35 History taking and clinical examination in musc

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 (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 di ffi cult 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. Com pare 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. Ankle stability

Trauma to the ankle is a common cause of instability . Accurate assessment may be di ffi cult 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. Com pare 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. /uni25CF The Lachman test (Figure 35.32). Flex the knee to 15–30° and pull the proximal tibia gently forwards. Exces - sive 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. /uni25CF 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 /uni00A0 mm), grade II (5–10 /uni00A0 mm) and grade III (>10 /uni00A0 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 . /uni25CF 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 /uni00A0 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 necessar y . 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 su ff er 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, travel - ling in a ‘J’ pattern. /uni25CF Patellar tracking (Figure 35.34). Sit the patient and ask them to let their legs hang o ff 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 indi - cates maltracking. /uni25CF Patellar apprehension (Fairbank’s) test (for insta - bility). 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 di ff use 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 sta bility; (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 – /f_i xed /f_l exion 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, /f_i bular head Movements Flexion and extension Special tests Patellar apprehension test and extensor mechanism Cruciate ligaments Collateral ligaments Menisci

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Assessment of joint hypermobility

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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 hyper- mobility 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 /uni25CF 1 point if, while standing forward bending, the patient can place their palms on the ground with legs straight; /uni25CF 1 point for each elbow that bends backwards; /uni25CF 1 point for each knee that bends backwards; /uni25CF 1 point for each thumb that touches the forearm when bent backwards; /uni25CF 1 point for each little finger that bends backwards beyond 90°; /uni25CF total score out of 9. Summary box 35.2 MSK examination /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF Peter H Beighton , b. 1934, British medical geneticist. With Francis T Horan published ‘Orthopedic aspects of the Ehler): s-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 Re /f_l ex Deltoid Biceps Wrist extension Brachioradialis Triceps Triceps Finger /f_l exors – Interossei – Psoas – Quadriceps – Quadriceps – Tibialis anterior Knee jerk – Gastrocnemius/perineals 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 /f_i nger 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) Left ______ Lie hands on the Right ______ /f_l oor while keeping knees straight and bending forward at waist Total ______ Figure 35.1 Beighton score (a screening technique for hypermobility).

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CLINICAL EXAMINATION OF THE FOOT AND ANKLE

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The foot can be divided into three parts: the hindfoot (calca neus, talus), the midfoot (navicular, cuboids, cuneiforms) and the forefoot (metatarsals and phalanges). CLINICAL EXAMINATION OF THE FOOT AND ANKLE

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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

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

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CLINICAL EXAMINATION OF THE HIP JOINT

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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 HIP JOINT

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The knee is a synovial hinged joint. There are three compart - ments: medial, lateral and patellofemoral. The quadriceps, quadriceps tendon, patella, patellar tendon and tibial tuberos - ity constitute the extensor mechanism of the knee. The anterior cruciate ligament (A CL) 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 /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF 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

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CLINICAL EXAMINATION OF THE SHOULDER

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

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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)

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ELBOW

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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).

Signi /f_i cance Tests the adequacy of the blood supply to the hand from the radial and ulnar arteries and the arcade between them Identi /f_i es compression of a peripheral nerve Compression of the medial nerve causes paraesthesia A positive test indicated by /f_l exion of the thumb interphalangeal joint suggests weakness of the adductor pollicis muscle supplied by the ulnar nerve. Recruitment of the median nerve-innervated /f_l exor pollicis brevis explains the thumb posture

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FURTHER READING

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Beighton PH, Horan F . Orthopedic aspects of the Ehlers-Danlos syndrome. J Bone Joint Surg 1969; 51-B : 444–53. Ellenbecker TS, Nirschl R, Renstrom P . Current concepts in examination and treatment of elbow tendon injury . Sports Health 2013; 5 (2): 186–94. Guosheng Y , Chongxi R, Guoqing C et al . The diagnostic value of a modified Neer test in identifying subacromial impingement syndrome. Eur J Orthop Surg Traumatol 2017; 27 (8): 1063–7. Martin HD, Palmer IJ. History and physical examination of the hip: the basics. Curr Rev Musculoskelet Med 2013; 6 (3): 219–25. Rossi R, Dettoni F , Bruzzone M et al . Clinical examination of the knee: know your tools for diagnosis of knee injuries. Sports Med Arthrosc Rehabil Ther T echnol 2011; 3 : 25. Warwick D, Blom A, Whitehouse M. Apley and Solomon’s concise system of orthopaedics and trauma , 5th edn. Abingdon: CRC Press, 2022. 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

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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 in dex 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 snu ff box. Feel for sensation using two-point discrimination of the medial nerve (radial aspect of the index finger), radial nerve (in the anatomical snu ff 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 Fr enc h 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. /uni25CF 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). /uni25CF Nerves : compressive neuropathies are most commonly seen a ff ecting the median nerve (see Tinel’s [Figure 35.11a] and Phalen’s [Figure 35.11b] tests in Table 35.9). /uni25CF Palmar fascia : feel for palmar thickening and skin pits; long finger-like structures (cords), most commonly a ff ecting the ring and little fingers, are suggestive of Dupuytren’s disease. /uni25CF Bones . Palpate from the radial to the ulnar side of the wrist joint. In the trauma setting, palpate the anatomical snu ff 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 /f_l exion of the PIPJ and hyperextension of the DIPJ Hyperextension of the MCPJ and Swan neck Rheumatoid PIPJ and /f_l exion 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 /f_i nger and ulnar half of the ring /f_i nger Median Thumb, index, middle and radial half of the ring /f_i nger 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 /f_i st several times. The tips of the /f_i ngers 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 /f_l exion with the elbows extended Froment’s sign Ask the patient to grip a sheet of paper between the index /f_i nger and thumb of both hands. Grip the paper yourself similarly. Ask the patient to resist as you attempt to pull the paper away

Feel

/uni25CF Soft tissues . An e ff usion may be detected by perform ing 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. /uni25CF 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 exam iner’s thumb while the other hand pronates and supinates the forearm. On the medial side, palpate the medial epi . Posteriorly , palpate the olecranon fossa. condyle /uni25CF 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). /uni25CF 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. -

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(a) (b) Figure 35.20 (a) Elbow /f_l exion; (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. /uni25CF 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. /uni25CF Lateral epicondylitis (synonym tennis elbow). The lateral epicondyle is the common origin of the forearm extensors. Palpate for tenderness – usually just distal (5–10 /uni00A0 mm) to the epicondyle near the origin of the exten sor carpi radialis brevis muscle. Wrist extension against resistance with the elbow extended should provoke the patient’s symptoms. Summary box 35.5 Elbow examination /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF

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 . /uni25CF 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 shoul - der dislocation). - /uni25CF Bones . Palpate the acromioclavicular and sternoclavicu - lar joints and the clavicle.

Figure 35.22 The area of skin supplied by the axillary nerve – the ‘regimental badge area’.

Feel

/uni25CF Soft tissues . Tenderness overlying the greater tro - chanter may suggest trochanteric bursitis or an abductor enthesopathy . /uni25CF 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 fem - oral artery can be palpated as it passes under the inguinal liga - ment at its midpoint halfway betw een the ASIS and the pubic tubercle. Feel

/uni25CF Soft tissue . Feel the tendons for quadriceps and patellar tendon rupture. /uni25CF 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 e ff usion is present. Place one hand on either side of the patella and, with the other hand, push down on the patella. With an e ff usion, 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.

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Proximal interphalangeal joint Distal interphalangeal joint Flexion Flexion Flexion Flexion Normal Flexion Normal –

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

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Finger flexors

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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). /uni25CF 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. /uni25CF 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 /f_l exibility.

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General principles

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

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HISTORY Introduction

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/uni25CF Ensure you have followed appropriate hand hygiene guid ance. /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. HISTORY Introduction

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Impingement syndrome

Impingement syndrome

This is impairment of rotator cu ff 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

Impingement syndrome

This is impairment of rotator cu ff 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

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Introduction

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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

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

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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 defor mity . 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 cover ed by an envelope of soft tissues and skin. Look at the skin for: /uni25CF surgical scars (arthroscopy scars may be di ffi cult to see); /uni25CF bruising (may indicate recent injury or a bleeding disor - der); /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 e ff usion); - /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 .

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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 defor mity). 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 fle xion 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 . /uni25CF 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. - /uni25CF 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. /uni25CF 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 Infants-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)

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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 defor mity). 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 fle xion 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 . /uni25CF 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. - /uni25CF 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. /uni25CF 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 Infants-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. Lumbar spine

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Metatarsophalangeal joint

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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-o ff requires 35–40° of dorsiflexion. Metatarsophalangeal joint

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Midtarsal joint

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

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There are three stages to assessing movement. The words used to describe a particular movement are shown in Table 35.3 /uni25CF Active . Ask the patient to move the joint within the limits of their pain. /uni25CF 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 distin guished. In limitation caused by pain or sti ff ness the ranges are the same but one is painful. In weakness passive range is greater than active. - - /uni25CF Stability . Stability has a static and a dynamic compo - nent: 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 pow er using the Medical Research Council (MRC) grading system as illus - trated 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 hav e 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 Size, surface and de /f_i nition of margins L ymph nodes Are the local ones enlarged? L iquid Is it /f_l uctuant? 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. Flexion Forward or anterior movement of the trunk or limb Lateral /f_l exion Bending of the forward-facing head and trunk to either side Extension Backward or posterior movement Abduction A movement away from the midline of the body Adduction A movement towards the midline of the body Internal rotation Rotation towards the midline of the body External rotation Rotation away from the midline Supination Movement of the forearm so that the palm faces anteriorly Pronation Movement of the forearm so that the palm faces posteriorly Circumduction A combination of /f_l exion, abduction, extension and adduction without rotation Inversion Movement of the foot that directs the sole of the foot medially Eversion Movement of the foot that directs the sole of the foot laterally Retraction 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 /f_i nger C8 Little /f_i nger T1 Medial forearm L1 Anterior thigh L2 Anterior thigh/groin L3 Anterior and lateral thigh L4 Medial leg and foot L5 Lateral leg and /f_i rst dorsal web space Extensor hallucis longus S1 Lateral and plantar foot S2–S4 Perianal

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Range of motion is limited in the thoracic spine: /uni25CF Forward bending test (Figure 35.6). Ask the patient to bend forwards to touch their toes: /uni25CF 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); /uni25CF 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. /uni25CF Lateral bending . This can be used to assess the flexibil - ity 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. /uni25CF 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. /uni25CF 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

Di ff erentiate 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). /uni25CF Forward flexion . Ask the patient to raise their hands in front to touch the ceiling while keeping the elbows extended (0–180°). /uni25CF Extension . Ask the patient to extend both arms behind (0–30°). /uni25CF Abduction . Shoulder abduction involves the glenohu meral 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°). /uni25CF Adduction . Ask the patient to touch their other shoulder tip. /uni25CF 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). /uni25CF External rotation . With the arms by the sides, bend the elbows to 90° and rotate the forearms to the mid-prone Christopher Jobe , contemporary , American orthopedic surgeon, specialising in shoulder and knee surgery , diagnostic musculoskeletal ultrasound and sports injuries. position. Ask the patient to separate their hands as much as possible (0–40°).

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ion; (b) extension; (c) adduc

tion; (d) internal rotation; (e) external rotation.

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The hip joint can be moved into flexion, extension, abduc - tion 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 /uni25CF 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. /uni25CF Abduction (40°) . The hip should be abducted by mov - ing the leg away from the midline with the other hand on the patient's pelvis to detect any tilt in the pelvis.

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

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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. Move

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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.

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SPINE

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The spinal column consists of 33 vertebrae with 23 interver tebral 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 cr ease (Figure 35.2). If it falls to either side of the cleft, la teral 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). SPINE

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Snapping hip

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Snapping hip is a condition in which the patient feels a snap ping 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 pr otrusion 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 /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF - - - -

Osteoarthritis Hip dysplasia Hip fracture Avascular necrosis Hip dislocation Fixed /f_l exion 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 dif /f_i culty in clearing control: high- the toes during the swing phase: the patient stepping compensates by externally rotating the leg and /f_l exing 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

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Special tests Achilles tendon

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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. Squeez e 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.

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Figure 35.38 Testing subtalar joint motion.

Special tests and diagnoses

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- Special tests and diagnoses
-

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/uni25CF 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 posi - tive Trendelenburg test. /uni25CF Leg length discrepancy (LLD) . The inequality may be in the hip joint, femur, tibia, ankle or foot or a combina - tion of these. The pathology may be from the bone being too short or too long. When assessing LLD, square the pel - vis. If that is not possible then place both legs in the same position. For example, if there is an adduction deformity present in the a ff ected leg, place the good leg in the same deg ree of adduction. LLD can be caused by a real di ff er - ence in the leg lengths (the bones are di ff erent 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 malle - olus. The second is called ‘apparent’ LLD, measured mid - line, e.g. xiphisternum to medial malleolus. Each di ff ers in cause and therefore treatment. T he LLD apparent to the patient can also be measured using wooden blocks placed under the patient’s ‘short’ leg until the patient feels level. /uni25CF Gait . Hip disease can present with an altered gait pat tern. The common types of abnormal gait are described in Table 35.11 (see also Summary box 35.8). /uni25CF Impingement . Two commonly performed tests relate to femoroacetabular impingement. The FADDIR test, per formed 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 flex ion, abduction and external rotation (F-AB-ER) and can repr oduce 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). /uni25CF 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). /uni25CF 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 John W Lachman , 1919–2007, Professor and Chairman of the Orthopedic Department at Temple University in Philadelphia, PA, USA. 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: /f_l ex the knee to 15–30° and pull the proximal tibia forwards.

Special tests

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Subtalar joint (Figures 35.38 and 35.39)

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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 5Â° 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 (Figures 35.38 and 35.39)

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Subtalar joint flexibility

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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). Subtalar joint flexibility

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Take a history

Take a history

/uni25CF 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 . /uni25CF 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? /uni25CF Associated symptoms . Ask about the following: pain; swelling; instability – ‘giving way’; mechanical symptoms (e.g. locking, clicking, clunking); loss of power; altered sensation. /uni25CF Functional impairment . Ask whether the patient is having di ffi culties 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. /uni25CF Past medical history (PMH) . Check for comorbid conditions which may contribute to the presenting problem or a ff ect the patient’s fitness for an anaesthetic, e.g. diabetes, asthma, previous heart attack or stroke. Check for any previous problems with anaesthesia. /uni25CF Past surgical history . Ask about relevant surgical procedures. /uni25CF Drug history . Ask about all medication and the following in particular: anticoagulants, steroids, aspirin, immunosuppressant therapy , oral contraceptive pill and hormone replacement therapy . - /uni25CF 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. /uni25CF Family history . This may reveal a history of MSK disease. Summary box 35.1 Taking a history /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF

Use and interpret special tests • Use /f_i ndings 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

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Tarsometatarsal joint stability

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Tarsometatarsal joint

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

(b) Figure 35.37 (a) Ankle dorsi /f_l exion and (b) ankle plantar /f_l exion.

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Thoracic spine

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Thumb and thenar eminence

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/uni25CF Abductor pollicis brevis, opponens pollicis and flexor pollicis brevis can be tested together by oppos - ing 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 /f_l exion. (a) (b) Figure 35.14 Testing the (a) /f_l exor digitorum super /f_i cialis; (b) /f_l exor digitorum profundus.

/uni25CF 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). /uni25CF Extensor pollicis longus . The integrity of the tendon is tested by asking the patient to lift the thumb o ff a table with the palm flat on the table (Figure 35.16). /uni25CF Adductor pollicis . Test using Froment’s sign (see Table 35.9 and Figure 35.17). /uni25CF 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 Y ork, 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 /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF

Figure 35.15 Test for /f_l exor 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

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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

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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 longitu

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 T o test integrity , ask the patient to perform a single-foot tiptoe test on both sides. The inability to lift the a ff ected heel o ff the ground is suggestive of a tibialis posterior tendon injury or insu ffi ciency . /uni25CF T o 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 a ff ects 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 pro lapse, peripheral nerve injury (e.g. sciatic, common and deep peroneal) or a peripheral neuropath y . 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 e version 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 involv ed toes. The condition is di ffi cult 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 /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

Tibialis anterior

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