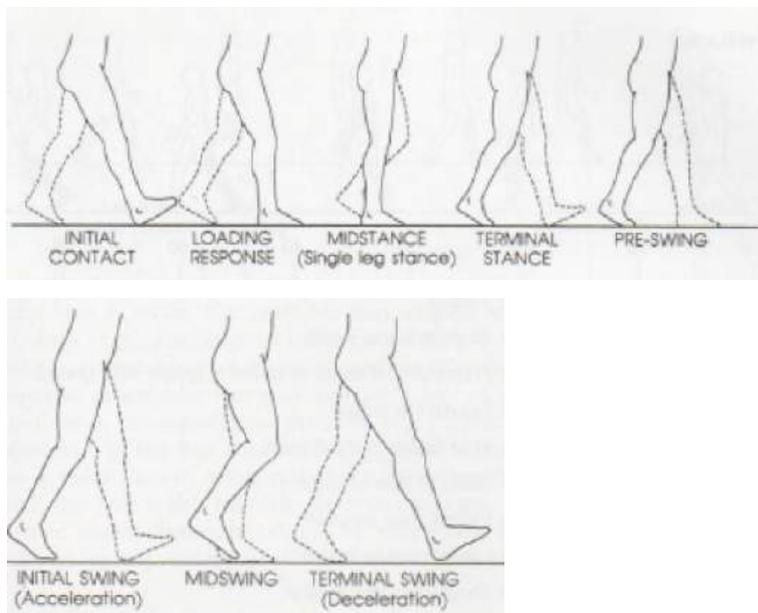
A. Pemeriksaan Hip

Pemeriksaan pada hip merupakan rangkaian pemeriksaan yang dilakukan pada posisi berdiri, duduk, dan berbaring. Dalam setiap posisi dilakukan pemeriksaan secara sistematis melalui look, feel, movement

1. Pemeriksaan Look / Inspeksi

Cara Berjalan (Gait)

Dievaluasi baik dengan menggunakan alat bantu untuk berjalan seperti crutch atau berjalan tanpa alat bantu dengan tanpa alas kaki



Gambar A4. Fase berjalan

a. *Short Limb Gait* : pasien berjalan dengan posisi pergelangan kaki *equinus* pada sisi yang abnormal atau tampak adanya kemiringan pada bahu atau pinggul kearah tungkai yang abnormal sebagai kompensasi terhadap tungkai yang pendek. Pada saat berdiri, pasien dapat mengkompensasi keadaan ini dengan menekuk tungkai yang normal



Gambar A5. Short Leg Gait

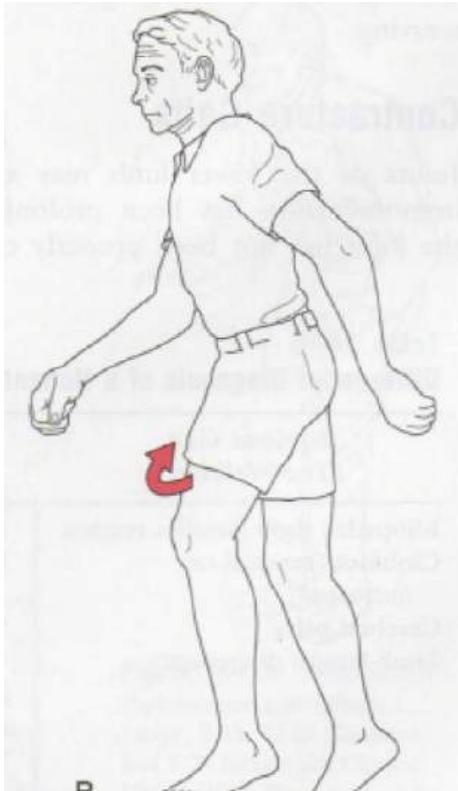
b. *Trendelenburg gait* : pada saat menumpu di sisi tungkai yang abnormal, otot abduktor tidak mampu mengangkat sisi pelvis yang berseberangan, sehingga pada saat berjalan titik pusat gravitasi bergeser menjauhi tungkai yang menumpu, sehingga untuk mencapai keseimbangan badan pasien akan bergerak miring kearah tungkai yang abnormal untuk mendekatkan titik pusat gravitasi ke arah tungkai yang menumpu / yang abnormal. Jika kelemahan otot abduktor hip terjadi bilateral maka akan terjadi *waddling gait*



Gambar A6. Trendelenburg Gait

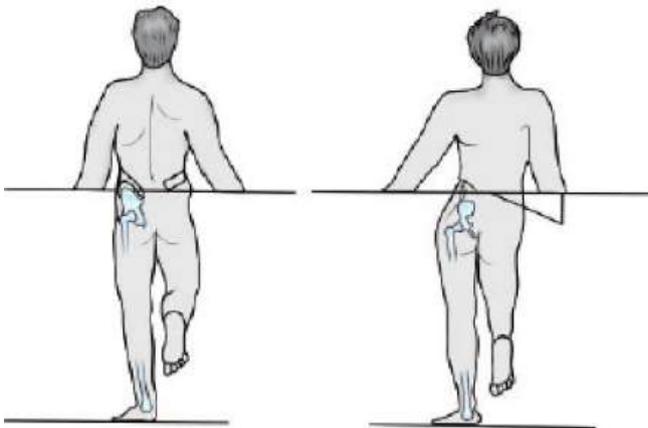
c. *Antalgic Gait* : cara berjalan yang ditandai dengan, singkatnya waktu *stance phase* atau pendeknya waktu menumpu pada tungkai yang abnormal dan langkah kaki yang pendek

d. *Stiff Hip Gait* : pergerakan pada sendi pinggul / hip minimal yang ditandai dengan pada saat melangkah tungkai yang abnormal akan melakukan gerakan circumductio pada pinggul untuk mengayun tungkai



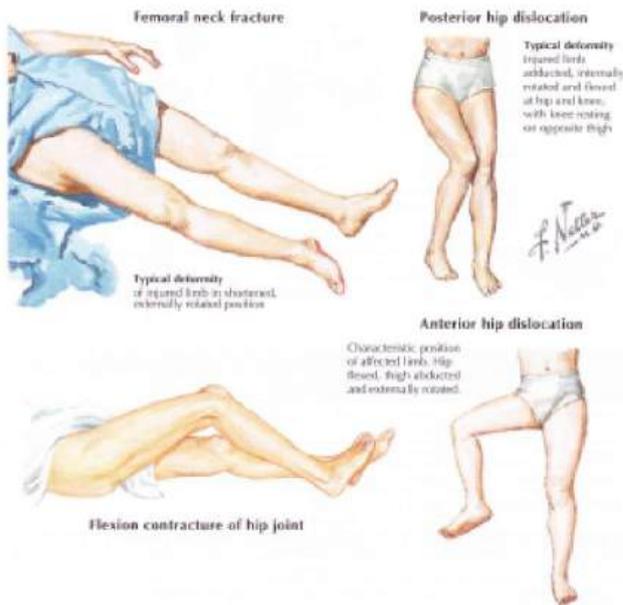
Gambar A7. Stiff Hip Gait

Pada posisi berdiri evaluasi penderita dari depan, samping, dan belakang.



Gambar A8. Trendelenburg's Test

Pada posisi berbaring, evaluasi ada tidaknya deformitas



Gambar A9. Deformitas pada Hip

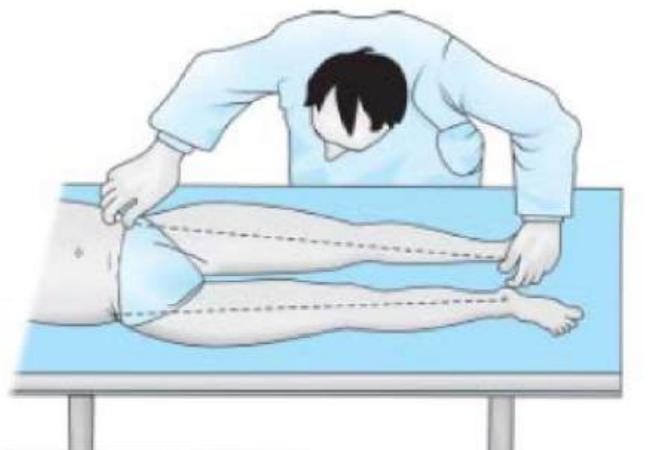
2. Pemeriksaan Feel / Palpasi

Evaluasi ada tidaknya nyeri tekan pada trochanter mayor, lipat paha

PALPATION		
Bony structures	Greater trochanter/bursa	Pain/palpable bursa: infection/bursitis, gluteus medius tendinitis Snapping—IT band may snap over GT
	Lesser trochanter	Snapping—Psoas tendon may snap over LT

Gambar A10. Palpasi struktur tulang pada Hip

Mengukur panjang tungkai untuk mengevaluasi ada tidaknya *leg length discrepancy*. Sebelum melakukan pengukuran, pemeriksa harus mengatur posisi pelvis agar seimbang dan sejajar antara kedua tungkai. Jarak antara kedua tungkai terpisah kurang lebih 15-20 cm dan paralel satu sama lain. Ada 2 pengukuran yang dilakukan, yaitu *True Length* dan *Apparent Length*. *True Length* diukur dari (ASIS) ke medial maleolus sisi tungkai yang sama, sedangkan *Apparent Length* diukur dari Umbilicus atau Prosesus Xyphoideus ke medial maleolus tungkai kanan dan kiri.



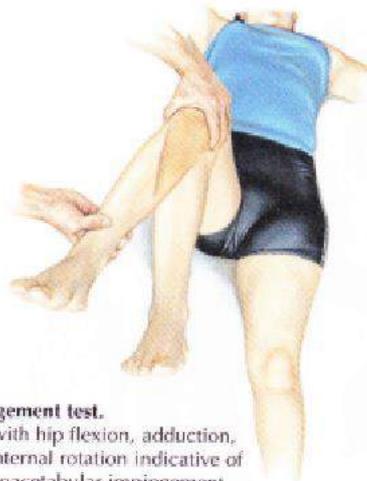
Gambar A10. True Length



Gambar A11. Apparent Length

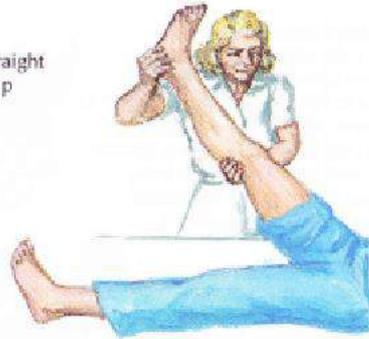
NEUROVASCULAR		
Sensory		
Genitofemoral nerve (L1-2)	Proximal anteromedial thigh	Deficit indicates corresponding nerve/root lesion
Obturator nerve (L2-4)	Inferomedial thigh	Deficit indicates corresponding nerve/root lesion
Lat. femoral cutaneous n. (L2-3)	Lateral thigh	Deficit indicates corresponding nerve/root lesion
Femoral nerve	Anteromedial thigh	Deficit indicates corresponding nerve/root lesion
Post. femoral cutaneous n. (S1-3)	Posterior thigh	Deficit indicates corresponding nerve/root lesion
Motor		
Obturator nerve (L2-4)	Thigh/hip adduction	Weakness = adductor muscle group or nerve/root lesion
Superior gluteal nerve (L5)	Thigh abduction	Weakness = gluteus medius or nerve/root lesion
Femoral nerve (L2-4)	Hip flexion Knee extension	Weakness = iliopsoas or nerve/root lesion Weakness = quadriceps or nerve/root lesion
Inferior gluteal nerve (L5-S2)	Hip extension	Weakness = gluteus maximus or nerve/root lesion
Sciatic:		
Tibial portion (L4-S3)	Knee flexion	Weakness = biceps long head or nerve/root lesion
Peroneal portion (L4-S2)	Knee flexion	Weakness = biceps short head or nerve/root lesion
Other		
Reflex	None	
Pulses	Femoral	

Gambar A12. Evaluasi neurovaskular



Stinchfield test.
Pain with resisted straight leg raise indicates hip joint pathology.

F. J. Netter M.D.
C. Machado M.D.



Impingement test.
Pain with hip flexion, adduction, and internal rotation indicative of femoroacetabular impingement and for early arthritis.

Log roll test.
Examiner places hands on limb, gently rolls hip into internal and external rotation.



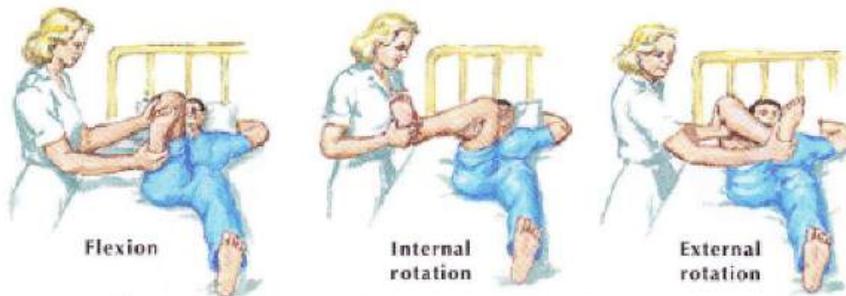
Thomas' sign
Hip flexion contracture determined with patient supine. Unaffected hip flexed only until lumbar spine is flat against examining table. Affected hip cannot be fully extended, and angle of flexion is recorded.



EXAM/OBSERVATION	TECHNIQUE	CLINICAL APPLICATION
SPECIAL TESTS		
Impingement	Supine: flex, adduct, IR hip	Pain may be indicative of femoral acetabular impingement.
FABER/Patrick	Flex, AB duct, ER hip, then abduct more (figure of 4)	Positive if painful. SI joint or hip pathology.
Log roll	Supine, hip extended: IR/ER	Pain in hip is consistent with arthritis.
Stinchfield	Resisted straight leg raise	Pain is positive test for hip pathology.
Thomas sign	Supine; one knee to chest	If opposite thigh elevates off table, flexion contracture.
Ober	On side: flex and abduct hip	Extend and adduct hip; if stays in abduction, ITB contracture.
Piriformis	On side: adduct hip	Pain in hip/pelvis indicates tight piriformis (compressing sciatic nerve).
90-90 straight leg	Flex hip & knee 90°, extend knee	>20° of flexion after full knee extension = tight hamstrings.
Ely's	Prone: passively flex knee	If hip flexes as knee is flexed, tight rectus femoris muscle.
Leg length	ASIS to medial malleolus	A measured difference of >1cm is positive.
Meralgia	Pressure medial to ASIS	Reproduction to pain, burning, numbness = LFCN entrapment.

Gambar A13. Spesial Test pada Hip

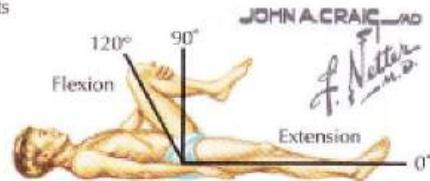
3. Pemeriksaan Movement



Hip flexion-rotation exercises with patient supine. Hip and knee passively flexed, then limb rotated laterally and medially as pain permits

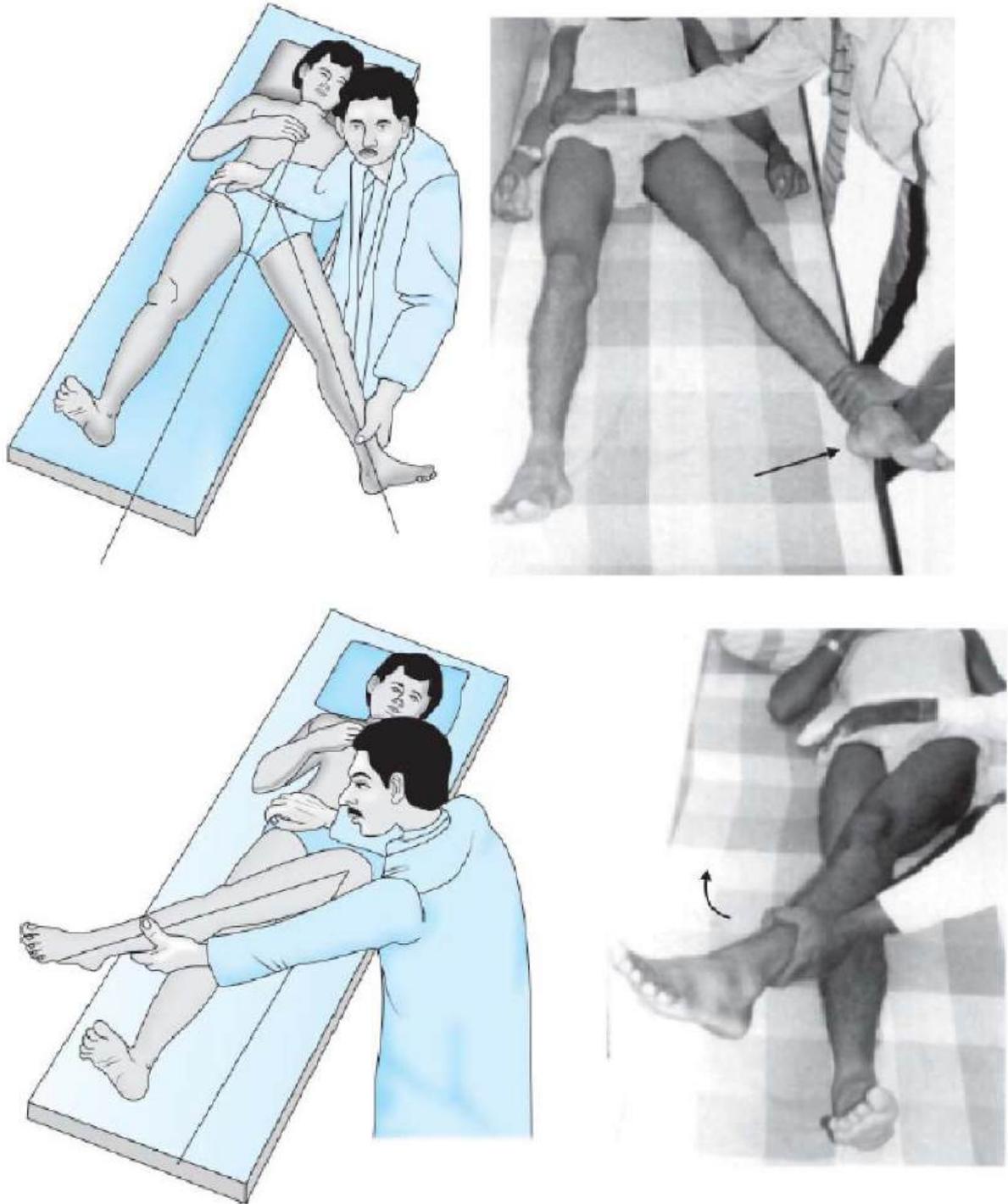


Internal rotation
Limitation of internal rotation of left hip. Hip rotation best assessed with patient in prone position because any restriction can be detected and measured easily



EXAM/OBSERVATION	TECHNIQUE	CLINICAL APPLICATION
RANGE OF MOTION		
Flexion	Supine: knee to chest Thomas test	Normal: 120-135° Rule out flexion contracture (see Special Tests, p. 263)
Extension	Prone: lift leg off table	Normal: 20-30°
Abduction/adduction	Supine: leg lateral/medial	Normal: Abd: 40-50°, Add: 20-30°
Internal/external rotation	Seated: foot lateral/medial Prone: flex knee leg in/out	Normal: IR: 30°, ER: 50° Normal: IR: 30°, ER: 50°

Gambar A14. Pemeriksaan Move pada Hip



Gambar A15. Pemeriksaan Abduksi dan Adduksi Hip

B. Pemeriksaan pada Lutut dan Tungkai Bawah

1. Pemeriksaan Look / Inspeksi

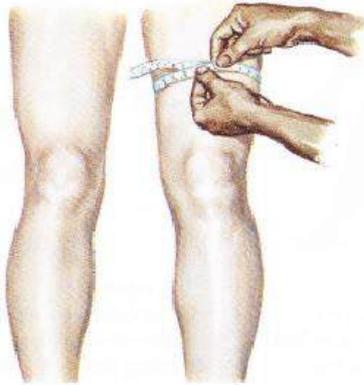
Evaluasi Gait, seperti pada pemeriksaan hip. Lakukan pemeriksaan pada posisi pasien berdiri, duduk, dan berbaring, dari arah depan, samping, dan belakang pasien. Evaluasi deformitas pada lutut, berupa genu varus atau genu valgus



Gambar B5. Deformitas pada lutut : A. Genu varus, B. Genu Valgus, C. Windswept

Evaluasi rotasi dari Patella, rotasi pedis, atrofi otot quadriceps, scar, bengkak pada lutut atau adanya massa pada lutut seperti ganglion, meniscal cyst.

Quadriceps atrophy



Prepatellar bursitis
(housemaid's knee)

F. Netter M.D.
JOHN A. CRAIG, MD

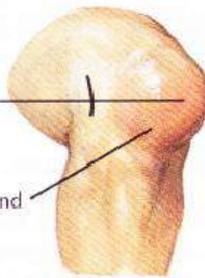


Osgood-Schlatter Disease

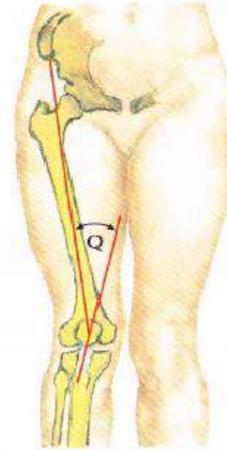
Clinical appearance. Prominence over tibial tuberosity partly due to soft-tissue swelling and partly to avulsed fragments

Line of incision

Cellulitis and induration



Incision and drainage often necessary

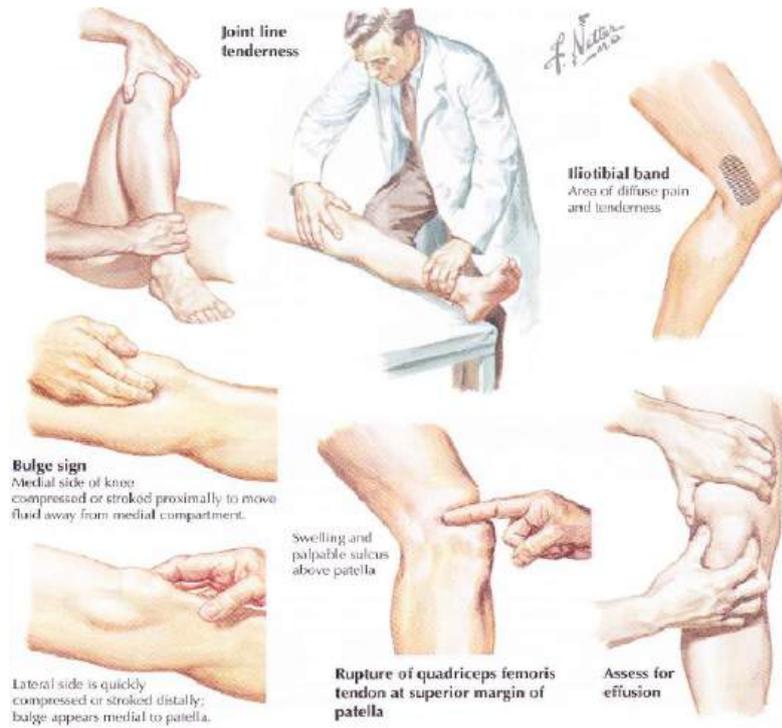


Q angle formed by intersection of lines from anterior superior iliac spine and from tibial tuberosity through midpoint of patella. Large Q angle predisposes to patellar subluxation.

EXAM	TECHNIQUE/FINDINGS	CLINICAL APPLICATION/DDX
INSPECTION		
Gait	Varus thrust Patella tracking Flexed knee gait	Can indicate LCL or posterolateral corner injury/insufficiency Maltracking can lead to patellofemoral symptoms From tight Achilles tendon or hamstrings, can lead to patellofemoral symptoms
Anterior	Knee alignment Genu valgum (knock knee) Genu varum (bow leg) Q angle Swelling Enlarged tibial tubercle	Normal knee alignment is clinically neutral (6° valgus radiographically). Evaluate while weight-bearing. Variations can be developmental or post-traumatic. Can predispose to lateral compartment DJD, patella instability/maltracking Can predispose to medial compartment DJD, ligamentous incompetency Angle from ASIS to mid-patella to tibial tubercle. NI: male ≤10°, female ≤15°; increased angle predisposes to patellar subluxation, patellofemoral symptoms Prepatellar: prepatellar bursitis (inflammatory or septic); intraarticular effusion; arthritis, infection, trauma (hemarthrosis); intraarticular fracture, meniscal tear, ligament rupture May be result of Osgood-Schlatter disease (esp. in adolescents)
Posterior	Mass	Baker's cyst
Lateral	Knee alignment Recurvatum Patella position High-riding patella Low-riding patella	Evaluated while weight-bearing Possible PCL injury Best evaluated radiographically with Insall ratio (see Joints, Patellofemoral) Patella alta: can predispose to patella instability Patella baja: usually posttraumatic or postsurgical (possible arthrofibrosis)
Musculature	Quadriceps Vastus medialis	Atrophy can result from injury, postoperative, or neurologic conditions VMO atrophy may contribute to patellofemoral symptoms

Gambar B6. Inspeksi Pada Lutut

2. Pemeriksaan Palpasi pada lutut dan tungkai bawah



EXAM	TECHNIQUE/FINDINGS	CLINICAL APPLICATION/DDX
PALPATION		
Bony structures	Patella Tibial tubercle	Tenderness at distal pole: tendinitis (jumper's knee) Tenderness with Osgood-Schlatter disease
Soft tissues	Quadriceps tendon Patellar tendon Compress suprapatellar pouch Prepatellar bursa Pes anserine bursa Retinaculum/plica Medial joint line and MCL Lateral joint line and LCL Iliotibial band/LFC (anterolateral knee) Popliteal fossa Compartments of leg (anterior, posterior, lateral)	Defect: tendon rupture; tenderness: tendinitis Defect: tendon rupture; tenderness (esp. at insertion); tendinitis (jumper's knee) Ballotable patella (effusion); arthritis, trauma, infection Edematous/tender bursae indicate correlating bursitis Tenderness indicates bursitis Thickened, tender plica is pathologic Tenderness: medial meniscus tear or MCL injury Tenderness: lateral meniscus tear or LCL injury Pain or tightness is pathologic Mass consistent with Baker's cyst, popliteal aneurysm Firm or tense compartment: compartment syndrome

NEUROVASCULAR		
Sensory		
Femoral nerve/saphenous (L4)	Medial leg	Deficit indicates corresponding nerve/root lesion
Peroneal nerve (L5) Lateral sural Superficial branch	Proximal lateral leg Distal lateral leg	Deficit indicates corresponding nerve/root lesion
Tibial nerve (S1) Medial sural	Proximal posterolateral leg	Deficit indicates corresponding nerve/root lesion
Sural nerve	Distal posterolateral leg	Deficit indicates corresponding nerve/root lesion
Motor		
Femoral nerve (L2-4)	Knee extension	Weakness = Quadriceps or nerve/root lesion
Sciatic: Tibial (L4-S3) Peroneal (L4-S3)	Knee flexion Knee flexion	Weakness = Biceps (LH) or nerve/root lesion Weakness = Biceps (SH) or nerve/root lesion
Tibial nerve (S1)	Foot plantarflexion	Weakness = TP, FHL, FDL, or nerve/root lesion
Peroneal (deep) n. (L4) Peroneal (superficial) n. (L5)	Foot dorsiflexion Hallux dorsiflexion	Weakness = TA or nerve/root lesion Weakness = EHL or nerve/root lesion
Other		
Reflex (L4)	Patellar	Hypoactive/absence indicates L4 radiculopathy Hyperactive may indicate UMN/myelopathic condition
Pulse	Popliteal	Diminished pulse can result from trauma

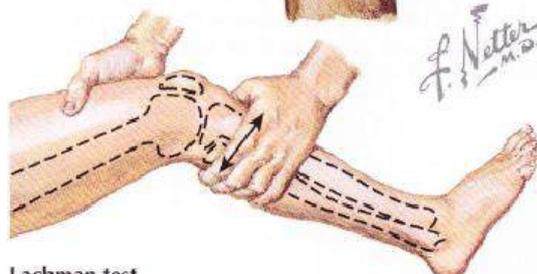
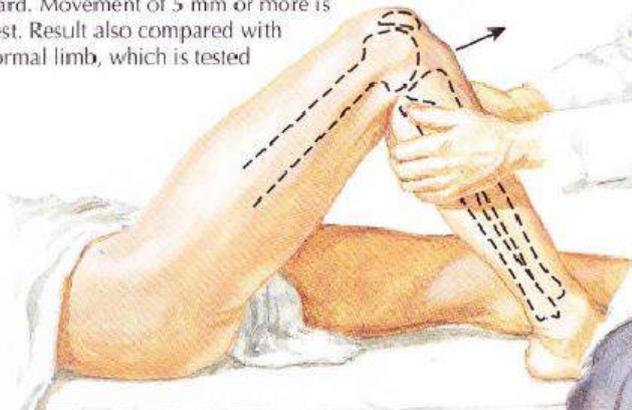
Gambar B7. Palpasi pada lutut

Apprehension (Fairbank) test As examiner displaces patella laterally, patient feels pain and forcefully contracts quadriceps femoris muscle.



Anterior drawer test

Patient supine on table, hip flexed 45°, knee 90°. Examiner sits on patient's foot to stabilize it, places hands on each side of upper calf and firmly pulls tibia forward. Movement of 5 mm or more is positive test. Result also compared with that for normal limb, which is tested first.

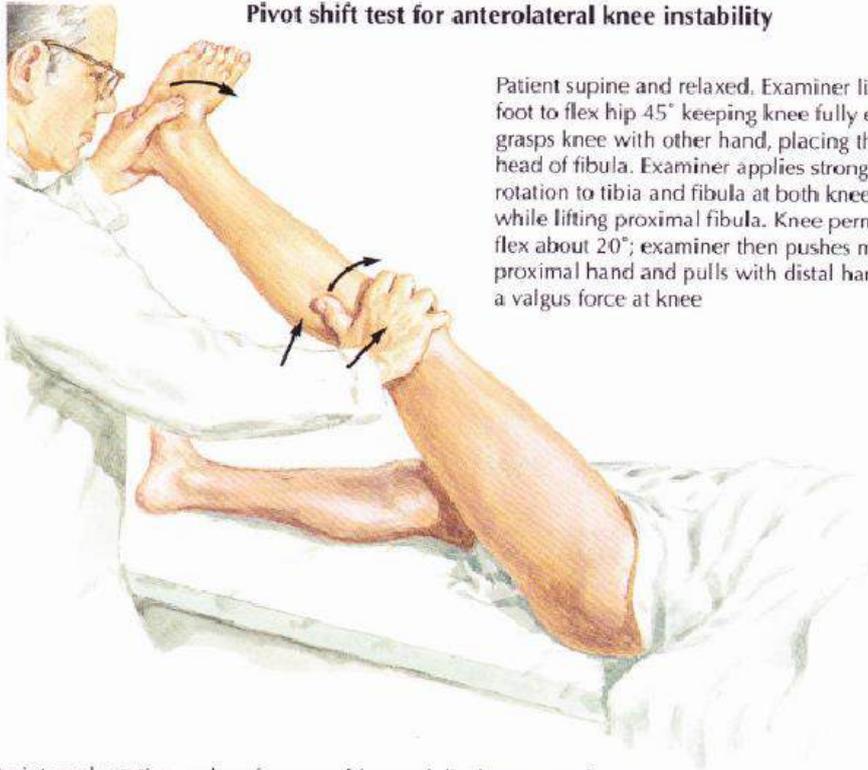


Lachman test

With patient's knee bent 20°–30°, examiner's hands grasp limb over distal femur and proximal tibia. Tibia pulled forward with femur stabilized. Movement of 5 mm or more than that in normal limb indicates rupture of anterior cruciate ligament.

EXAM	TECHNIQUE	CLINICAL APPLICATION/DDX
SPECIAL TESTS		
Patellofemoral Joint		
Patella displacement	Translate patella medially & laterally	Divide patella into 4 quadrants. Patella should translate 2 quadrants in both directions. Decreased mobility indicates a tight retinaculum.
Patella apprehension	Relax knee, push patella laterally	Pain/apprehension of subluxation: patellar instability or medial retinaculum/MPFL injury
J sign	Actively extend knee from flexed position	Lateral displacement of patella in full extension: maltracking
Patella compression/grind	Extend knee, fire quads, compress patella	Pain: chondromalacia, OCD, PF arthritis/DJD of patella
Meniscus		
Joint line tenderness	Palpate both joint lines	Most sensitive exam for meniscal tear when tender (see page 309)
McMurray	Flex/varus/ER knee, then extend Flex/valgus/IR knee, then extend	Pop or pain suggests medial, meniscal tear Pop or pain suggests lateral, meniscal tear
Apley's compression	Prone, knee 90°, compress & rotate	Pain or pop indicates meniscal tear
Anterior Cruciate Ligament		
Lachman	Flex knee 20-30°, anterior force on tibia	Laxity indicates ACL injury. Most sensitive exam for ACL rupture. Grade 1: 0-5mm, 2: 6-10mm, 3: >10mm; A: good, B: no endpoint
Anterior drawer	Flex knee 90°, anterior force on tibia	Laxity/anterior translation: ACL injury
Pivot shift	Supine, extend knee, IR, valgus force on proximal tibia, then flex knee	Clunk with knee flexion indicates ACL injury. (If ACL is deficient, the tibia starts subluxated and reduces with flexion, causing the clunk.)

Pivot shift test for anterolateral knee instability



Patient supine and relaxed. Examiner lifts heel of foot to flex hip 45° keeping knee fully extended; grasps knee with other hand, placing thumb beneath head of fibula. Examiner applies strong internal rotation to tibia and fibula at both knee and ankle while lifting proximal fibula. Knee permitted to flex about 20°; examiner then pushes medially with proximal hand and pulls with distal hand to produce a valgus force at knee

As internal rotation, valgus force, and forward displacement of lateral tibial condyle maintained, knee passively flexed. If anterior subluxation of tibia (anterolateral instability) present, sudden visible, audible, and palpable reduction occurs at about 20°–40° flexion. Test positive if anterior cruciate ligament ruptured, especially if lateral capsular ligament also torn



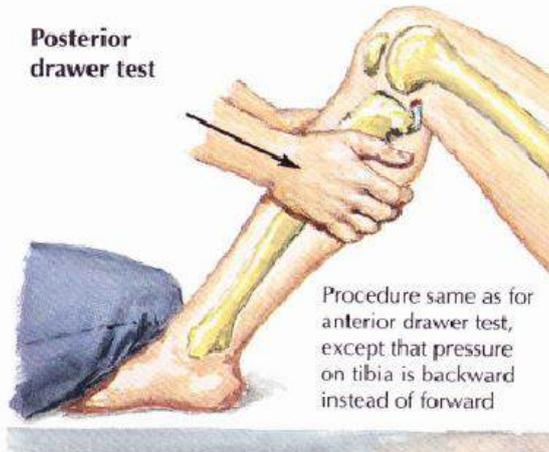
F. Netter M.D.

Posterior sag sign

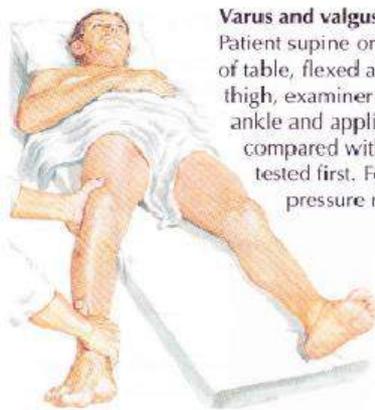


Leg drops backward

Posterior drawer test



Procedure same as for anterior drawer test, except that pressure on tibia is backward instead of forward



Varus and valgus tests

Patient supine on table, relaxed, leg over edge of table, flexed about 30°. With one hand fixing thigh, examiner places other hand just above ankle and applies valgus stress. Degree of mobility compared with that of uninjured side, which is tested first. For varus stress test, direction of pressure reversed.

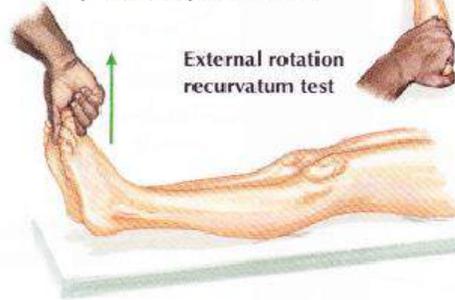
F. Netter M.D.
F. DeVanzo C.M.D.



External rotation at 30° and 90° (dial test).
Test may be performed prone or supine (shown).



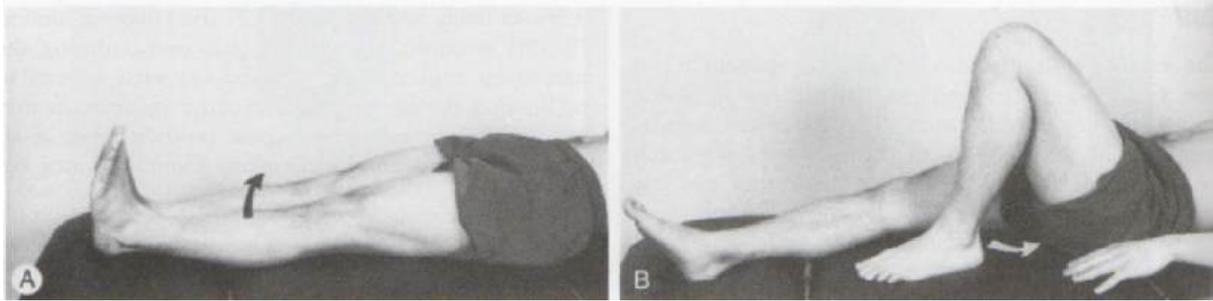
External rotation recurvatum test



EXAM	TECHNIQUE	CLINICAL APPLICATION/DDX
SPECIAL TESTS		
Posterior Cruciate Ligament		
Posterior drawer	Flex knee 90°, posterior force on tibia	Posterior translation: PCL injury
Posterior sag	Supine, hip 45°, knee 90°, view laterally	Posterior translation of tibia (by gravity) on femur indicates PCL injury
Quadriceps active	Supine, knee 90°, fire quadriceps	Posteriorly subluxated tibia translates anteriorly if PCL is deficient
Reverse pivot shift	Supine, flex knee 45°, ER, valgus force on proximal tibia, then extend knee	Clunk with knee extension indicates PCL injury. (If PCL is deficient, the tibia is subluxated posteriorly, then reduces w/extension, causing the clunk.)
Collateral Ligaments		
Valgus stress	Lateral force to knee at 30°, then 0°	Laxity at 30°—MCL injury; 0°—MCL and cruciate ligament injury
Varus stress	Medial force to knee at 30°, then 0°	Laxity at 30°—LCL injury; 0°—LCL and cruciate ligament injury
Other		
Prone ER at 30° & 90° (Dial)	Prone, ER both knees at 90°, then 30° (can be done supine)	Increased ER at 30°: posterolateral corner (PLC) injury; at 90° PLC & PCL injuries
ER recurvatum	Supine, legs straight, raise legs by toes	Recurvatum, varus, and IR of knee indicates PLC (+/- PCL) injury
Slocum	Knee 90°, IR tibia 30°, anterior force Knee 90°, ER tibia 30°, anterior force	Displacement: anterior & lateral injury (ACL & PLC) Displacement: anterior & medial inj. (ACL, MCL, POL)
Posterior lateral drawer	Knee 90°, ER tibia 15°, posterior force	Laxity indicates posterolateral corner and/or PCL injury
Posterior medial drawer	Knee 90°, IR tibia 30°, posterior force	Laxity indicates PCL and medial ligament (MCL, POL) injury

Gambar B8. Spesial Tes pada Lutut

3. Pemeriksaan Move pada lutut

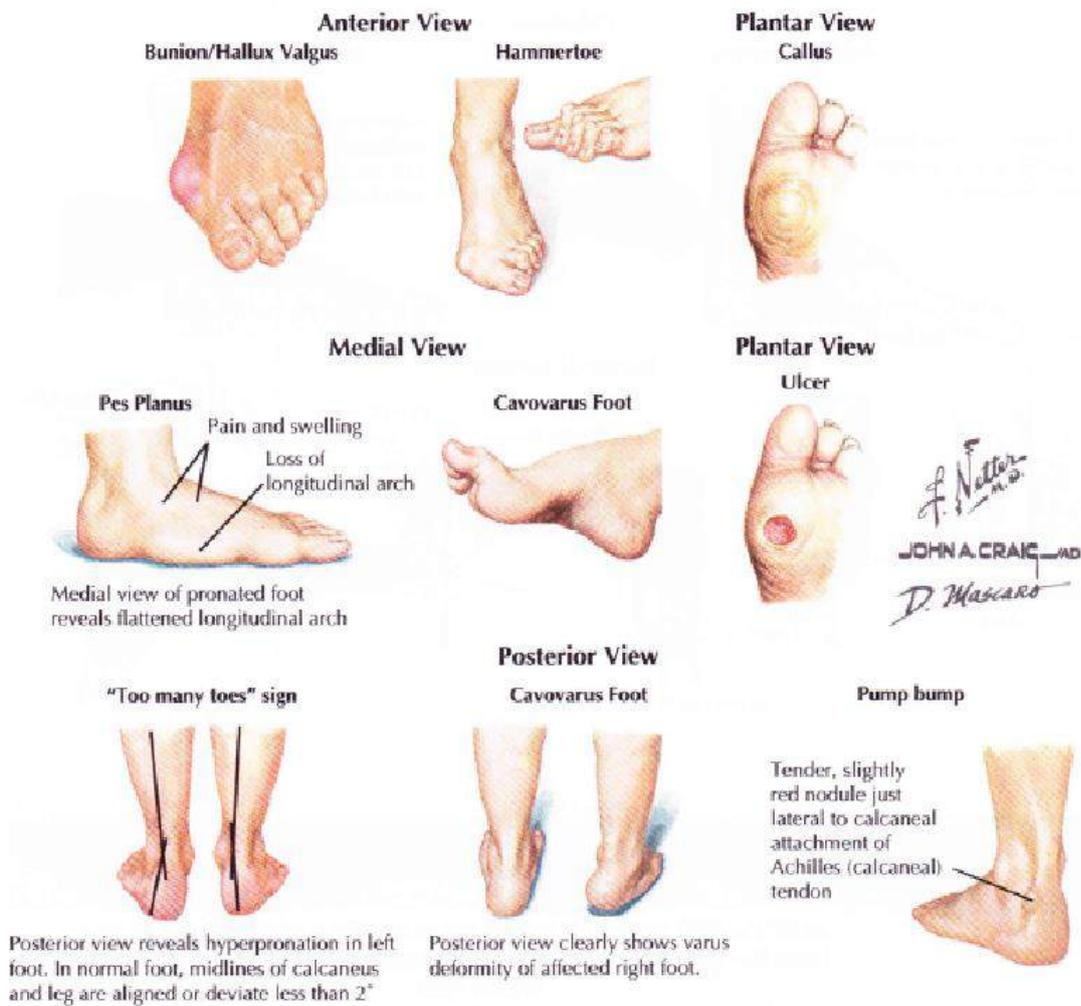


Gambar B9. Aktif movement pada lutut

C. Pemeriksaan pada Pergelangan kaki dan Kaki (Foot & Ankle)

1. Pemeriksaan Inspeksi / Look

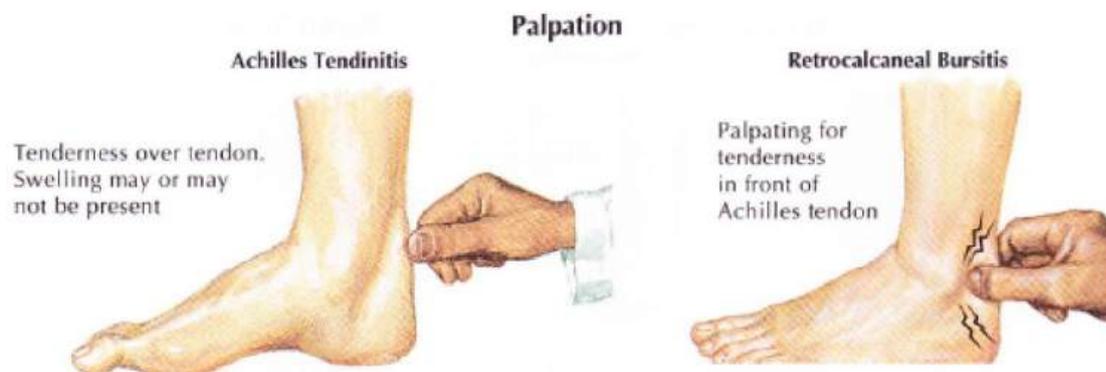
Evaluasi Gait, seperti pada pemeriksaan hip dan knee. Lakukan pemeriksaan pada posisi pasien berdiri, duduk, dan berbaring, dari arah depan, samping, dan belakang pasien.



EXAM	TECHNIQUE	CLINICAL APPLICATION/DDX
INSPECTION		
Foot (weight-bearing)	Anterior view Posterior view Medial view	Hallux valgus (bunion), hammertoes, other deformities (clubfeet, MT adductus) Slight valgus is normal; "pump-bump" seen with Achilles tendinitis Increased valgus: posterior tibialis dysfunction, tarsal coalition, planovalgus Varus alignment: neurologic disease (e.g., Charcot-Marie-Tooth) Pes planus (flat foot): posterior tibialis dysfunction, tarsal coalition, pediatric pes planovalgus Pes cavus (high arch): neurologic disease (e.g., Charcot-Marie-Tooth)
Foot (non-WB)	Plantar view	Ulcers (esp. in diabetics), callus, transfer lesions (callus under 2nd MT head)
Swelling	Ankle Foot: Dorsal Medial Diffuse	Sprain, fracture Fracture, contusion Posterior tibialis dysfunction Consider cardiovascular etiology
Skin	Color	Pallor may indicate vascular disease; congestion may indicate venous insufficiency
	Hair	Decreased hair may indicate peripheral vascular disease
Shoes	Narrow toe box Abnormal wear	Associated with hallux valgus (esp. in women) May indicate malalignment (e.g., pes planus or cavus) or dysfunction (e.g., foot drop)

Gambar C4. Inspeksi pada Foot & Ankle

2. Pemeriksaan Palpasi / Feel



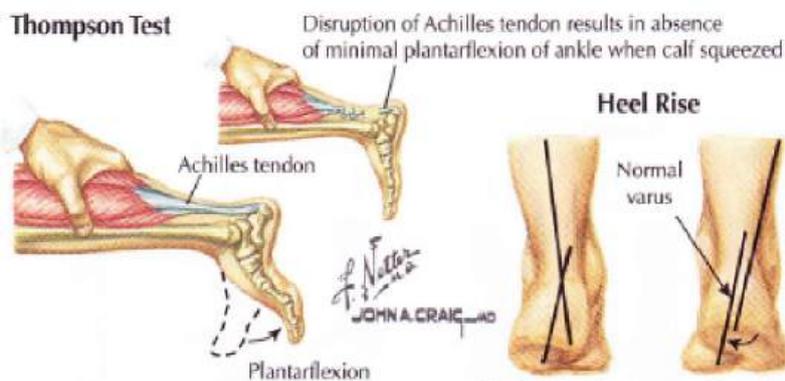
EXAM	TECHNIQUE	CLINICAL APPLICATION
PALPATION		
Bony structures	1st MP joint/MT& head Lesser MPT joint/MT Tarsal bones/midfoot Calcaneus/heel Malleoli	Bunion, pain: hallux rigidus, sesamoids, turf toe, gout Pain: metatarsalgia, Freiberg's infraction, fx, tailor's bunion (5th MT head) Tenderness suggests fracture, osteoarthritis, dislocation Pain: fracture; posterior: bursitis (pump bump); plantar: spur, plantar fasciitis; medial: nerve entrapment Pain indicates fracture, syndesmosis injury in leg
Soft tissue	Skin Between metatarsal heads Medial ankle ligaments Tendons (at med. malleolus) Lateral ankle ligaments Peroneal tendons (LM) Achilles tendon	Cool: peripheral vascular disease Swelling: trauma/infection vs venous insufficiency Pain: neuroma Pain suggests ankle sprain (deltoid ligament) Pain indicates tendinitis, rupture Pain suggests ankle sprain (ATFL, CFL, PTFL [rare]) Pain indicates tendinitis, tear, dislocation/subluxation Pain: tendinitis; defect suggests Achilles rupture

EXAM	TECHNIQUE	CLINICAL APPLICATION
NEUROVASCULAR		
Sensory		
Saphenous (L4)	Medial foot (med. cutaneous)	Deficit indicates corresponding nerve or root lesion
Tibial (L4-S1)	Plantar foot (med. & lat./plantar)	Deficit indicates corresponding nerve or root lesion
Superficial peroneal	Dorsal foot	Deficit indicates corresponding nerve or root lesion
Deep peroneal (L5)	1st dorsal web space	Deficit indicates corresponding nerve or root lesion
Sural (S1)	Lateral foot	Deficit indicates corresponding nerve or root lesion
Motor		
Deep peroneal (L4)	Foot inversion/dorsiflexion	Weakness = tibialis anterior or corresponding nerve or root lesion
Deep peroneal (L5)	Great toe dorsiflex	Weakness = extensor hallucis longus or nerve or root lesion
Tibial (S1)	Foot plantarflexion	Weakness = gastrocnemius or nerve or root lesion
Superficial peroneal	Foot eversion	Weakness = peroneus muscles or nerve or root lesion
Reflex		
S1	Achilles reflex	Hypoactive/absence indicates S1 radiculopathy
Upper motor neuron	Babinski reflex	Upgoing toes indicates an upper motor neuron disorder
Pulses	Dorsalis pedis (on dorsum) Post. tibial (post. med. mall.)	Decreased pulses = trauma/vascular compromise, peripheral vascular disease

Gambar C5. Palpasi Foot & Ankle

EXAM	TECHNIQUE	CLINICAL APPLICATION
SPECIAL TESTS		
Thompson	Prone: squeeze calf	Absent foot plantarflexion indicates Achilles tendon rupture.
Anterior drawer	Stabilize tibia, PF foot, anterior force on heel	Tests lateral ligaments (esp. ATFL). Increased laxity indicates ligament injury.
Talar tilt	Stabilize tibia, DF foot, invert foot	Tests lateral ligaments (esp. CFL). Increased laxity indicates ligament injury.
Ext. rotation stress	Stabilize tibia, ER foot	Tests deep deltoid & syndesmotic lig. Laxity indicates ligament injury
Eversion stress	Stabilize tibia, evert foot	Tests superficial deltoid ligament. Incr. laxity indicates ligament injury
Squeeze	Compress distal tibia/fibula	Pain may suggest a syndesmosis injury (sprain or complete rupture).
Heel rise	Standing, rise onto toes	Heel should go into varus. No varus in PTTD and fixed deformities. Inability to do single heel rise indicates PTTD.
Coleman block	Lateral foot and heel on block; 1st ray hangs free	Flexible hind foot varus: ankle will go into valgus or neutral when on block. Fixed hind foot varus: ankle will stay in varus on the block.
Tinel's sign	Tap nerve posterior to MM	Paresthesias/tingling indicate tibial nerve entrapment (in tarsal tunnel).
Compression	Squeeze foot at MT heads	Pain (or numbness/tingling): interdigital neuroma (Morton's neuroma)

Thompson Test



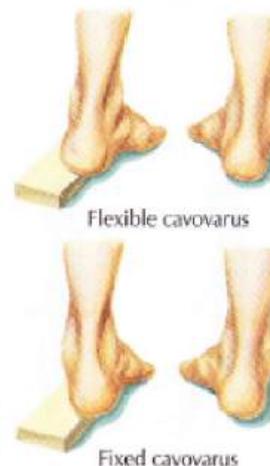
Normal: Squeezing calf results in gastrocnemius and soleus contraction causing plantarflexion of ankle joint if Achilles tendon is intact

Heel Rise



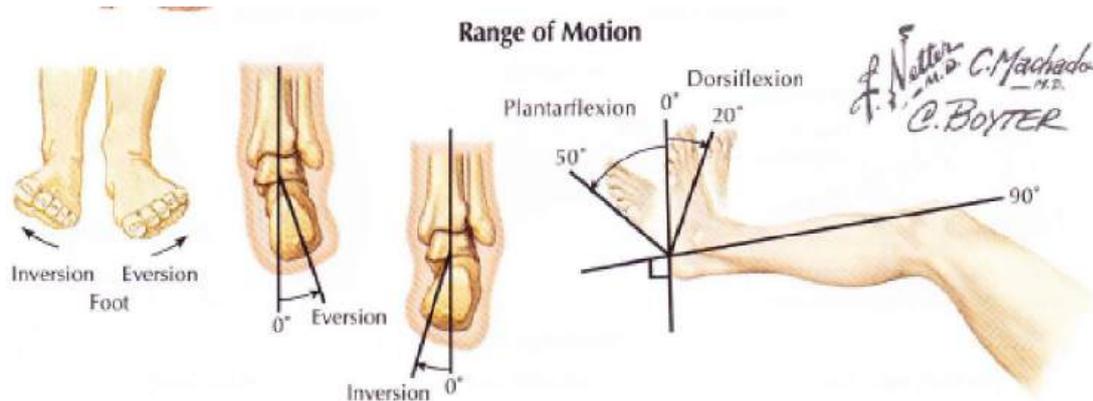
On toe standing, normal PTT function pulls heel into varus. PTT dysfunction allows heel to remain in valgus position

Coleman Block Test



Gambar C6. Spesial Tes Foot & Ankle

3. Pemeriksaan Move



EXAM	TECHNIQUE	CLINICAL APPLICATION
RANGE OF MOTION		
Ankle: dorsiflex/plantarflex	Stabilize subtalar joint	Normal: flex 50°/extend 25°
Subtalar: inversion/eversion	Stabilize tibia	Normal: invert 5-10°/evert 5°
Transverse/midtarsal: adduction/abduction	Stabilize heel/hind foot, give abd./add. stress	Normal: adduct 20°/abduct 10°
Great toe: MTP: flex/extend IP: flex/extend	Stabilize foot, flex/extend Stabilize foot, flex/extend	Normal: flex 75°/extend 75°; decreased in hallux rigidus Normal: flex 90°/extend 0°
Combine motions; Pronation: dorsiflexion, eversion, abduction; Supination: plantarflexion, inversion, adduction		

Hal-hal yang harus diperhatikan pada pemeriksaan anggota gerak bawah adalah:

1. Universal Precaution (penggunaan APD)
2. Perkenalan diri dan menjelaskan setiap pemeriksaan yang akan dilakukan dan tujuannya
3. Jangan menambah cedera pada pasien (First Do No Harm)

Alat-alat yang dibutuhkan

1. Goniometer
2. Manekin atau Probanus
3. Meteran
4. LCD Projector
5. White Board
6. Reflex Hammer

Chek List Pemeriksaan Anggota Gerak Bawah

No	Aspek Keterampilan yang Dilakukan	BOBOT	Nilai		
			0	1	2
1	Salam dan memperkenalkan diri ke Px	1			
2	Meminta izin akan memeriksa px	1			
3	Sendi panggul				
	a. Look (px berdiri dan terlentang); a. Deformitas b. Pembengkakan c. Sikatrix d. Fistulae e. Atrophy f. Gait	1			
	b. Feel: a. Temperatur kulit. b. Nyeri tekan. c. AVN Distal	1			
	c. Move o Fleksi & Ekstensi o Abduksi & Aduksi	2			

	<ul style="list-style-type: none"> o Internal Rotasi & Eksternal Rotasi 				
4	Sendi lutut				
	<ul style="list-style-type: none"> a. Look (px berdiri dan terlentang): a. Deformitas b. Benjolan , ukuran, warna sama dg sekitar c. Vena Prominent d. Mengkilat e. Fistulae f. Atrophy g. Gait 	1			
	<ul style="list-style-type: none"> b. Feel: a. Temperatur kulit. b. Nyeri tekan. c. AVN Distal 	1			
	<ul style="list-style-type: none"> c. Move o Fleksi & Ekstensi o <i>Anterior dan Posterior Drawer test</i> o <i>Valgus dan varus stress</i> o <i>Mc Murray Manouver (Meniscus test)</i> o <i>Apley Compresion test</i> 	2			

5.	Sendi pergelangan kaki				
	<ul style="list-style-type: none"> a. Look : a. Deformitas b. Luka c. Pembengkakan d. Fistulae e. Atrophy f. Gait 	1			
	<ul style="list-style-type: none"> b. Feel: a. Temperatur kulit. b. Nyeri tekan. c. AVN Distal 	1			
	<ul style="list-style-type: none"> c. Move o Dorsofleksi o Plantarfleksi o Abduksi.& Adduksi. o Inversi.& Eversi 	2			
	JUMLAH (A)	12			
KET : Nilai 0 : Tidak Dilakukan, Nilai 1 : Dilakukan tidak sempurna, Nilai 2 : Sempurna					
No	(B). PENILAIAN PERFORMANCE	NILAI			
		1	2	3	4

1.	Komunikasi				
2.	Sikap profesional				
3.	Performance selama pemeriksaan				
4	Kualitas teknik pemeriksaan				
	JUMLAH (B)				
<p>KET : 1 : Gagal dilakukan; 2 : Borderline; 3 : Memenuhi harapan; 4 : Sangat baik (melebihi harapan)</p>					

DAFTAR PUSTAKA

Netter's Concise Orthopaedic Anatomy, 2nd Edition, 2010, Saunders Elsevier, Philadelphia

C Rex; S Rajasekaran; Charles SB Galasko, Clinical Assesment and Examination in Orthopedics, 2nd Ed., Jaypee Brothers Medical Publishers, New Delhi; Panama; London, 2012

David J. Magee, Orthopedic Physical Assesment, 4th Ed., Saunders Elsevier, St. Louis, 2006