

35 History taking and clinical examination in musculoskeletal disease

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Ankle (Figure 35.37)

Ankle (Figure 35.37)

/uni25CF Dorsiflexion . Test dorsiflexion with the knee both flexed and extended. If restriction is greater with the knee extended than flexed, the contracture is principally in the gastrocnemius.

Restriction that is equal in all knee posi - tions is caused by a contracture principally of the soleus.

/uni25CF Plantarflexion . Ask the patient to touch the floor with their foot (15°). Weakness suggests injury to the Achilles - tendon or pathology a ff ecting the S1 nerve root.

Ankle stability

Ankle stability

Trauma to the ankle is a common cause of instability . Accurate assessment may be difficult in the acute setting because of pain. /uni25CF Anterior draw test . With the foot resting over the bed, hold the heel with one hand and the front of the tibia with the other. Move the heel forwards on the fixed tibia. Compare with the other side. Instability of the syndesmosis may be palpable (Figure 35.41). /uni25CF Squeeze test for distal tibiofibular stability Compress the proximal calf. Pain at the ankle may indicate separation of the distal fibula from the tibia. /uni25CF Tilt test . Hold the talus at the neck rather than the heel so that you can be sure that any tilt is in the ankle and not the subtalar joint.

Anterior cruciate ligament

Anterior cruciate ligament

The most sensitive test for evaluation of the ACL is the Lachman test. The Lachman test (Figure 35.32). Flex the knee to 15–30° and pull the proximal tibia gently forwards. Excessive laxity may indicate rupture of the ACL. Anterior translation of the tibia associated with a soft or no end point is a positive test. The test may be negative in chronic ruptures because the ACL stump can scar to the PCL. Anterior draw test (Figure 35.33a). Flex both knees to 90° and look for a posterior sag (compare the height of the tibial tuberosities looking from the side). This may indicate an injury to the PCL. Stabilise the feet by sitting on them. Now place your hands around the proximal and posterior aspect of the tibia. With your index fingers, push up the hamstrings to encourage them to relax. Now draw the tibia gently forwards and measure any laxity, comparing it with the other knee. The degree of laxity can be graded: grade I (0–5 mm), grade II (5–10 mm) and grade III (>10 mm). Posterior cruciate ligament The PCL is the primary restraint to posterior tibial translation between 30° and 90° of knee flexion. At 90° knee flexion, the PCL controls the majority of posterior translation of the tibia. Look for a posterior sag with the knees flexed to 90°. The posterior draw test is the most reliable clinical test for a PCL injury. Posterior draw test (Figure 35.33b). Perform the test with the knee flexed to 90°. Push the anterior aspect of the proximal tibia posteriorly and compare any laxity with the other side. If more than 10 mm of posterior Thomas Porter McMurray, 1887–1949, Professor of Orthopaedic Surgery, Liverpool University, Liverpool, UK. Sir Harold Arthur Thomas Fairbank, 1876–1961, orthopaedic surgeon, King's College Hospital, London, UK. flexion, a combined PCL and posterolateral corner injury may be present. An evaluation of the competency of the posterolateral corner is necessary. Menisci The presence of palpable joint line tenderness is the most sensitive clinical examination test for a meniscal tear. Flex the knee to 90° and palpate the joint line using your thumb and index finger. Note any areas of tenderness. Tests for meniscal damage are not very reliable but, combined with a history of mechanical symptoms, locking, catching and pain, may be helpful. With posterior medial meniscal tears patients suffer pain on high flexion or squatting. The well-known test for meniscal tears is McMurray's test. The patient lies supine with their knee flexed to 45° and hip flexed to 45°. The examiner braces the lower leg: one hand holds the ankle; the other hand holds the knee. For assessment of the medial meniscus, palpate the medial joint line with the knee flexed. A 'click' may be felt, suggesting meniscus relocation. A valgus stress is applied to the flexed knee. Externally rotate the leg (toes point outward), and slowly extend the knee while it is still in valgus. Patellofemoral joint The patella normally enters the trochlea from a lateral position and becomes centralised with increasing knee flexion, travelling in a 'J' pattern. Patellar tracking (Figure 35.34). Sit the patient and ask them to let their legs hang off the end of the couch with the knees flexed to 90°. Ask the patient to extend the knee slowly to full extension. Towards the end of extension, look for lateral subluxation of the patella ('J' sign). This indicates maltracking. Patellar apprehension (Fairbank's) test (for instability). Attempt to displace the patella laterally with the knee in extension. Patients with instability

contract their quadriceps muscle or complain of pain. With the patient supine and the quadriceps relaxed, flex the knee to 30° while trying to push the patella laterally. With instability the patient may react with apprehension. In addition, the quadriceps muscle may contract in an attempt to realign the patella. Patellar tendon The patellar tendon serves as the distal limit of the extensor mechanism. Rupture usually occurs at the osseotendinous junction. This results in an inability to actively perform and maintain full knee extension. A rupture presents with diffuse swelling in the anterior knee. A high-riding patella (patella alta) is present secondary to the unopposed pull of the quadriceps muscle. A defect in the tendon is usually palpable. When the rupture extends through the medial and lateral retinacula, active extension is lost.

(b) Figure 35.33 (a) Anterior draw test for anterior cruciate ligament stability; (b) posterior draw test for posterior cruciate ligament stability.

Summary box 35.9 Knee examination /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF

Inspection of the standing patient Front - alignment (varus/valgus/rotational deformity), muscle bulk Side - flexion deformity Back - popliteal swellings, hamstrings Gait - antalgic, high-stepping gait (foot drop), varus thrust Inspection of the supine patient Skin, scars, soft tissues, deformity Palpation of the extensor mechanism, medial and lateral joint lines and collateral ligaments, hamstrings, tibial tuberosity, fibular head Movements Flexion and extension Special tests Patellar apprehension test and extensor mechanism Cruciate ligaments Collateral ligaments Menisci

Assessment of joint hypermobility

Assessment of joint hypermobility

Increased movement and flexibility of a joint can often cause joint pain and symptoms of instability. A formal assessment of joint mobility can help document the degree of mobility. The Beighton score alone cannot be used to diagnose hypermobility in terms of its underlying causes; however, it acts as a standardised clinical assessment across both upper and lower limbs and the spine. The Beighton score is calculated as follows (Figure 35.1): 1 point if, while standing forward bending, the patient can place their palms on the ground with legs straight; 1 point for each elbow that bends backwards; 1 point for each knee that bends backwards; 1 point for each thumb that touches the forearm when bent backwards; 1 point for each little finger that bends backwards beyond 90°; total score out of 9. Summary box 35.2 MSK examination

Peter H Beighton, b. 1934, British medical geneticist. With Francis T Horan published 'Orthopedic aspects of the Ehler-Danlos syndrome' in 1969.

Hand hygiene and chaperone presence Introduce yourself and put the patient at ease Assess the gait Look Feel Move Special tests Neurological examination Pulses Motor Reflexes Deltoid Biceps Wrist extension Brachioradialis Triceps Triceps Finger Reflexes - Interossei - Psoas - Quadriceps - Quadriceps - Tibialis anterior Knee jerk - Gastrocnemius/peroneals Achilles Bladder and foot intrinsics - A numerical mobility score of 0 to 9, 1 point allocated for the ability to perform each of the following tests: Pull little finger back Left _____ beyond 90° (1 point Right _____ for each side) Left _____ Pull thumb back to touch forearm (1 Right _____ point for each side) Bend elbow Left _____ backwards beyond Right _____ 10° (1 point for each side) Left _____ Bend knee backwards beyond Right _____ 10° (1 point for each side) Lie hands on the floor while keeping knees straight and bending forward at waist Total _____ Figure 35.1 Beighton score (a screening technique for hypermobility).

CLINICAL EXAMINATION OF THE FOOT AND ANKLE

CLINICAL EXAMINATION OF THE FOOT AND ANKLE

The foot can be divided into three parts: the hindfoot (calcaneus, talus), the midfoot (navicular, cuboids, cuneiforms) and the forefoot (metatarsals and phalanges).

CLINICAL EXAMINATION OF THE HAND AND WRIST

CLINICAL EXAMINATION OF THE HAND AND WRIST

The hand and wrist should be thought of as one functional unit. The muscles may be divided into extrinsic (the muscle bellies in the forearm) and intrinsic (origins and insertions within the hand alone). The 'flexors' (volar side) flex the wrist and fingers and the 'extensors' (dorsal surface) extend the digits and fingers. Baron Guillaume Dupuytren , 1777-1835, surgeon, Hôtel Dieu, Paris, France, described the condition in 1831. Friedrich Joseph de Quervain , 1868-1940, Professor of Surgery , Berne, Switzerland, described this form of tenosynovitis in 1895. Colles , 1773-1843, President of the Royal College of Surgeons of Ireland (1802), Professor of Anatomy , Physiology and Surgery (1804) and described Abraham distal radial fracture in 1814. Spine examination /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF

Inspection of the standing patient From the front and back (coronal plane) From the side (sagittal plane) Palpation Palpation of the posterior bony elements and the paraspinal muscles Move Assess /f_ l exion, extension, lateral rotation and lateral bending Neurological Assess sensation, tone, power, re /f_ l exes, proprioception and coordination Special tests Spurling's test Forward bending test Lasègue's straight leg test Contralateral stretch test

CLINICAL EXAMINATION OF THE HIP JOINT

CLINICAL EXAMINATION OF THE HIP JOINT

The hip is a synovium-lined ball-and-socket joint. Typical clinical diseases of the hip that may be encountered in children and adults are shown in Table 35.10 . A patient complaining of hip pain should undergo a careful examination of the spine, abdomen, pelvis, groin and thigh. In addition, consider a gynaecological examination in women.

CLINICAL EXAMINATION OF THE KNEE

CLINICAL EXAMINATION OF THE KNEE

The knee is a synovial hinged joint. There are three compartments: medial, lateral and patellofemoral. The quadriceps, quadriceps tendon, patella, patellar tendon and tibial tuberosity constitute the extensor mechanism of the knee. The anterior cruciate ligament (ACL) provides primary restraint to anterior displacement of the tibia. The posterior cruciate ligament (PCL) provides posterior restraint of the tibia. The medial collateral ligament (MCL) resists valgus and Hip examination external rotation forces whereas the lateral collateral ligament (LCL) resists varus forces.

Inspection of the standing patient Front - pelvic tilt, rotational deformity Side - lumbar lordosis Back - pelvic tilt, scoliosis, gluteal wasting Gait - Trendelenburg, antalgic Inspection of the supine patient Skin, scars, soft tissues, deformity Palpation of the anterior joint line, adductor origin, greater trochanter, ischial tuberosity Movements Flexion and extension Abduction and adduction Internal and external rotation Special tests Thomas's test Trendelenburg test Leg length assessment - real/apparent Impingement tests Snapping hip tests

CLINICAL EXAMINATION OF THE SHOULDER

CLINICAL EXAMINATION OF THE SHOULDER

Pain arising from the shoulder joint may be felt anterolaterally . Referred pain may present from the cervical spine, heart, mediastinum and the diaphragm.

Cervical spine

Cervical spine

Look Ensure that the shoulders, back muscles and scapulae can be seen. Look for muscle wasting and asymmetry of the neck creases and check that the shoulders are level and that there is a normal cervical lordosis (range 20–40°). Feel Stand behind the patient and support the patient's chin. /uni25CF Soft tissues . Feel for spasm of the paraspinal muscles. /uni25CF Bone . Palpate the spinous processes (tenderness and alignment); the spinous processes of C7 (vertebra promin ens) and T1 are usually large and are easily palpable at the base of the neck. - Move Motion occurs in three planes: flexion/extension, lateral bend - ing and rotation (Figure 35.4). /uni25CF Flexion (45°)/extension (55°) . Ask the patient to bend their neck forwards – place the chin on the chest. - Measure the distance from the chin to the sternum. Ask the patient to extend their neck by looking up at the ceiling.

(b) (a) Figure 35.3 (a) kyphosis. (b, c) Figure 35.2 Plumb line. (c) Standing sagittal pro /f_i le showing cervical and lumbar lordosis, with thoracic Normal alignment whole spine from front and behind patient.

/uni25CF Right/left rotation (70°) . Ask the patient to look over each shoulder while not moving the chest wall. /uni25CF Right/left lateral bending (40°) . Ask the patient to lay their ear on their ipsilateral shoulder.

Figure 35.4 Cervical spine /f_l exion/extension (a, b) , rotation (c)

ELBOW

ELBOW

The elbow is a hinge joint formed by the articulation of the ulna and radius with the humerus.

Extensors and flexors

Extensors and flexors

Asking the patient to grip two of your fingers in their fist tests the power of the extensors of the wrist (radial nerve) because Jules Froment, 1878-1946, Professor of Clinical Medicine, Lyons, France. they are needed to brace the wrist. It also tests the power of the flexors in the forearm (median nerve). Asking the patient then to extend and spread their fingers apart against resistance tests the intrinsic muscles of the hand (mainly the ulnar nerve).

Significance Tests the adequacy of the blood supply to the hand from the radial and ulnar arteries and the arcade between them Identifies compression of a peripheral nerve Compression of the median nerve causes paraesthesia A positive test indicated by flexion of the thumb interphalangeal joint suggests weakness of the adductor pollicis muscle supplied by the ulnar nerve. Recruitment of the median nerve-innervated flexor pollicis brevis explains the thumb posture

FURTHER READING

FURTHER READING

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Feel

Feel

Ask the patient if they have any areas of tenderness. Ensure that you do not cause the patient pain – watch their face as you feel. It may be easier (especially with children) to feel the normal side first. tion in Pyrford, UK, which became internationally known as the

Presentation Head movement lacks coordination. No regular cadence Head moves from side to side (windscreen wiper) Head dips. Cadence dot/dash Head rocks to and fro

The aim of sensory testing is to establish a pattern of sensory loss. Look for a dermatomal (may indicate spinal root or peripheral nerve pathology) or glove-and-stocking distribution (may indicate a neuropathy, e.g. diabetes). Perform a screening test by lightly stroking both limbs. Record whether the patient feels a difference. If none is noticed there is no need to spend more time on the neurological examination. If there is a difference, then a full neurological examination should now be performed. Soft tissues /uni25CF Tenderness. Try to determine the actual anatomical structure from which the pain arises (e.g. subcutaneous fat, bursae, nerves, arteries). /uni25CF Lumps and effusions. Determine the characteristics of any lump or effusion using Table 35.2 as a guide. /uni25CF Pulses. Palpate the distal pulses (or capillary return) of the limb. Recording distal neurovascular status both before and after surgery is important. Absence of distal pulses is an absolute contraindication to elective surgery in that limb. Acute loss of circulation to a limb is a surgical emergency. Bone Palpate the contours of the joint and assess for tenderness. For superficial joints, such as the knee, the joint line can be felt and checked for lumps and tenderness. Feel

Palpate, with one hand supporting the patient's pelvis. Feel

/uni25CF Skin. If there is any question of abnormal sensation on a simple stroke test comparing both sides, proceed to the two-point discrimination test using the sharp ends of a paper clip. Record the minimum distance between the tips of the paper clip at which the patient is able to recognise two points. Table 35.8 describes the anatomical regions supplied by the median, ulnar and radial nerves. /uni25CF Pen sliding test. To assess the absence or presence of sweating, slide a pen along the radial border of the index finger. If the pen slides smoothly, this may indicate loss of sweating. /uni25CF Soft tissue. Feel for muscle bulk and tendon thickening. Feel bony prominences, radial styloid, ulnar styloid and the anatomical snuff box. Feel for sensation using two-point discrimination of the medial nerve (radial aspect of the index finger), radial nerve (in the anatomical snuff box) and ulnar nerve (ulnar aspect of the little finger). William Heberden (Senior), 1710–1801, physician, practised first in Cambridge and later in London, UK. Charles Jacques Bouchard, 1837–1915, physician, Dean of the Faculty of Medicine, Paris, France. Boutonnière is French for 'buttonhole'. Edgar van Nuys Allen, 1900–1961, Professor of Medicine, The Mayo Clinic, Rochester, MN, USA. Jules Tinel, 1879–1952, Physician, Hôpital Beaujon, Paris, France. George S Phalen, contemporary orthopaedic surgeon and Chief of Hand Surgery, The Cleveland Clinic,

Cleveland, OH, USA. He helped to establish the American Society for Surgery of the Hand.

Blood vessels : check the radial and ulnar artery pulses; assess the capillary refill time, which is normally less than 2 seconds; Allen's test should also be performed before surgery (Table 35.9 and Figure 35.10).

Nerves : compressive neuropathies are most commonly seen affecting the median nerve (see Tinel's [Figure 35.11a] and Phalen's [Figure 35.11b] tests in Table 35.9).

Palmar fascia : feel for palmar thickening and skin pits; long finger-like structures (cords), most commonly affecting the ring and little fingers, are suggestive of Dupuytren's disease.

Bones . Palpate from the radial to the ulnar side of the wrist joint. In the trauma setting, palpate the anatomical snuff box (Figure 35.12): a fracture of the scaphoid may cause tenderness (see Chapter 32). The scaphoid tubercle, pisiform and the hook of hamate are all palpable on the volar aspect of the wrist. -

Anatomical site Name Association
 DIPJ Heberden's Osteoarthritis nodes PIPJ Bouchard's Osteoarthritis node Boutonnière Rheumatoid Hyperextension of the MCPJ, deformity arthritis /flexion of the PIPJ and hyperextension of the DIPJ Hyperextension of the MCPJ and Swan neck Rheumatoid PIPJ and /flexion of the DIPJ deformity arthritis Rheumatoid Z deformity Flexion of the MCPJ with arthritis of the hyperextension of the thumb interphalangeal joint Subluxation of the MCPJ Ulnar drift Rheumatoid arthritis DIPJ, distal interphalangeal joint; MCPJ, metacarpophalangeal joint; PIPJ, proximal interphalangeal joint.

TABLE 35.8 Sensory distribution of the nerve supply to the hand.

Nerve	Sensory distribution
Ulnar	Little finger and ulnar half of the ring finger
Median	Thumb, index, middle and radial half of the ring finger
Radial	Base of the thumb on the dorsum of the hand

Figure 35.10 (a-c) Performing Allen's test. TABLE 35.9 Special hand tests. Test Technique Allen's test Elevate the hand and apply digital pressure on the radial and ulnar arteries to occlude them. Ask the patient to make a fist several times. The tips of the fingers should go pale. Release each artery in turn and observe the return of colour Tinel's test Tap over the nerve of interest. Tingling may indicate nerve compression Phalen's test Place the wrist in maximum flexion with the elbows extended Froment's sign Ask the patient to grip a sheet of paper between the index finger and thumb of both hands. Grip the paper yourself similarly. Ask the patient to resist as you attempt to pull the paper away

Feel

Soft tissues . An effusion may be detected by performing a cross-fluctuation test. The ulnar nerve can be rolled under your fingers placed between the medial epicondyle and the olecranon. Test the distal sensation in the hand (especially in the distribution of the ulnar nerve) and assess the vascular status.

Bones . The three palpation landmarks are the medial and lateral epicondyles and the apex of the olecranon. These form an equilateral triangle when the elbow is flexed to 90°. The radial head is palpated with the examiner's thumb while the other hand pronates and supinates the forearm. On the medial side, palpate the medial epicondyle . Posteriorly , palpate the olecranon fossa.

Flexion–extension . The normal range is from -5° (slight hyperextension) to 150°. Ask the patient to bend the elbow from the fully straight position (Figure 35.20).

Pronation and supination . With the elbows at 90° and the palms facing upwards (full supination), ask the patient to turn the forearm so that the dorsum of the hand faces upwards (full pronation) (Figure 35.21). The normal values are 70° pronation and 90° supination. -

(a) (b) Figure 35.20 (a) Elbow flexion; (b) elbow extension. (a) (b) (c) Figure 35.21 Testing forearm rotation: (a) mid-prone position; (b) full supination; (c) full pronation.

Tennis elbow and golfer's elbow Both conditions are inflammatory processes of the tendons that attach the large muscle mass of the forearm to the lateral or medial epicondyle. Medial epicondylitis (synonym golfer's elbow). The medial epicondyle is the common origin of the forearm flexors and the pronator muscle. Palpate the medial epicondyle for tenderness. The diagnostic test is resisted wrist flexion, which reproduces the pain over the medial epicondyle. Lateral epicondylitis (synonym tennis elbow). The lateral epicondyle is the common origin of the forearm extensors. Palpate for tenderness - usually just distal (5-10 mm) to the epicondyle near the origin of the extensor carpi radialis brevis muscle. Wrist extension against resistance with the elbow extended should provoke the patient's symptoms. Summary box 35.5 Elbow examination

Inspection of the standing patient Front - asymmetry, carrying angle, deformity Back - olecranon fossa Inspection of the supine patient Skin, scars, soft tissues, deformity Palpation of bony structures Movements Flexion and extension, pronation and supination Special tests Tennis and golfer's elbow

Feel

Generalised pain in the shoulder may arise from the neck or the shoulder joint itself. More localised pain is often indicative of acromioclavicular joint pathology. Skin. Test sensation in the upper part of the lateral aspect of the arm ('regimental badge area') (Figure 35.22). Loss may indicate damage to the axillary nerve (following shoulder dislocation). Bones. Palpate the acromioclavicular and sternoclavicular joints and the clavicle.

Figure 35.22 The area of skin supplied by the axillary nerve - the 'regimental badge area'.

Feel

Soft tissues. Tenderness overlying the greater trochanter may suggest trochanteric bursitis or an abductor enthesopathy. Bone. Bony landmarks can be palpated; these include the anterior superior iliac spine (ASIS), iliac crest and the greater trochanter of the femur. Other areas for palpation include the inguinal ligament, which may have a local hernia or lymphadenopathy. The femoral artery can be palpated as it passes under the inguinal ligament at its midpoint halfway between the ASIS and the pubic tubercle. Feel

Soft tissue. Feel the tendons for quadriceps and patellar tendon rupture. Fluid displacement or stroke test. First empty the medial side of the knee by stroking any fluid up from the medial side into the suprapatellar pouch. Then place your hand on the superior aspect of the suprapatellar pouch and move it inferiorly, attempting to displace any fluid into the knee joint. Maintain your hand at the level of the superior pole of the patella. Now look to see whether the normal gutters on either side of the knee are less noticeable because of fluid distension. Stroke the back of your hand over each gutter in turn. Look at the opposite gutter to see if there is cross-

filling. /uni25CF Patellar tap test . This test is used when a large effusion is present. Place one hand on either side of the patella and, with the other hand, push down on the patella. With an effusion, fluctuance is present as the patella moves towards - the joint. /uni25CF Bone . Feel the tibial tuberosity , inferior pole of the patella, patellar facets, origin and insertion of the knee ligaments and joint line (medial and lateral). Remember to palpate for any popliteal swellings. Note the height of the patella.

(b) Figure 35.30 (a) Knee /f_ flexion; (b) extension.

Feel

/uni25CF Skin . Reduced sensation in a glove-and-stocking distribution is seen with diabetes.

(b) Clini

Proximal interphalangeal joint Distal interphalangeal joint Flexion Flexion Flexion Flexion Normal Flexion Normal -

/uni25CF Soft tissues . The posterior tibial and the dorsal pedis pulses should be identified (Figure 35.36). Palpate the tibialis anterior tendon and the long extensor tendons on the dorsum of the foot. From the back, palpate the Achilles tendon. Palpate the peroneal tendons from the lateral side and the tibialis posterior tendon from the medial side. The sinus tarsi can be assessed. This is an anatomical space bounded by the talus and calcaneus and is recognisable as a soft-tissue depression anterior to the lateral malleolus. It is filled with fat and the extensor digitorum brevis muscle. Sinus tarsi syndrome may occur. This may be caused by injury to the interosseous talocalcaneal ligament or the subtalar joint. There is pain and tenderness over the sinus tarsi with subjective hindfoot instability . The pain is char ved by local anaesthetic injection. acteristically relieve /uni25CF Bones . Feel for deformity , bony prominences and loose bodies: /uni25CF ankle joint : the medial and lateral malleoli, anterior and posterior joint line, lateral gutter and ligament complex, the syndesmosis (front of the ankle), medial gutter and medial ligament complex; /uni25CF subtalar joint : palpate each facet; /uni25CF midtarsal joints : the talonavicular and calcaneocuboid joints; TMTJ is several millimetres proximal to the others; movement is minimal in the second ray , limited in the third ray , moderate in the fourth and fifth rays and very variable in the first ray . /uni25CF Specific structures to palpate: /uni25CF calcaneus (heel bone): the most common cause of pain is plantar fasciitis; this may present with numbness, burn - ing and electric shock sensations, which are worse in the morning and improve as the day goes on; identify the exact point of tenderness; /uni25CF tendons : examine for contracture of the Achilles tendon insertion and the peroneal or tibialis posterior tendons; /uni25CF head of talus : invert and evert the patient's foot; /uni25CF sustentaculum tali : palpate one fingerbreadth below the medial malleolus; this important structure serves as an attachment for the spring ligament; /uni25CF cuneiforms (medial, middle and lateral), MTPJs, web spaces and all the forefoot bones.

(b) Figure 35.36 (a) Palpation of the posterior tibial pulse. (b) Palpation of the dorsalis pedis pulse.

Finger flexors

Finger flexors

). /uni25CF Superficialis tendon test . The flexor digitorum pro - fundus (FDP) usually has one muscle belly from which tendons to all of the fingers arise. The FDP can be immo - bilised by holding all of the fingers (except the one being ws the superficialis tendon examined) in extension; this allo to be tested in isolation. If the test finger is able to flex, despite profundus being immobilised, then the superficialis tendon to that finger is working. Repeat the test for the other fingers and e xamine FDP (Figure 35.14).

Flat foot flexibility

Flat foot flexibility

Use the windlass and Jack's tests to distinguish a flexible from a fixed flat foot (Figure 35.40).

Windlass test . Ask the patient to stand on their toes and observe the arch of the foot on the medial aspect. As soon as the patient stands on their toes, the arch forms. Failure of this indicates a fixed flat foot.

Jack's test . With the patient standing, lift up the great toe. The arch should form in the flexible flat foot.

(b) Figure 35.39 (a, b) Testing subtalar joint flexibility.

General principles

General principles

Apley described a useful and systematic approach to clinical examination. This approach is divided into three parts: 1 look; 2 feel; 3 move.

HISTORY Introduction

HISTORY Introduction

/uni25CF Ensure you have followed appropriate hand hygiene guidance. /uni25CF Introduce yourself and check the patient's name and date of birth. /uni25CF Request presence of a chaperone as appropriate. /uni25CF Explain what you are going to do, obtain verbal consent and ensure that the patient is comfortable.

Impingement syndrome

Impingement syndrome

This is impairment of rotator cuff function within the subacromial bursa. It may lead to inflammation (tendinitis) or a partial- or full-thickness tear. Impingement is characterised by pain and weakness on abduction and internal rotation. /uni25CF Painful arc test (Figure 35.24). Ask the patient to abduct their arms from their sides. The presence of pain from 60° to 120° is positive. /uni25CF Jobe's test (empty can) (Figure 35.25). Ask the patient to abduct the arm to 90° elevation in the scapular plane with full internal rotation (empty can position). Ask the patient to resist downward pressure. The presence of pain is a positive test. Shoulder instability Instability may be defined as a shoulder that slips in and out of joint (dislocation) more than once or twice, or frequently slips partially out of joint and then returns on its own. Instability can be anterior, posterior, inferior or multidirectional.

(b) Figure 35.25 Jobe's test for rotator cuff impingement. Figure 35.24 (a–c) Painful arc test for rotator cuff impingement. Figure 35.26 Anterior apprehension test for anterior shoulder insta

bility.

supine or standing, flex the elbow to 90° and abduct the shoulder to 90°. Now externally rotate the shoulder. Apprehension indicates anterior instability . Summary box 35.6 Shoulder examination /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF

Inspection of the standing patient Front – asymmetry, deformity Side – muscle wasting Back – muscle wasting, scapula Inspection of the supine patient Skin, scars, soft tissues, deformity

Palpation of shoulder girdle (sternum to scapula) Movements Flexion and extension, abduction and adduction, internal and external rotation Special tests Impingement syndrome - painful arc, Jobe's test, Hawkins' test (see also Chapter 38) Shoulder instability - apprehension, relocation test, sulcus sign Rotator cuff assessment Acromioclavicular joint pathology Frozen shoulder versus glenohumeral osteoarthritis

Introduction

INTRODUCTION

The components of the musculoskeletal (MSK) system include the bones, joints, ligaments, muscles and tendons as well as the neurological and vascular structures. A simple system allows a concise yet comprehensive history to be taken and a reliable examination to be performed. This will permit diagnosis of the common, the rare and the clinically urgent MSK problems that are likely to be encountered in clinical practice.

Learning objectives

Learning objectives

To understand how to: Take a comprehensive musculoskeletal history • Perform a structured and systematic musculoskeletal • examination

Look

Look

The inspection begins as soon as you enter the examination room. Look for any walking aids. Remember to look at the whole patient and not just at the joint of interest. For example: /uni25CF look at the hands for rheumatoid arthritis; /uni25CF look at the eyes for Horner's syndrome; /uni25CF look for any obvious upper or lower limb or spinal deformity . Gait The gait cycle is all of the activity between the initial contact of the foot with the ground and the succeeding initial contact of the same limb. There are two main stages: the stance phase (60%) and the swing phase (40%). Ask the patient to stand, and inspect from the front, side and back. Then, ask the patient to walk using any walking aids. Some of the types of limp that might be present are described in Table 35.1 . Focused inspection Adequately expose the joint above and below . Expose the opposite limb for comparison. Make sure that the patient is comfortable. It may be easier for you and the patient if they Alan Graham Apley , 1914-1996, Director of Orthopaedic Surgery , St Thomas' Hospital, London, UK. As a consultant also at Rowley Bristow Orthopaedic Hospital, he conducted the most popular orthopaedic postgraduate course for the FRCS examina 'Pyrford Orthopaedic Course'. Johann Friedrich Horner , 1831-1886, Professor of Ophthalmology , Zurich, Switzerland, described this syndrome in 1869. Friedrich Trendelenburg , 1844-1924, Professor of Surgery successively at Rostock (1875-1882), Bonn (1882-1895) and Leipzig (1895-1911), Germany . The Trendelenburg position was first described in 1885. a couch is used, make sure that it is in the centre of the room (not against the wall) so that you can work on both sides of the patient. Remember that all joints are covered by an envelope of soft tissues and skin. Look at the skin for: /uni25CF surgical scars (arthroscopy scars may be difficult to see); /uni25CF bruising (may indicate recent injury or a bleeding disorder); /uni25CF erythema (e.g. cellulitis); /uni25CF ulcers (e.g. arterial, vascular or neuropathic); /uni25CF rashes; /uni25CF sinuses (e.g. secondary to osteomyelitis); /uni25CF hair loss and the presence or absence of sweating; /uni25CF pigmentations or raised lesion (e.g. café-au-lait spots or neurofibromas). Look at the soft tissues for: /uni25CF swelling (e.g. may indicate a joint effusion); - /uni25CF lumps (consider which tissue layer they are arising from); /uni25CF muscle wasting (e.g. may be secondary to disuse atrophy , neuropathy); /uni25CF muscle fasciculation (lower motor neurone pathology). Look at the bones for: /uni25CF abnormal limb alignment - comparison with the other side may be helpful; /uni25CF deformity .

TABLE 35.1 Types of limp. Cause Pathogenesis Long Osteoarthritis (in other leg) Head dips. Cadence dash/dash Incoordinated Cerebral palsy Muscle weakness Osteoarthritis hip Pain Osteoarthritis hip Stiff Arthrodesis hip Limp Pathology Antalgic Hip joint arthritis Trendelenburg Weakness of hip abductors High-stepping gait Foot drop secondary to common peroneal nerve palsy Spastic Cerebral palsy Ataxic Cerebellar pathology

Look

Ensure that the front and the back from the neck to the gluteal cleft can be visualised. Note skin markings (e.g. café-au-lait spots, hairy patches). These may suggest occult neurology or bony pathology. Roy Glenwood Spurling, 1894–1968, American neurosurgeon, first described the Spurling test with William Beecher Scoville. /uni25CF Front . Check for asymmetry of the shoulder and ribcage suggesting scoliosis. /uni25CF Back . Look for a difference in the height of the iliac crests (pelvic tilt). Assess for coronal plane deformity, such as scoliosis (lateral curvature of the thoracic spine with rotation). A rib hump suggesting a structural scoliosis may be visible. /uni25CF Side . Assess for sagittal plane deformity, such as an increased kyphosis.

and bending (d) .

Look

/uni25CF Back . Check the skin at the base of the spine for hairy tufts and dimples (underlying spina bifida). Prominence of the spinal muscles on one side may be the result of muscle spasm secondary to pain. /uni25CF Side . The lumbar spine has a smooth concavity known as the lumbar lordosis (normal range is 40–60°). Muscle spasm is a cause of loss of the normal lordosis. Feel for any 'step-off' in the spinous processes. This may indicate forward slippage of one of the vertebrae on another. Movement occurs in flexion, extension, lateral bending and rotation (Figure 35.7). Record the motion in each plane in degrees. Remember that a significant portion of lumbar flexion is achieved through the hip joint. /uni25CF Forward flexion . This is a measure of lumbar flexibility . The skin of the lumbar spine stretches as the patient bends forwards. To measure flexion, place the tip of your thumb over the T12/L1 junction and the tip of your index finger of the same hand over the lumbosacral junction. Ask the patient to bend forwards and touch the toes (normal range 40–60°). Measure the distance by which your thumb and the tip of your index finger separate. /uni25CF Lateral bending . Ask the patient to slide their right hand down the outside of their right leg and then their left hand down the outside of their left leg. Note the distance that each hand moves down that side of the thigh. /uni25CF Rotation . Stand behind the patient and hold their pelvis still with both hands. Ask the patient to twist around and look over their shoulder. Note the angle that the shoulder girdle forms with the pelvis (range 3–18°). Special tests /uni25CF Lasègue's straight leg raise test (Figure 35.8). This test increases tension along the sciatic nerve (L5 and S1 nerve roots). With the patient supine, elevate the leg with the knee bent to check pain-free movement of the hip. Then, straighten the knee and note the angle at which the hamstrings allow the hip to flex. Finally, allow the hip to extend until tension is removed from the hamstring muscles and then the ankle is dorsiflexed firmly (but without excessive force), which in turn pulls on the sciatic nerve. If the patient experiences pain running down the leg, then the test is positive. Charles Ernest Lasègue, 1816–1863, Professor of Medicine, University of Paris, and Physician, La Salpêtrière, Paris, France. This test was described by Lasègue's student, who named it after his teacher. - -

Figure 35.6 (a–c) Forward bending test. (a) (b) Figure 35.7 Lumbar examination; lateral bending (a) and rotation (b) .

/uni25CF Contralateral stretch test . Elevate the asymptomatic leg; if pain is reproduced in the other leg the test is considered positive.

(b) (c) Figure 35.8 (a-c) Lasègue's straight leg test.

Look

Inspect the posture of both hands. A nerve lesion will produce a specific resting position (e.g. an ulnar nerve lesion will produce clawing of the little and ring fingers). /uni25CF Skin . Assess for scars, discoloration (café-au-lait spots, erythema) and loss of hair. The nails may reveal systemic disease (e.g. psoriatic pitting). Look for tight bands in the palm (Dupuytren's contracture). Loss of sweating is seen in complex regional pain syndrome. /uni25CF Soft tissue . Centrally located swellings at the wrist may indicate a ganglion arising from the wrist joint itself; de Quervain's tenosynovitis may present with a swelling around the radial styloid. /uni25CF Muscle wasting . Check for thenar, hypothenar (Figure 35.9) and intrinsic muscle wasting. To assess thenar eminence wasting, place the hands side by side with the thumbs upwards and look down and compare the - thenar regions. Patterns of muscle wasting are shown in Table 35.6 . /uni25CF Bones . Look for bony deformity (dinner fork deformity , Colles' fracture). Typical bony deformities are described in Table 35.7 .

TABLE 35.6 Patterns of muscle wasting in the hand. Thenar wasting Median nerve palsy (C8)
Hypothenar wasting Ulnar nerve palsy (T1) Intrinsic wasting Ulnar nerve palsy (T1)

(b) Figure 35.9 Thenar (a) and hypothenar (b) wasting.

Look

/uni25CF Skin . Check the extensor surface for signs of psoriasis. /uni25CF Soft tissues . Look for any swellings, e.g. olecranon bursa, rheumatoid nodules, gouty tophi. /uni25CF Muscle wasting . Examine the biceps and triceps muscle bulk. Note that compression of the ulnar nerve at the elbow leads to wasting distally in the hypothenar eminence and intrinsic muscles of the hand - assess the hand for the presence of clawing and wasting. /uni25CF Bone . With the elbow in extension, look at the axis between the upper arm and forearm. There is a physiological valgus ('carrying angle') of 9-14° (2-3° greater in women) (Figure 35.19). This angle allows the elbow to be tucked into the waist depression above the iliac crest: /uni25CF cubitus varus (gun-stock deformity): the carrying angle is reversed, secondary to a malunited supracondylar fracture; /uni25CF cubitus valgus : the carrying angle is increased, caused by malunion of a distal humeral fracture; /uni25CF hyperextension : there is normally a physiological hyper extension of the elbow (5°).

Figure 35.19 Carrying angle of the elbow illustrating the normal cubitus valgus.

Look

Assess the attitude of the limb. /uni25CF Skin . Check for surgical scars. An anterior scar is used for the deltopectoral approach. At the side, the deltoid splitting approach and lateral arthroscopic portals may be seen. Posteriorly , arthroscopic portal sites can be seen. /uni25CF Soft tissues . Wasting of the deltoid muscle is commonly seen after shoulder dislocation when there is a temporary loss of function of the axillary nerve that supplies it. The rotator cuff comprises four muscles: supraspinatus, infraspinatus, subscapularis and teres minor. Wasting of these muscles

may occur following a rotator cuff problem. fracture of the middle third clavicle is the most common cause. A dislocation may be suspected by a loss of normal shoulder contour. The more common anterior dislocation often presents with an anterior bulge and a squared-off shoulder.

Look

With the patient standing, look at the front, side and back of the hip. Look around the room for walking aids and heel raises in the shoes. /uni25CF Skin . Look for scars and sinuses. /uni25CF Soft tissues . Muscle wasting may be present as a consequence of hip arthritis or primary muscle or neurological disease. /uni25CF Bone . Look at the posture of the limb and assess for adduction deformity; fixed adduction may be present in severe osteoarthritis and cerebral palsy , and makes the leg appear short because the pelvis is tilted (apparent shortening). Richard J Hawkins , contemporary , Canadian orthopaedic surgeon, based in Colorado and a founding member and Past President of the American Shoulder and Elbow Surgeons. Georg Clemens Perthes , 1869–1927, Professor of Surgery , Tübingen, Germany , described osteochondritis of the femoral capital epiphysis in 1910. Hugh Owen Thomas , 1834–1891, general practitioner, Liverpool, UK. He is regarded as the founder of orthopaedic surgery although never holding a hospital appointment, preferring to treat patients in their own homes. He introduced the Thomas splint in 1875. /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF

children and adults. Children Adults Developmental dysplasia of Primary osteoarthritis the hip Secondary osteoarthritis Transient synovitis of the In /f_l ammatory arthritis hip Avascular necrosis Perthes' disease Femoroacetabular impingement Septic arthritis and osteomyelitis Labral tears Slipped capital femoral Referred pain epiphysis Juvenile idiopathic arthritis

Look

Look at the front, sides and back of both knees and for any walking or mobility aids or external appliances. /uni25CF Skin . Check for scars. /uni25CF Soft tissues . Look for wasting of the quadriceps and swelling in front of and behind the knee. /uni25CF Bone . Look for overall alignment (varus or valgus deformity). Measure the intermalleolar distance if a valgus deformity is present. With varus deformity , measure the distance between the medial aspects of the knees. From the side of the knee, look for fixed flexion or recurvatum (hyperextension). Gait Look for antalgic gait (osteoarthritis) and varus thrust (collapse of the knee into more varus as weight is taken on that leg). Look

Ask the patient to stand and assess the overall limb alignment. Assess pelvic obliquity , LLD (and its level), valgus/varus deformities of the knee and rotational alignment. Check for contractures of the hips and knees. Now focus your attention on the foot itself: /uni25CF Foot shape . Assess the overall shape of the forefoot from the front. From the side, look for the normal medial arch (Figure 35.35a). The hindfoot is best appreciated from behind. Now look at the vertical relationship between the Achilles tendon and the calcaneus (normal heel valgus of 5–7°). Look from behind and count the number of toes that can be seen. The 'too many toes' sign demonstrates increased forefoot abduction (pes planus [flat foot]) and a splayed forefoot. Foot shapes that may be encountered include neutral foot (no overall deformity), skew foot (hind - foot valgus and forefoot adduction), metatarsus adduc - tus (neutral hindfoot and adduction of the metatarsus), pes planus

(collapse of the medial arch) and pes cavus or high arch (increased medial arch) (Figure 35.35b). The possible causes of pes planus and pes ca vus are shown in Summary boxes 35.10 and 35.11 , respectively .

Skin . A bunion or red swelling on the medial aspect of the metatarsophalangeal joint (MTPJ) is common. This is an area of inflamed skin with an underlying subcutane - ous bursa and a joint osteophyte. Systemic manifestations include gouty tophi and thin fat pads under the metatarsal heads as seen in rheumatoid arthritis. Corns are callosi - ties which form where toes rub against the inside of shoes. Remember to assess the appearance of the nails. -

Soft tissues . Swelling may indicate soft-tissue or joint pathology . Muscle wasting is most commonly seen on the dorsum of the foot and in the clefts between the metatar - sals. If this is present, a full neurological examination of the upper and lower limbs should be performed, including the spine.

Bones . Look for any bony prominences or exostoses. Common forefoot deformities are shown in Table 35.12 .

Figure 35.34 (a, b) Patellar tracking.

Antoine Bernard-Jean Marfan , 1858–1942, physician, Hôpital des Enfants-Malades, Paris, France, described this syndrome in 1896. Jean Martin Charcot , 1825–1893, physician, La Salpêtrièr e, Paris, France. rance, later became Professor of Pathological Anatomy in the Faculty of Medicine, and finally , Pierre Marie , 1853–1940, neurologist, Hospice de Bicêtre, Paris, F in 1918, Professor of Neurology . Howard Henry T ooth , 1856–1925, physician, St Bartholomew’s Hospital and the National Hospital for Nervous Diseases, London, UK, described peroneal muscular atrophy in 1886, independently of Charcot and Marie. Richard von Volkmann , 1830–1889, Professor of Surgery , Halle, Germany .

Causes of pes planus /uni25CF /uni25CF /uni25CF /uni25CF **Summary box 35.11 Causes of pes cavus** (Figure 35.35b) /uni25CF /uni25CF /uni25CF /uni25CF **Gait** Look for a high-stepping gait (foot drop), painful (antalgic) gait (ankle and foot joint pain) and a short propulsive phase (forefoot pain). **Footwear** Inspect the footwear. This may reveal areas of abnormal weight-bearing. With normal wear of the sole, a corner is typically worn o ff the posterolateral aspect of the heel (heel strike). In addition, there may be a circular wear pattern under the ball of the big toe (toe-o ff phase). /uni25CF **External appearance** . Look at the materials used, the metal supports and heel raise, depth and width. /uni25CF **Internal appearance** . Look at the insoles, arch sup - ports and heel cups.

(b) Figure 35.35 (a) Normal medial longitudinal arch of the foot. cal and radiological appearance of pes cavus. **TABLE 35.12 Common forefoot deformities.**

Deformity	Metatarsophalangeal joint
Claw toe	Hyperextension
Hammer toe	Normal
Mallet toe	Normal
Hallux valgus or varus	Valgus or varus position
Normal variant	Hyperlaxity syndrome, e.g. Marfan’s syndrome
Tarsal coalition – rigid and painful	/f_l at foot (see Figure 35.40a)
Tibial posterior dysfunction	Spinal anomalies, e.g. spina bi /f_i da
Hereditary sensorimotor neuropathies, such as Charcot– Marie–Tooth disease	Charcot foot (e.g. neuropathic foot)
Post-compartment syndrome (e.g. Volkmann’s ischaemic contracture)	

Lumbar spine

Lumbar spine

Examination should include the pelvis, hips, lower limbs, gait and peripheral vascular system as well as the lumbar region. Irritation of nerves in the lumbar spine can mimic problems in the lower limb. Always consider referred pain.

Metatarsophalangeal joint

Metatarsophalangeal joint

Test extension (70–90°) by asking the patient to lift the toes to the ceiling and test flexion (45°) by pointing the toes to the floor. Normal toe-off requires 35–40° of dorsiflexion.

Midtarsal joint

Midtarsal joint

Hold the heel with one hand and move the forefoot medially - (adduction = 20°) and laterally (abduction = 10°) with the other hand.

Move

Move

There are three stages to assessing movement. The words used to describe a particular movement are shown in Table 35.3. **Active**. Ask the patient to move the joint within the limits of their pain. **Passive**. Move the limb or joint yourself. Record the range of movement in 'degrees' (a goniometer may be helpful). Comparison of active and passive range allows the three causes of loss of range of movement to be distinguished. In limitation caused by pain or stiffness the ranges are the same but one is painful. In weakness passive range is greater than active. **Stability**. Stability has a static and a dynamic component: static tests assess the integrity of the ligaments and joint (bone) surfaces; dynamic tests assess the integrity and functions of the muscles and tendons. Ask the patient to move the joint actively through its range of motion while you try to stop the movement. Record power using the Medical Research Council (MRC) grading system as illustrated in Table 35.4. Consider the muscles that drive each movement, the peripheral nerves that supply them and the nerve root values (Table 35.5). In the following sections, in addition to the approach of 'look, feel, move', we have included details of special tests for each joint as well as neurological examination of the limb. The peripheral nerve examination comprises sensory and motor testing, reflexes, tone and coordination and proprioception.

TABLE 35.2 Swelling: an acronym for history and examination of a lump. **S**tart Did it appear after trauma or gradually on its own? **W**here Anatomical site and layer (skin, fat, muscle); does it move in relation to these? **E**xternal features **S**ize, surface and definition of margins **L**ymph nodes Are the local ones enlarged? **L**iquid Is it fluctuant? Can it be transilluminated? **I**nternal features Is it hard? Is it tender? **N**oise Is there a thrill? Is there a bruit? **G**eneral Examination of the whole patient for general lumps movement. **F**lexion Forward or anterior movement of the trunk or limb **L**ateral flexion Bending of the forward-facing head and trunk to either side **E**xension Backward or posterior movement **A**bduction A movement away from the midline of the body **A**dduction A movement towards the midline of the body **I**nternal rotation Rotation towards the midline of the body **E**xternal rotation Rotation away from the midline **S**upination Movement of the forearm so that the palm faces anteriorly **P**ronation Movement of the forearm so that the palm faces posteriorly **C**ircumduction A combination of flexion, abduction, extension and adduction without rotation **I**nversion Movement of the foot that directs the sole of the foot medially **E**version Movement of the foot that directs the sole of the foot laterally **R**etraction Backwards movement of the head, jaw or shoulders **TABLE 35.4 The Medical Research Council grading system of muscle power.**

Grade	Description
0	No movement
1	Flicker of movement
2	Active movement with gravity elimination
3	Active movement against gravity
4	Active movement against resistance but power less than full
5	Normal power

Root level Sensation C5 Lateral upper arm C6 Lateral forearm C7 Middle finger C8 Little finger
T1 Medial forearm L1 Anterior thigh L2 Anterior thigh/groin L3 Anterior and lateral thigh L4 Medial

leg and foot L5 Lateral leg and first dorsal web space Extensor hallucis longus S1 Lateral and plantar foot S2-S4 Perianal

Move

Range of motion is limited in the thoracic spine: Forward bending test (Figure 35.6). Ask the patient to bend forwards to touch their toes: structural scoliosis : a rib hump will increase in size (bulge posteriorly on the thoracic convex side) as the patient bends forwards; this is diagnostic of idiopathic thoracic scoliosis (rotatory deformity); functional scoliosis : the spine straightens as the patient bends forwards and no rib hump is visible; this flexible deformity is secondary to other abnormalities such as abnormal leg lengths and muscle spasm in the lumbar region. Lateral bending . This can be used to assess the flexibility of a scoliosis. Radiographs can be taken in this position to supplement the assessment. Move

The wrist can be moved into flexion and extension, and ulnar and radial deviation. Wrist . Extension is tested by asking the patient to push the hands together into a 'prayer' position (Figure 35.13a If there is loss of extension, the palms will not meet and/ or one forearm will be dropped. Palmar flexion is tested in a similar fashion but with the hands pointing down and the back of the hands in contact (Figure 35.13b). Ulnar and radial deviation are tested by taking the patient's hand in your own and moving the hand into these directions. Hand . A general screening assessment is to ask the patient to roll up their fingers from full extension to full flexion. This will reveal a trigger finger. Move

Differentiate between movements of the shoulder joint and scapulothoracic movement of the scapula on the chest wall. Patients with a painful shoulder will commonly move from the scapulothoracic joint. Stabilise the scapula by placing the thumb over the coracoid process and the fingers of the same hand over the spine of the scapula. Start in the 'neutral - position' with the arms by the sides, elbows extended and the palms facing forwards. Note any pain throughout the range of movement (Figure 35.23). Forward flexion . Ask the patient to raise their hands in front to touch the ceiling while keeping the elbows extended (0-180°). Extension . Ask the patient to extend both arms behind (0-30°). Abduction . Shoulder abduction involves the glenohumeral joint and scapulothoracic movement. The first 60° of movement is mainly at the glenohumeral joint. Beyond this the scapula begins to rotate on the thorax and final movements are almost entirely scapulothoracic. Raise the arms sideways until the fingers point to the ceiling (180°). Adduction . Ask the patient to touch their other shoulder tip. Internal rotation . Ask the patient to touch their back with the dorsum of the hand and to raise their hand up the back as high as possible (normal range is thoracic spine level T7-9). External rotation . With the arms by the sides, bend the elbows to 90° and rotate the forearms to the mid-prone position. Ask the patient to separate their hands as much as possible (0-40°).

(d) (e) Figure 35.23 Movements of the shoulder: (a) forward flexion; (b) extension; (c) adduction; (d) internal rotation; (e) external rotation.

Move

The hip joint can be moved into flexion, extension, abduction and adduction, and internal and external rotation (Figure 35.27). True hip movement ends when the pelvis begins to move. To detect true hip movement, simultaneously place a finger/hand on the ASIS contralateral to the hip being examined. Remember to compare both sides. Passive movement Hip flexion (120–0°) when lying supine The patient is asked to lie on their back and then roll themselves into a ball, flexing the hips and the spine fully . A comparison of the flexion of the two hips can be made in this position. The patient is then asked to hold onto the knee of the 'bad' leg with both hands (thereby fixing the pelvis in flexion) and the other leg is allowed to extend down onto the couch. A note is made of any fixed flexion deformity (inability of the thigh to come down onto the couch). This 'good' hip is then returned to full flexion and the patient grasps that knee while dropping the other, 'bad', hip into extension. This modified Thomas's test is the most comfortable and accurate way of measuring flexion and extension of the hip, minimising movement of the painful hip (Figure 35.28). Hip extension (0–10°) when lying in a prone position Hip extension can be measured by asking the patient to roll onto their front and extend the hip. Rotation Internal rotation (45°) . With the hip flexed to 90° and the knee in 90° of flexion, hold the front of the knee with one hand and the foot with the other. Internally rotate the hip (the foot goes outwards), then externally rotate the hip (the foot goes in). The angle that the tibia makes with the vertical indicates the range of movement. Pain at the extremes of movement suggests inflammation in the hip. Abduction (40°) . The hip should be abducted by moving the leg away from the midline with the other hand on the patient's pelvis to detect any tilt in the pelvis.

(c) Figure 35.28 Modified Thomas's test for assessing a fixed flexion deformity. A fixed flexion deformity of the right hip is indicated by an inability to fully straighten the right leg (arrow).

(d) Figure 35.27 Hip movements: (a) internal rotation; (b) external rotation; (c) adduction; (d) abduction.

Move

The knee moves principally in flexion (0–135°) and extension (from 0 to –10°) (Figure 35.30). Assess hyperextension by placing one of your hands on the anterior aspect of the distal femur. Now lift the distal tibia with the other hand. Measure the angle or the height that the heel can be lifted o

off the couch before the knee starts to move. Perform a lag test to assess the integrity of the extensor mechanism. The patient is asked to lift the whole leg up off the bed (10°) with the knee straight. They are then asked to bend the knee and then try to straighten it again with the leg still held in the air. If they are unable to re-straighten the knee they have a positive lag. This indicates significant weakness of the quadriceps mechanism. In the presence of an apparent fixed flexion deformity of the knee (seen in osteoarthritis), decide whether this is arising from the knee or the hip joint. To differentiate, sit the patient up with the knees hanging over the edge of the couch; this obliterates the effect of any hip flexion deformity. Passively try to extend the knee fully. With a flexion deformity of the knee, this is not possible.

(c) Figure 35.31 Assessing the medial (a, b) and lateral (c, d) collateral ligaments.

Move

The movements of the foot and ankle are linked via the ankle, subtalar and midfoot joints. Remember the acronyms PAED – pronation, abduction, eversion and dorsiflexion – and SAPI – supination, adduction, plantarflexion and inversion. These are the two common general foot deformities.

Neurological

Neurological

Focus your examination on the C5 to T1 nerve roots. These supply the upper extremities (Figure 35.5).

Figure 35.5 Spurling's test for cervical spine nerve root entrapment. The examiner turns the patient's head to the affected side while extending and applying downward pressure to the top of the patient's head.

SPINE

SPINE

The spinal column consists of 33 vertebrae with 23 intervertebral discs. This is supported by numerous ligaments and paraspinal muscles. When observed from the front (coronal plane) with the patient standing and the hips and knees fully extended, the head should be centred over the sacrum. A 'plumb line' dropped from the spinous process of C7 should fall through the gluteal crease (Figure 35.2). If it falls to either side of the cleft, lateral tilt of the spine is present. The ear, shoulder and greater trochanter of the hip should lie in the same vertical plane. When the patient is observed from the side, assess the four physiological sagittal plane curves (cervical and lumbar lordosis, and thoracic and sacral kyphosis) (Figure 35.3).

Snapping hip

Snapping hip

Snapping hip is a condition in which the patient feels a snapping sensation or hears a popping sound in their hip when they walk, get up from a chair or swing their leg around. The snapping sensation occurs when a muscle or tendon (the strong tissue that connects muscle to bone) moves over a bony protrusion in the hip region, e.g. psoas and iliotibial band. Although snapping hip is usually painless and harmless, the sensation can be annoying. In some cases, snapping hip leads to bursitis, a painful swelling of the fluid-filled sacs that cushion the hip joint. Summary box 35.7

Common causes of LLD in the hip

Osteoarthritis Hip dysplasia Hip fracture Avascular necrosis Hip dislocation Fixed flexion deformity Figure 35.29 (a, b) Trendelenburg test. TABLE 35.11 Common limps observed in hip disease. Gait pattern Description Weak: May lead to pelvic sway or tilt. The patient Trendelenburg swings the body over the weak hip to stay in balance when it is weight-bearing Painful: antalgic The rhythm is dot-dash, with a short period spent on the painful limb Unbalanced: May be caused by ataxia, e.g. cerebellar broad-based pathology. The rhythm also tends to be disordered May be due to loss of proprioception or a Loss of muscle drop foot. This leads to difficulty in clearing control: high- the toes during the swing phase: the patient stepping compensates by externally rotating the leg and flexing the hip and knee Deformity: in- Can be caused by persistent femoral toeing anteversion. The foot may catch on the back of the calf of the weight-bearing leg, tripping the patient

Special tests Achilles tendon

Special tests Achilles tendon

Feel the gastrocnemius and soleus bellies and the whole length of the tendon for gaps (rupture), tenderness or swelling. Also Patrik Haglund , 1870–1937, Swedish orthopaedic surgeon. Theodore Campbell Thompson , 1902–1986, American orthopedic surgeon, made many contributions to orthopaedic surgery , especially in the field of post- polio deformities. Franklin Adin Simmonds , 1911–1983, orthopaedic surgeon, Rowley Bristow Hospital, Pyrford, UK. Sherman S Coleman , 1922–2004, Chief Surgeon, Intermountain Unit of the Shriners Hospital, and Chairman, Division of Orthopedics, University of Utah, Salt Lake City , UT , USA. Ewan A Jack , 1909–1953, Scottish orthopaedic surgeon. identify the posterolateral (Haglund's) prominence of the calcaneus and palpate the retro-Achilles bursa. The test for integrity of the tendon is the Thompson or Simmonds test. Do not be misled by the patient's ability to stand on tiptoes - some people can do this using their long toe flexors alone. Lie the patient prone and allow their calves to rest on your forearms. Squeeze each calf in turn and watch for movement at the ankle joint. Lack of movement may indicate a rupture.

Figure 35.38 Testing subtalar joint motion.

Special tests and diagnoses

Special tests and diagnoses

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Special tests

Special tests

Trendelenburg test (Figure 35.29). Face the patient and ask them to place their hands on the palm of your hands for support. Then ask them to stand first on one leg, then the other. Increased pressure from the opposite hand as they take weight through the weak hip indicates a positive Trendelenburg test.

Leg length discrepancy (LLD) . The inequality may be in the hip joint, femur, tibia, ankle or foot or a combination of these. The pathology may be from the bone being too short or too long. When assessing LLD, square the pelvis. If that is not possible then place both legs in the same position. For example, if there is an adduction deformity present in the affected leg, place the good leg in the same degree of adduction. LLD can be caused by a real difference in the leg lengths (the bones are different lengths) or by a deformity that makes the leg appear short because the pelvis must be tilted to get the leg onto the ground. The first is called 'real' LLD, measured ASIS to medial malleolus. The second is called 'apparent' LLD, measured mid-line, e.g. xiphisternum to medial malleolus. Each differs in cause and therefore treatment. The LLD apparent to the patient can also be measured using wooden blocks placed under the patient's 'short' leg until the patient feels level.

Gait . Hip disease can present with an altered gait pattern. The common types of abnormal gait are described in Table 35.11 (see also Summary box 35.8).

Impingement . Two commonly performed tests relate to femoroacetabular impingement. The FADDIR test, performed with hip flexion at 90° and subsequent adduction and internal rotation (F-ADD-IR) can reproduce the hip pain in impingement. The FABER test combines hip flexion, abduction and external rotation (F-AB-ER) and can reproduce hip pain in impingement but also pain from other locations, e.g. sacroiliac. Special tests

Collateral ligaments To assess the ligaments, place the leg under your arm. Flex the knee to 30° (not more) to relax the posterior capsule (the MCL and LCL are taut in full extension and lax in flexion). Stress each ligament in turn by applying a valgus or varus force. With your index fingers simultaneously palpate over the collateral ligaments. Assess for signs of instability (excessive opening of the joint). The quality of the end point should be noted (is it firm or spongy?). Compare both sides (Figure 35.31).

Medial collateral ligament . A lax MCL or deficient lateral compartment may cause knee instability when applying a valgus stress. It is important to note that the valgus stress test should be applied with the knee in 30° of flexion. Valgus instability in full extension (0°) should alert you to a possible posterior structure injury (e.g. posterior capsule, PCL).

Lateral collateral ligament . A lax LCL or deficient medial compartment may cause knee instability when applying a varus stress in 10° of flexion. Instability in full extension (0°) suggests injury to the posterior structures. In a suspected lateral injury, evaluation of the peroneal nerve must be performed.

(d) Figure 35.32 Lachman's test: Flex the knee to 15–30° and pull the proximal tibia forwards.

Subtalar joint (Figures 35.38 and 35.39)

Subtalar joint (Figures 35.38 and 35.39)

Hold the talar neck and ask the patient to move their heel from side to side. Repeat using a hand on the heel to move the joint and apply a varus and valgus stress while feeling for movements of the talus. Holding the talus as opposed to the tibia isolates the subtalar from ankle motion. (Normal range is 5° in each - direction.) /uni25CF Inversion . Ask the patient to move their foot in towards them. /uni25CF - Eversion . Ask the patient to move their foot out to the side.

Subtalar joint flexibility

Subtalar joint flexibility

Ask the patient to stand on their toes and observe the heel from behind; the heel moves normally from valgus to varus, indicating flexibility . The Coleman block test is used to assess the flexibility of the subtalar joint. Ask the patient to stand on a 2-cm block with the great toe over the medial edge, resting on the floor. Now look from behind. If the hindfoot varus remains, the subtalar joint is fixed. If it corrects to valgus, the joint is mobile (Figure 35.39).

Take a history

Take a history

Presenting complaint . Start with an open-ended question. Ask the patient to 'explain what the problem is' in their own words and ask the patient what their hopes and expectations are from the interview .

History of the presenting complaint ('the three Ws') . **W** hen did you first notice the problem? **W** hat were you doing when it started? **W** as the onset sudden or did it develop gradually?

Associated symptoms . Ask about the following: pain; swelling; instability - 'giving way'; mechanical symptoms (e.g. locking, clicking, clunking); loss of power; altered sensation.

Functional impairment . Ask whether the patient is having difficulties performing activities of daily living: upper limb, e.g. personal hygiene, feeding; lower limb, e.g. putting on shoes and socks, standing, walking and climbing stairs.

Past medical history (PMH) . Check for comorbid conditions which may contribute to the presenting problem or affect the patient's fitness for an anaesthetic, e.g. diabetes, asthma, previous heart attack or stroke. Check for any previous problems with anaesthesia.

Past surgical history . Ask about relevant surgical procedures.

Drug history . Ask about all medication and the following in particular: anticoagulants, steroids, aspirin, immunosuppressant therapy , oral contraceptive pill and hormone replacement therapy .

Social history . Tailor questions to the patient's condition: patient's age; hand dominance; employment status; dependants; alcohol consumption; smoking; hobbies; home help; accommodation - own house, residential or nursing home; use of walking aids; mental test score assessment.

Family history . This may reveal a history of MSK disease.

Summary box 35.1 Taking a history

Use and interpret special tests • Use findings to understand the impact on a patient's pain • and function

Introduce yourself and put the patient at ease Explain what you are doing and ensure that the patient agrees Start with an open question to understand the presenting complaint Check for history of the presenting complaint and associated symptoms Ask about functional impairment Check past medical history and relevant surgical and family history Check drug and social history

Tarsometatarsal joint stability

Tarsometatarsal joint stability

Stability can be assessed by pushing each joint up and down. Standing lateral radiographs may be used in addition.

Tarsometatarsal joint

Tarsometatarsal joint

Hold the midfoot and manipulate each metatarsal up and down to estimate the passive range of movement.

(b) Figure 35.37 (a) Ankle dorsiflexion and (b) ankle plantar flexion.

Thoracic spine

Thoracic spine

Pathology commonly presents with pain and deformity . The thoracic spine is normally convex with a gentle kyphosis (normal range 20–45°).

Thumb and thenar eminence

Thumb and thenar eminence

Abductor pollicis brevis, opponens pollicis and flexor pollicis brevis can be tested together by opposing the thumb to the little finger.

(b) Figure 35.11 (a) Tinel's test; (b) Phalen's test. Figure 35.12 Palpating the anatomical snuff box between the tendons of extensor pollicis longus and abductor pollicis brevis. (b) Figure 35.13 Testing the range of (a) wrist extension; (b) wrist flexion. (a) (b) Figure 35.14 Testing the (a) superficial; (b) deep flexor digitorum.

Flexor pollicis longus . The muscle is supplied by the anterior interosseus nerve (branch of the median nerve) and can be tested by asking the patient to bring the tips of the thumb and index finger together (the 'OK' sign; Figure 35.15). Extensor pollicis longus . The integrity of the tendon is tested by asking the patient to lift the thumb off a table with the palm flat on the table (Figure 35.16). Adductor pollicis . Test using Froment's sign (see Table 35.9 and Figure 35.17). Abductor pollicis brevis . This muscle is supplied by the median nerve. With the hand lying flat on a table with the palm facing upwards, ask the patient to raise the thumb towards the ceiling. Ask the patient to resist as you push the thumb back towards the palm (Figure 35.18). Harry Finkelstein , 1883-1975, American surgeon, one of the cofounders of the Hospital for Joint Diseases, New York, NY , USA. In 1932, along with E J Haboush invented a stabilising apparatus and operative technique for bone lengthening, anticipating by decades the current widely utilised Ilizarov technique. Hand and wrist examination

Figure 35.15 Test for flexor pollicis longus supplied by the anterior interosseus nerve. Figure 35.16 Testing the integrity of extensor pollicis longus. Inspection

of the standing patient Dorsum
and palm – asymmetry, deformity,
muscle wasting Inspection of the
supine patient Skin, scars, soft
tissues Palpation of bony
structures and joints of the hand
Movements Wrist – /f_ l exion and
extension, ulnar and radial
deviation Hand – thumb
movements, metatarsophalangeal
joints and small joints of the hand
Special tests Allen’s test Tinel’s
and Phalen’s tests for the median
nerve Froment’s sign Finkelstein’s
test Figure 35.17 Froment’s sign;
the arrow illustrates the /f_ l exed

posture of the thumb
interphalangeal joint, indicating
weakness of the ulnar nerve-
innervated adductor pollicis
muscle. Figure 35.18 Testing the
power of the abductor pollicis
brevis sup

plied by the median nerve.

Tibialis anterior

Tibialis anterior

Ask the patient to walk on their heels with their feet inverted; the tibialis anterior tendon can be seen. With the patient's feet resting over the edge of the couch, ask the patient to actively dorsiflex and invert their foot to reach your hand. Palpate the tibialis anterior muscle. - .

(b) (c) Figure 35.40 (a) Flat foot appearance with a reduced medial longitudinal arch; (b) windlass test; (c) Jack's test. Figure 35.41 Anterior draw test.

dinal arch; (b) windlass test; (c) Jack's test. Figure 35.41 Anterior draw test.

Pathology of the tibialis posterior typically presents with posteromedial ankle pain, swelling and gradual onset of a flat foot. When assessing the tendon, look for swelling along its course, a flat foot with heel valgus, the 'too many toes' sign and prominence of the talar head. Palpate for tenderness, swelling or gaps in the tendon. /uni25CF To test integrity , ask the patient to perform a single-foot tiptoe test on both sides. The inability to lift the affected heel off the ground is suggestive of a tibialis posterior tendon injury or insufficiency . /uni25CF To test strength , position the foot in the plantarflexed and inverted position. Ask the patient to hold this position while you push against their foot. Dorsiflexors Tendinitis of the long toe dorsiflexors usually presents in athletes. Pain affects gait in the early contact phase. Palpate for swelling, gaps or any tenderness. Ask the patient to move the foot into dorsiflexion and to hold this position while you push the foot down. Inability to dorsiflex the foot is referred to as foot drop. Causes include stroke, spinal injury , spinal stenosis or disc prolapse, peripheral nerve injury (e.g. sciatic, common and deep peroneal) or a peripheral neuropathy . Peroneal tendons Peroneal tendon pathology presents with swelling and/or pain of the lateral hindfoot or midfoot. There may be a history of the ankle 'giving way'. Presentations of peroneal tendon pathology include: /uni25CF 'peroneal spasm' : may be seen in tarsal coalition; here, the muscles are usually contracted secondary to the hindfoot valgus; /uni25CF peroneal tendon dislocation : attempt to dislocate the tendons by dorsiflexing and everting the foot. The peroneus longus may be palpated just before it crosses under the foot to insert onto the base of the first metatarsal. Ask the patient to plantar flex the first metatarsal. Test strength and integrity by active and resisted eversion while you palpate the tendons for swelling, tenderness or gaps. Morton's neuroma This condition represents thickening of the tissue that surrounds the digital nerve leading to the toes as the nerve passes under Thomas George Morton ,

1835–1903, surgeon, Pennsylvania Hospital, Philadelphia, PA, USA. Jacob D Mulder , 1901–1965, Dutch surgeon and podiatrist. most frequent between the third and fourth toes. A neuroma presents with burning pain in the ball of the foot that radiates to the involved toes. The condition is difficult to diagnose and requires a high index of suspicion. Palpate in the web space between the symptomatic toes for a mass. Compression of the metatarsals may elicit a 'click' between the bones (Mulder's click). Summary box 35.12 Ankle and foot examination /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF - /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF

Inspection of the standing patient Front - alignment, foot shape and deformity Side - medial arch Back - heel position Gait - antalgic, high-stepping gait (foot drop) Inspection of the supine patient Skin, scars, soft tissues, bony deformity Palpation of the ankle, subtalar, midfoot and forefoot joints Movements Dorsi /f_ l exion, plantar /f_ l exion, inversion, eversion Special tests Flexibility of the subtalar joint and a /f_ l at foot Joint stability, Morton's neuroma Tendons - tibialis posterior and anterior, Achilles tendon, peroneals and dorsi /f_ l exors