education

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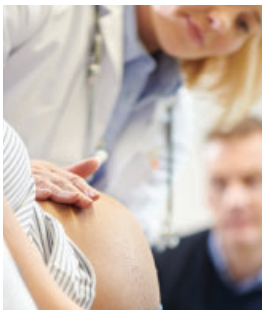
Safer delivery



A multicentre, randomised trial across England and Wales compared planned delivery versus expectant management (usual care) in women with late preterm pre-eclampsia (34 to 37 weeks' gestation). It found strong evidence that planned delivery is preferable, with less maternal morbidity and severe hypertension. There was no increase in neonatal morbidity despite more neonatal unit admissions than with usual care. The authors urge shared decision making with the pregnant women in such cases to decide on the timing of delivery.

Lancet doi:10.1016/S0140-6736(19)31963-4

Meat eating and mortality

People who get their protein from plants rather than animals live longer—especially compared with red or processed meat eaters, a large prospective cohort study confirms. Researchers followed 70 696 Japanese adults for a mean of 18 years and found that swapping some animal protein for plant or fish protein was associated with lower all cause, cancer related, and cardiovascular disease related mortality. The authors admit that "plant protein intake may represent a healthy eating behaviour; although adjustment for several lifestyle factors showed little difference in the overall results, the possibility of residual confounding in the association between plant protein and mortality remains."

JAMA Intern Med doi:10.1001/jamainternmed.2019.2806

PCI after STEMI

In ST-segment elevation myocardial infarction (STEMI), opening up the offending or "culprit" coronary artery with percutaneous coronary intervention (PCI) saves lives and prevents further myocardial infarctions. But is it a good idea to open up other occluded coronary arteries seen on angiography before they too cause problems? This study found that achieving complete revascularisation was beneficial; a composite measure of cardiovascular deaths or new myocardial infarctions was 7.8% in the complete revascularisation group and 10.5% in the culprit-lesion-only PCI group. There was no increase in major bleeding or stroke rates between the groups. Timing of the PCI for non-culprit lesions wasn't critical in this study; complete revascularisation showed consistent benefit regardless of whether it was performed during the initial hospital stay or up to several weeks later. It would be handy to know whether cleaning up all the significantly blocked coronary arteries at the same time as the PCI for STEMI is more effective and as safe as doing it later, but this study couldn't evaluate that.

N Engl J Med doi:10.1056/NEJMoa1907775

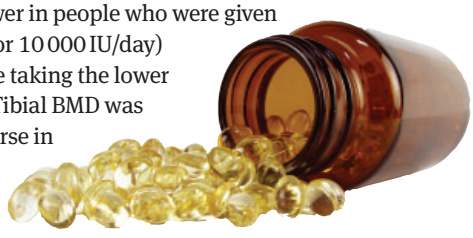
Ditch the urine dipping?

A retrospective cohort study of 2733 adults in hospital with asymptomatic bacteriuria (ASB) has found that 82.7% were given inappropriate antibiotic treatment, especially if they were elderly or confused. Patients with ASB who received antibiotics had a 37% longer hospital stay (4 *v* 3 days) compared with those who weren't treated. "Despite common misperceptions, positive urinalysis or urine culture results do not define a urinary tract infection (UTI) or necessitate antibiotic therapy," say the authors, echoing US guidelines. This sort of study can't prove causation; patients with ASB may have volunteered UTI symptoms that weren't recorded and despite the authors' best efforts, confounding factors may abound. But treating ASB is contrary to guidelines, associated with potential harm, and widespread in a hospital setting. Urinalysis in asymptomatic, stable patients may be unnecessary.

JAMA Intern Med doi:10.1001/jamainternmed.2019.2871

Too much vitamin D

Has enthusiasm for vitamin D gone too far? A reported 3% of US adults take over 4000 IU of vitamin D a day, presumably on the basis that if deficiency is bad for you, then an excess must be good. But does higher dose vitamin D supplementation improve bone mineral density (BMD) and strength? This small randomised trial of 311 healthy adults found that it doesn't; bone density (radial) was significantly lower in people who were given higher doses (4000 or 10 000 IU/day) compared with those taking the lower dose of 400 IU/day. Tibial BMD was also significantly worse in the group that took 10 000 IU/day compared with those taking 400 or 4000 IU/day. There was no significant difference in bone strength at the tibia or radius between the three groups. This study raises the question: does high dose vitamin D actually have a negative effect on bone? Further study of this and other potential harms is needed.



JAMA doi:10.1001/jama.2019.11889

Ann Robinson is an NHS GP and health writer and broadcaster

Optimising fitness for major vascular surgery

Ruth Benson,[1] Gordon McGregor,[2] Mishkat Shehata,[3] Christopher Imray[4]

1 Institute of Cancer and Genomic Sciences, University of Birmingham
2 Centre for Sport, Exercise & Life Sciences, Coventry University
3 Unit of Academic Primary Care, University of Warwick, Coventry
4 Warwick Medical School, Coventry University and Exeter University
Correspondence to R A Benson ruth.benson@gmail.com

CPD READING
0.5 HOURS

Major vascular surgeries, such as aortic aneurysm repair, carotid endarterectomy, and lower limb revascularisation, are increasingly common and carry a high risk. More than 200 million people are affected by peripheral arterial disease worldwide,[1] of whom 10-20% require surgery. In the UK, 1.2-1.5% of men over 65 have an abdominal aortic aneurysm, and more than 4000 repairs were performed in 2017.[2 3] Between 7% and 18% of ischaemic strokes are attributed to carotid artery stenosis. About 4000 patients undergo carotid endarterectomy in the UK each year.[4 5] In this article, we review key preoperative interventions that can be started in primary care at the time of referral to a vascular surgeon. The decision whether a patient is fit for surgery will likely be made by the specialist vascular team following evaluation and imaging. However, early interventions initiated in primary care can potentially improve patient outcomes, even when there is uncertainty around a patient's suitability for surgery.

Why is it important?

Patients undergoing major vascular surgery frequently have comorbidities, such as older age, hypertension, existing cardiac disease, and a history of smoking. Optimising their fitness for surgery is challenging but can help the patient undergo surgery and improve outcomes. Cardiovascular risk factors are the most common comorbidities linked to long term mortality. Ischaemic heart disease is an important cause of death in patients who have had surgery for abdominal aortic aneurysm, and was responsible for more than 25% of deaths, compared with ≤6% for early surgical or aneurysm specific complications, in two large trials in the UK.[6] The European Society for Vascular Surgery recently reported that up to 70% of patients with peripheral arterial disease or abdominal aortic aneurysm had multi site vascular disease.[7]

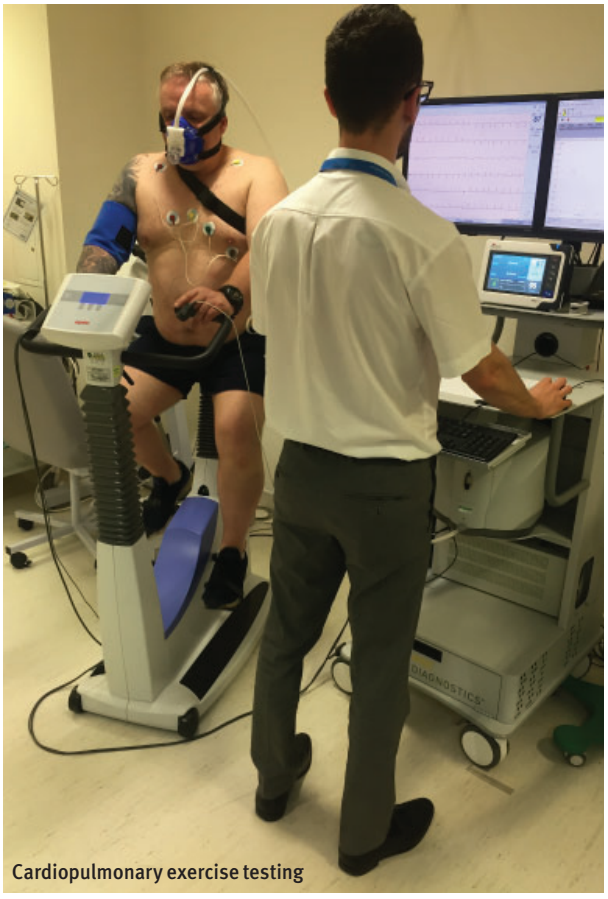
Poor fitness is associated with a greater risk of perioperative mortality or major complications after surgery for abdominal aortic aneurysm for both endovascular and open repair in several prospective observational studies.[9-13] No data are available for lower limb or carotid surgery.

WHAT YOU NEED TO KNOW

- Interventions such as increasing physical activity, optimising management of comorbidities, and smoking cessation can all improve outcomes after surgery
- There is no guidance on when to introduce exercise interventions before surgery. Earlier is better (eg, at the time of referral)
- Vascular conditions, including aortic aneurysm, are not a contraindication to low intensity aerobic exercise

How is the patient's physical fitness for vascular surgery determined?

Physical fitness for surgery can be difficult to quantify. Cardiopulmonary exercise testing (figure) is a validated technique used to measure exercise capacity while monitoring cardiac and respiratory function in response to a physical challenge. Outputs from cardiopulmonary exercise testing include peak oxygen uptake (VO_2 peak) and anaerobic threshold (VO_2 AT). These have been shown to correlate with length of hospital stay, pneumonia, myocardial infarction, and mortality after repair of abdominal aortic aneurysm in several small studies.[14-17] Patients with a lower anaerobic threshold may be declined surgery if the risk is deemed to outweigh the benefit. Coexisting frailty, symptomatic ischaemic heart disease, and reduced activity levels due to fear of exercising with an aneurysm or limb pain due to ischaemia tend to negatively affect the result of cardiopulmonary exercise testing.



Cardiopulmonary exercise testing

What preoperative interventions can help improve outcomes of vascular surgery?

Improving physical fitness

Reassure patients that vascular conditions, especially abdominal aortic aneurysm, are not a contraindication to low impact physical activity. In a small trial (124 patients), a supervised exercise programme for six weeks before surgery was associated with fewer postoperative complications and length of hospital stay following elective abdominal aortic aneurysm repair, although short term mortality was unaffected.[18] Preoperative high intensity interval training involving short bursts of vigorous exercise interspersed with periods of low intensity recovery was found to be acceptable in patients with a large abdominal aortic aneurysm in a small trial (27 patients).[19] A systematic review of exercise before abdominal aortic aneurysm repair found good patient compliance (70-94%) in five studies (120 patients), using programmes lasting between two and 12 weeks, and marked improvements in anaerobic threshold.[20]

Refer patients to specific information resources (box) on how to maintain fitness with their condition. For patients with critical limb ischaemia and limited ability to mobilise and exercise, guidelines from the National Institute for Health and Care Excellence (NICE) for management of rest pain recommend referral to a specialist pain service.[21] This may be suitable in patients who have been turned down for revascularisation for any reason, who need high doses of opioid analgesia, or in whom pain persists even after surgery (including amputation).

Optimising medical management

Antiplatelet therapy

Guidelines from NICE and European vascular taskforces[22 23] recommend starting clopidogrel for suspected or known carotid and peripheral disease at the time of referral to vascular surgery. Aspirin is preferred in patients diagnosed with abdominal aortic aneurysm although updated guidelines are awaited.

Antiplatelet therapy with aspirin or another agent is protective in patients at risk of occlusive vascular events, such as myocardial infarction, stroke, angina, cerebral ischaemia, or peripheral arterial disease. A meta-analysis (287 randomised controlled trials, 135 000 patients) identified a 34% proportional reduction in myocardial infarction and a 26% reduction in cardiovascular related event or death for patients with ischaemic heart disease, peripheral arterial disease, or diabetes taking an antiplatelet versus controls.[24] Preoperative use of antiplatelets and statins was associated with improved 30 day mortality (odds ratio 0.76; 95% confidence interval 0.5 to 1.05; P=0.09) after major vascular surgery in a large retrospective study (14 489 patients). Continuing these medications at discharge improved five year survival (hazard ratio 0.5; 95% confidence interval 0.4 to 0.7; P<0.01).[25]

Managing lipid levels

Prescribing a short course of a statin about a month before surgery has been associated with reduced cardiovascular events and deaths compared with placebo in patients undergoing aortic, carotid, and lower limb revascularisation surgery in two small randomised controlled trials.[27 28] NICE guidelines recommend atorvastatin for patients with any cardiovascular disease (ie, peripheral arterial disease, stroke, and abdominal aortic aneurysm).[29] They also recommend baseline tests for total low density lipoprotein and high density lipoprotein cholesterol in all patients diagnosed with these conditions. If available, the results should be included in the referral letter to the vascular surgeon to prevent them being repeated. Test again three months after commencing treatment. An increase in dose may be required in patients already on a statin in whom recommended targets have not been met. For example, guidelines from the European Vascular Society recommend achieving a serum low density lipoprotein cholesterol of <1.8 mml/L or a decrease of ≥50% of between 1.8 and 3.5 mmol/L for any patient with peripheral arterial disease.[22]

Blood pressure control

Hypertension is often diagnosed at the same time as an acute vascular event, such as stroke, abdominal aortic aneurysm, or acute limb ischaemia. A subgroup analysis (567 men aged 50-79) of the American Aneurysm Detection and Management (ADAM) study found that abdominal aortic aneurysm growth increased by up to 0.02 cm per year for every 10 mm Hg increase in diastolic pressure (95% confidence interval 0.01 to 0.04; P=0.01).[30]

Refer to NICE guidelines (CG127) on hypertension for blood pressure control targets based on the stage of hypertension, age, ethnicity, and comorbidities, such as diabetes, renal failure, and signs of end organ damage. Initiate treatment at the time of referral if indicated. The 2013 Cochrane review on blood pressure management in peripheral arterial disease (eight randomised controlled trials, 3610 patients) failed to show superiority of one antihypertensive agent over another in this population due to study heterogeneity. Furthermore, it did not find clear evidence that □-blockade should be avoided in the presence of peripheral arterial disease.[31] Discuss with the patient lifestyle interventions, such as smoking cessation, reducing alcohol intake, weight loss, low salt intake (6 g/1 teaspoon a day), and regular exercise, which will help with blood pressure control and improve fitness for surgery.[7 32]

COPD

Severe lung disease, such as chronic obstructive pulmonary disease (COPD), is associated with greater inhospital mortality, respiratory complications, and slower recovery after abdominal aortic aneurysm repair, as seen in two large cohort studies in the USA and Taiwan.[33 34]

NICE guidelines[35] present clear stepwise guidance on the diagnosis and management of COPD in primary care, including when to refer a patient for specialist advice. The vascular team can also refer the patient if there has been insufficient time to manage the patient in primary care. If COPD has been diagnosed in primary care, it is appropriate to initiate smoking cessation and inhaled and oral medication while waiting for a vascular review.

Anaemia

Detecting anaemia at the time of referral can indicate concomitant disease, and can enable early treatment to reduce the need for perioperative transfusion.

Anaemia in vascular patients is often complicated by associated comorbidity and use of antiplatelets. Evidence suggests that preoperative anaemia and need for perioperative transfusion are risk factors for poorer postoperative outcomes. In a large US registry study (2946 patients), about a quarter of patients undergoing vascular surgery required transfusion. Transfusion was associated

with an increased risk of death (odds ratio 6.94, 95% confidence interval 3.22 to 14.92; P=<0.001), myocardial infarction (odds ratio 7.96, 95% confidence interval 3.74 to 16.92), and postoperative pneumonia (odds ratio 7.43, 95% confidence interval 3.25 to 16.96; P=<0.001).[36] The US national quality improvement database (941 496 adults undergoing non-cardiac general, vascular, and orthopaedic operations) found that patients receiving intraoperative transfusion had higher unadjusted morbidity and mortality, which increased in a dose dependent manner.[37] A meta-analysis (24 observational studies, 949 445 patients) showed that in non-cardiac surgery patients (vascular, orthopaedic, spinal, and upper gastrointestinal operations), preoperative anaemia was associated with increased need for perioperative transfusion, acute kidney injury (odds ratio 3.75, 2.95 to 4.76; P<0.001), infection (odds ratio 1.93, 1.17 to 3.18; P=0.01), and mortality (odds ratio 2.87, 2.10 to 3.93; P<0.001).[38]

Obtain a full blood count at the time of referral to the vascular team, and communicate the results when known. Commence treatment alongside referral to the vascular team using the local pathway for managing anaemia.[39]

EDUCATION INTO PRACTICE

- How would you discuss physical activity with patients being referred for a vascular condition based on reading this article?
- How do you discuss the importance of smoking cessation with your patients? Will that change after reading this article?
- For patients with a documented diagnosis of vascular disease at your practice, how many have had a blood pressure reading in the last 12 months? How many have had a lipid measurement in the last 12 months?

What other lifestyle modifications to consider?

Smoking cessation

Offer urgent referral to a smoking cessation service, even if surgery is imminent. Recommended interventions include behavioural support by a trained counsellor, nicotine replacement therapy, and medications such as varenicline and bupropion.[40 41] Smoking cessation support is offered in hospital; however, the earlier patients stop before surgery, the greater the benefits.

Current smoking was associated with a 0.05 cm annual increase in aneurysm expansion rate in those under surveillance in the ADAM study (95% confidence interval 0.25 to 0.28; P<0.001).[30] Broadly speaking, cardiovascular risk reduces by up to a third within two to four years after stopping smoking, reducing to that of a non-smoker within 15 years.[42] A pooled meta-analysis (six randomised trials, 448 patients) noted that smoking cessation using various interventions as little as two weeks before a range of major surgical procedures led to a 41% relative risk reduction in postoperative complications, including abdominal wound infection and breakdown (relative risk 0.76, 95% confidence interval 0.69 to 0.84; P<0.0001) compared with those who continued to smoke.[43]

Frailty

Frailty describes reduction in physiological reserve and negatively affects tolerance and recovery from surgery. Frail people are at greater risk of postoperative complications and mortality, as seen in a large retrospective study in 23 207 patients undergoing repair of abdominal aortic aneurysm.[45] Defining frailty is challenging, but it is now included in the list of preoperative risk factors in the UK national vascular quality improvement audit, owing to evidence for its impact on postoperative recovery.

Validated tools for preoperative frailty assessment can help identify patients at high risk of complications with vascular surgery.[46 47] In primary care, multimorbidity and frailty can be screened for opportunistically in at risk adults at the time of referral using a validated tool, such as the electronic frailty index. A falls assessment in patients with peripheral arterial disease, cognitive assessment in those with carotid disease, and a medication review are advisable. The medication review is particularly pertinent, as many patients referred to a vascular surgeon will be started on an antiplatelet (and proton pump inhibitor) and statin, and are at risk of polypharmacy.

Competing interests None declared.

Patient consent obtained for the figure.

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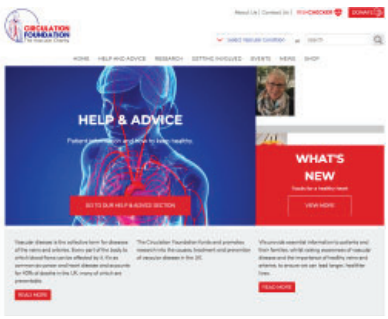
Find the full version with references at http://dx.doi.org/10.1136/bmj.l5002

INFORMATION RESOURCES FOR PATIENTS



- The Vascular Society for Great Britain and Ireland provides free patient information on all major vascular conditions, including advice on lifestyle changes and moderate exercise: https://www.vascularsociety.org.uk/
- The Pre-Op Optimisation Project is a free resource developed by a general practitioner. It covers a wide range of advice on how to reduce preoperative risk before surgery, with links to guidelines and information for doctors and patients alike: http://www.preop.org.uk/
- The Royal College of Surgeons of England has dedicated a section of its website to patients who are going to have surgery, with answers to common questions and clear advice when preparing for an operation: https://www.rcseng.ac.uk/patient-care/having-surgery/things-to-consider-before-having-surgery/

HOW PATIENTS WERE INVOLVED IN THE CREATION OF THIS ARTICLE

We consulted six patients who had undergone surgery for repair of abdominal aortic aneurysm, coronary artery bypass grafting, and major limb amputation for peripheral arterial disease at the Centre for Exercise and Health, Coventry, during the writing of this article. Patients with abdominal aortic aneurysm repair and coronary artery bypass grafting described feeling underprepared and weak, and had restricted their activity before surgery because of fears around causing abdominal aortic aneurysm rupture or a heart attack. Patients with peripheral arterial disease felt they had little time to prepare before their amputation, or were in too much pain to consider any physical exercise.

This article has been written with these concerns in mind, and describes key evidence for interventions by the general practitioner and patient at the moment of referral.

Testing the reflexes

A J Lees,[1] Brian Hurwitz[2]

[1]The National Hospital, Queen Square, London
[2]King's College London
Correspondence to: A J Lees andrew.lees@ucl.ac.uk

CPD READING
0.5 HOURS

Eliciting the deep tendon reflexes is a vital component of medical assessments in general practice (where 9% of medical problems are believed to be neurological in origin[1]) and in hospital (where 10-20% of admissions have a primary neurological problem[2]).

Reflex testing contributes to accurate bedside diagnosis in many cases of neuromuscular disease, providing localising diagnostic information that cannot be obtained by any other method (including clinical neurophysiological and neuroradiological investigations). It can be helpful in deciding if neurological, neurosurgical, or orthopaedic referral is required.

This article briefly describes the clinical and pathological rationales for reflex testing and gives practical tips on when and how to elicit the deep tendon reflexes.

What are deep tendon reflexes?

When a tendon is tapped briskly its muscle contracts as a consequence of a synchronous volley of afferent impulses from the primary sensory endings of the muscle spindles in the stretched muscle. This involves a two neurone reflex in the spinal or brain stem segment that innervates the muscle (fig 1). At the same time, neurones modulated by descending corticospinal fibres are stimulated which activate opposing muscle groups around the joint dampening the resulting jerk.

WHAT YOU NEED TO KNOW

- Tendon reflex testing allows lower and upper motor neurone lesions to be distinguished reliably
- Interpret reflexes alongside a clinical history and any abnormalities of power, tone, and sensation found on examination
- Reflex testing is essential if you suspect spinal cord and cauda equina compression, acute cervical or lumbar disc compression, or acute inflammatory demyelinating polyradiculoneuropathy

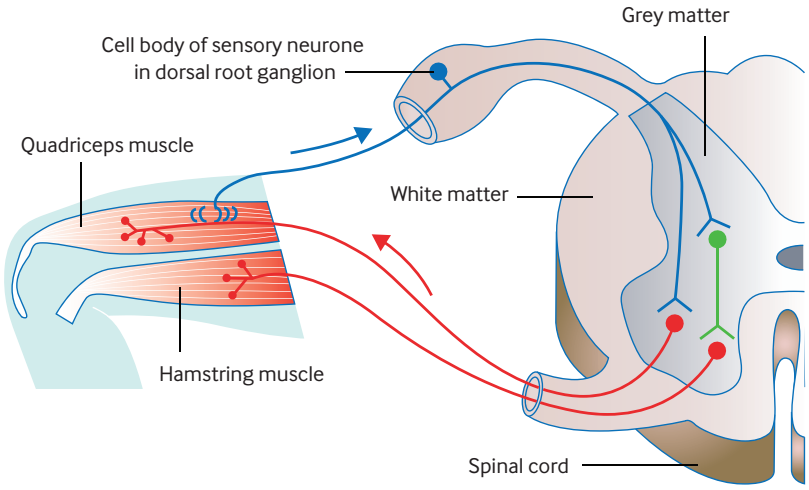


Fig 1 | The reflex arc

PRESENTATIONS IN GENERAL PRACTICE WHERE TENDON REFLEX TESTING IS ESSENTIAL AND DISCRIMINATORY

- Persistent pain radiating down the leg on straight leg elevation suggestive of a prolapsed lumbar disc—If a knee jerk is absent, a diagnosis of a L3/L4 nerve root entrapment can be made; if the ankle jerk on the side with pain is absent, a S1 root lesion is probable.
- Numbness of the feet and ankles in a stocking distribution and loss of knee and ankle jerks (even in the absence of impaired sensation to pinprick) indicate that a peripheral neuropathy needs excluding with nerve conduction studies.[3]
- Pain in one shoulder with weakness of the arm and absent triceps jerk suggest cervical disc prolapse or, in an older person, a cervical spondylotic root lesion. Further examination may reveal weakness of C7/C8 innervated muscles. If other reflexes in the arms are brisk, this suggests associated cervical cord compression.
- Pain or "heaviness" in the lower back, legs, hips, or buttocks and/or weakness after walking (spinal claudication) with absent ankle jerks, saddle anaesthesia, and new symptoms of urinary or bowel disturbance suggest a cauda equina lesion, which needs emergency neurological or neurosurgical referral.
- Subacute onset of increasing leg weakness with absent limb reflexes and no sensory loss may be due to acute inflammatory demyelinating polyradiculone uropathy (Guillain-Barré syndrome), which needs emergency neurological referral.
- Weakness of the legs with sphincter disturbance and sensory loss with a sensory level on the abdomen, brisk reflexes, Babinski signs, and absent cutaneous abdominal reflexes suggest spinal cord compression, which requires urgent neurosurgical referral.

WHICH REFLEXES TO TEST?

The deep tendon reflexes (also sometimes referred to as stretch reflexes) most often tested are:

Arms	Biceps (C5/6 myotome)	Find the biceps tendon with your index and middle finger. Push down on the tendon and pull it slightly towards the patient's wrist then strike the tendon sharply with the patellar hammer and look for the contraction (fig 2).
	Brachioradialis (supinator) (C6 myotome)	Strike with the hammer just proximal to the styloid process of the radius and look for flexion and supination of the forearm.
	Triceps (C7/8 myotome)	With the patient supine, hold the arm down and across the trunk towards the opposite hip. Let the forearm rest lightly on the abdomen and then, with the patient's elbow flexed about 40°, strike the tendon at its insertion just proximal to the elbow.
Legs	Knee (L3/L4 myotome)	Flex the leg at the knee and hip. Hold the leg under the knee and then strike the patellar tendon and watch for quadriceps contraction.
	Ankle jerks (S1/S2 myotome)	The ankle jerk is the most difficult reflex to elicit, and palpation of the Achilles tendon before striking to ensure the hammer is striking the correct location can be helpful when difficulties in interpretation are encountered (fig 3). A plantar strike (a firm strike of the patellar hammer on the ball of the foot) is an alternative technique to elicit the reflex (fig 3b). One study found that a plantar strike showed less inter-observer and intra-observer variability than an Achilles tendon strike.[4] In a separate study, medical students found the plantar strike easier and more reliable.[5] Practitioners are advised to use the technique with which they are most comfortable. An absent ankle jerk can sometimes be heard as a dull thud. If the result is uncertain, a further effective way to test this reflex is to ask the patient to kneel on a chair with the Achilles tendon exposed (fig 3c) (this method was often used by endocrinologists to elicit the slow relaxation of ankle jerks in myxoedema). The plantar reflex is often discussed alongside deep tendon reflexes, but it is a cutaneous reflex elicited by scratching the sole of the foot. If the great toe consistently goes up (dorsiflexes, Babinski's sign) then a lesion of the upper motor neurone is present (flexion withdrawal due to ticklishness or hypersensitivity can be confounding factors). There is some evidence that neurologists' interpretation of the plantar reflex is influenced by their presuppositions based on the clinical history.[6] Neurologists sometimes carry out more detailed reflex testing, but this is beyond the scope of most non-specialist clinicians.

When to do it?

Patients presenting with motor or sensory symptoms in the limbs should have their reflexes tested to help distinguish between a lower motor neurone lesion (due to damage in the final common pathway that connects the anterior horn cells of the spinal cord with muscles via the nerve roots, plexuses, peripheral nerves, and neuromuscular junction) and an upper motor neurone lesion (due to damage upstream from the anterior horn cell, including the corticospinal tracts, the brain stem, and motor cortex). This distinction is the first stage in locating the site of neurological damage.

There are situations where all the neurological symptoms occur above the neck (such as bulbar symptoms due to motor neurone disease) where reflex testing is also essential.

The box on the previous page lists some clinical scenarios where testing the deep tendon reflexes is discriminatory when coming to a diagnosis.

How to do it?

Explain the process to the patient

Inform the patient that:

- Reflexes in the arms, legs, and jaw will be tapped
- This will be painless
- They should not be alarmed if their limbs jerk nor concerned if they don't.

A small minority of people become anxious at the prospect of reflex testing, similar to a fear of being tickled. Ideally the patient should be undressed so that the entirety of their arms and legs are visible and should either be sitting on the edge of the examination couch with the legs dangling or lying flat. If you are pressed for time, the examination can be conducted with the patient partly clothed. The one exception to this is the ankle jerk, where clear visualisation is needed to ensure the hammer lands centrally on the Achilles tendon.

Ensure good technique

The commonest cause of an absent reflex is a clumsy blow with a hammer off-centre to the tendon of a muscle held tightly by a fearful patient.

Special situations

Reflexes may be challenging to elicit in heavily built, muscular men because it can be difficult to generate enough force to stretch the tendon and initiate the reflex arc. If the reflexes are difficult to elicit then try reinforcement (Jendrassik's manoeuvre): just before you tap the tendon is tapped, ask the patient to (*a*) clench their jaw for arm reflexes or (*b*) wring their hands together for knee and ankle jerks.

Reflexes can be tested in children from the age of toddlers upwards. Usually there are no problems, but explain to the parents what you are doing and make a game of the procedure to avoid the child being frightened.

What does it tell us?

In general practice testing the reflexes can be helpful in deciding if neurological, neurosurgical, or orthopaedic referral is needed—despite this, there is evidence that most patients in the United Kingdom are not fully examined before referral.[7] For specific circumstances where tendon reflex testing is essential, see the box on the previous page.

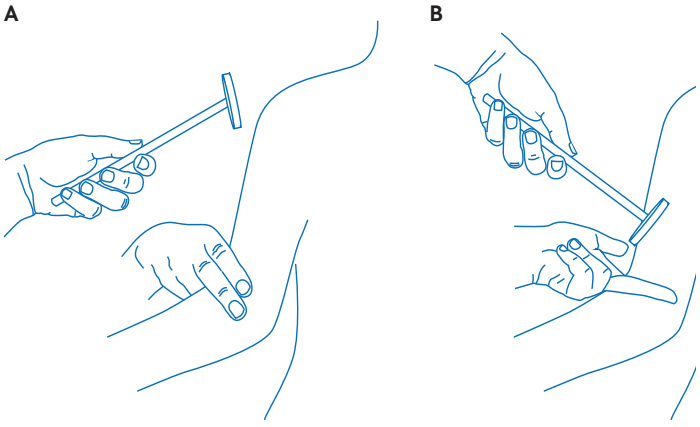


Fig 2 | Testing the biceps tendon reflex: locate the biceps tendon with index and middle fingers, push down on the tendon and pull it slightly towards the wrist, then strike with the patellar hammer and assess the contraction

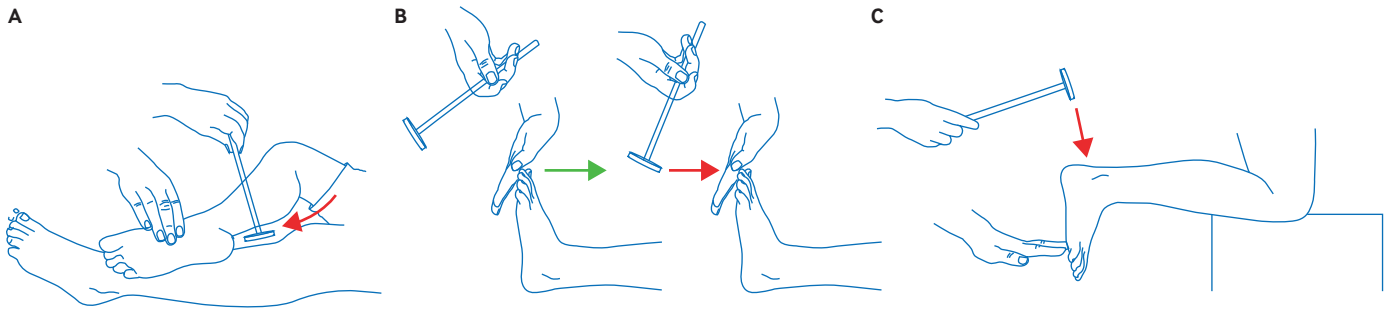


Fig 3 | Testing the ankle jerk reflex by (a) tapping the Achilles tendon, (b) plantar strike, or (c) with the patient kneeling on a chair to expose the tendon

How to interpret reflex testing

An absent jerk points to a lower motor neurone lesion, whereas a very brisk reflex suggests an upper motor neurone lesion.

Single absent reflex—A single absent reflex is always pathological if supported by other findings, but if there are no other supportive symptoms or signs suggestive of a peripheral nerve or root lesion the "ignore one sign" rule is often applied by neurologists. At the very least, however, this finding warrants a follow-up reassessment in general practice.

No reflexes bilaterally—A small percentage of normal people have no tendon reflexes which is of no pathological consequence provided there is no associated weakness or muscle wasting.

Asymmetrical reflexes—Comparing reflexes on one side of the body with those on the other is important when trying to decide whether a hemiparesis due to an upper motor lesion is present. However, care is needed to avoid over-interpretation of mild reflex asymmetry (this can be normal if a patient, for example, is less relaxed on one side because of associated limb pain).

Determining site of neuromuscular damage

When a lower motor neuron lesion is suspected after reflex testing the next step is to try to determine the more precise site of neuromuscular damage:

- An absence of all reflexes in the presence of muscle weakness points to a demyelinating peripheral motor neuropathy or polyradiculopathy
- Patchy reflex loss suggests a multifocal or axonal sensorimotor neuropathy
- Loss of one reflex with focal weakness is usually due to a root lesion.
- Absent limb reflexes in the presence of sensory loss in the distribution of the nerve supplying the reflex suggests involvement of the afferent arc of the reflex, from either the nerve or dorsal root ganglion lesion, commonly from a sensory ganglionopathy or a compression neuropathy.
- If absent limb reflexes are accompanied by motor weakness without sensory change then damage to the anterior horn cell, motor root, plexus, or peripheral nerve are all possible causes for the lower motor neurone lesion. There are multiple causes for this constellation of signs, but common ones include motor radicuopathies due to disc disease and motor neuropathies.
- Brisk reflexes in a wasted, weak limb with fasciculations strongly suggest a diagnosis of motor neurone disease.
- An inverted reflex where there is an absent biceps jerk but with spread to produce a brisk triceps or brachioradialis jerk suggests a lesion of the C5 nerve root with an upper motor lesion due to cord damage, as can occur in cervical spondylotic myelopathy.
- A tendon reflex which had been absent on earlier examination but is now present (also termed a returning reflex) is a good indicator of a more proximal nerve lesion that has since resolved.

How to describe and document deep tendon reflexes?

Tendon reflexes can be described (and recorded) as very brisk (+++), brisk (++), present (+), or absent (–). They may also be "present with reinforcement."

There is variation in the notation of tendon reflex responses, and as many as 20 different descriptions and scales are in use. In one study carried out in a university department of neurology evaluating the Mayo Clinic and NINDS scales, the agreement among three physicians was never better than "fair" or modest, and it was recommended that a verbal description (such as "very brisk") of the responses was more appropriate.[8]

Terms such as "sluggish" or "a bit brisk" provide little discriminatory diagnostic information and may indicate poor technique. The term "mute" to describe an absent reflex is best avoided as the reflex is seen not heard.

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Provenance and peer review: Commissioned; externally peer reviewed.

Competing interests: None declared.

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Find the full version with references at bmj.l2239 doi: 10.1136/bmj.l4830

EDUCATION INTO PRACTICE

- Do you have easy access to a patellar hammer?
- When testing a patient's tendon reflexes, do you explain why you are tapping the reflexes and what you are looking for?

HOW WERE PATIENTS INVOLVED IN THE CREATION OF THIS ARTICLE?

No patients were involved in the creation of this article.

A traditional hip implant is as effective as newer types for people over 65

The study

Choice of prosthetic implant combinations in total hip replacement: cost-effectiveness analysis using UK and Swedish hip joint registries data

Fawsitt C, Thom H, Hunt L

Value Health 2019;22:303-12 This study was funded by the NIHR Research for Patient Benefit Programme (project number PB-PG-0613-31032)..

Why was this study needed?

Total hip replacement (THR) is one of the most frequently performed surgeries. In 2017 there were 94 184 procedures performed in England and Wales.

"Metal-on-polyethylene" is the most commonly used type of implant, and has been successfully used since the 1950s. However, the polyethylene component wears with increased physical activity, and load results in loosening and bone loss over time. This can mean that patients have to undergo further revision surgery.

Newer, more expensive options have been developed to improve long term patient outcomes, which may be especially relevant for younger patients. Different surface combinations include "ceramic on polyethylene," "ceramic on ceramic," and "metal on metal."

This study, which builds on previous ones, improves our knowledge about the long term cost effectiveness of different types of implant for different patient groups.

What did this study do?

This economic modelling study compared 24 different implant combinations currently used in clinical practice against the most commonly used, cheapest implant in the UK (small head, cemented, metal-on-polyethylene).

The researchers analysed more than 1 million individual patient records from national joint registries in the UK and Sweden, countries with similar publicly funded health services. They looked at sub-groups of men and women of different ages to estimate the likelihood that their THR would fail and they would need revision surgery. They used these data in a Markov model to compare the cost effectiveness of each type of replacement for different age groups using approved UK methods and thresholds for "value."

The study used observational data, which means that surgeons may be more likely to choose certain combinations for certain patients.

What did it find?

- Small head, cemented, metal-on-polyethylene implants were the most cost effective for men and women over 65 (80% probability of being an accurate estimate for those over 75). This is the cheapest implant type, at around £750, and displays some of the lowest risks of revision surgery for older men and women. It is currently used in around 30% of THRs.
- Small head, cemented, ceramic-on-polyethylene implants were most cost effective in men and women younger than 65, but these results were more uncertain, mainly because it was harder to estimate the risk of revision surgery for these groups.
- The review found no evidence that uncemented, hybrid, or reverse hybrid implants were the most cost effective option for any patient group, due to higher costs or higher revision rates.
- Across all sub-groups, large head implant combinations were not cost effective.

What does current guidance say on this issue?

Guidance from the National Institute for Health and Care Excellence says that THRs should be recommended for treatment of end stage osteoarthritis of the hip only if the prostheses have rates of failure (or projected rates of failure) of 10% or less at 10 years or, as a minimum, a three year revision rate consistent with this.

A patient's age, activity levels, medical history, and the surgeon's preferences and experience of using a particular type of implant should be taken into consideration.

Competing interests: *The BMJ* has judged that there are no disqualifying financial ties to commercial companies.
Further details of other interests, disclaimers, and permissions can be found on bmj.com

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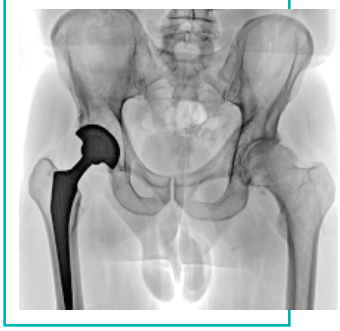
CPD READING

0.5 HOURS

What are the implications?

This is a useful study looking at the cost effectiveness of different implants in use with short and longer term risk of revision with large patient numbers. Although the evidence to date doesn't support large scale spending on new types of implant, clinical practice is changing worldwide, particularly in Australia and the US, and further data may become available in the coming years which could change this assessment.

Rigorous randomised trials with long term follow-up will be needed to assess the effectiveness of new types of implant, particularly for the under 65s. As the number of THRs performed every year continues to increase, the lifetime cost effectiveness of the implants is key for both patients and healthcare commissioners.



ZEPHYR/SPL

SPOT DIAGNOSIS

Hair loss and lymphadenopathy

A 19 year old man presented with a two month history of lumps behind the ears and in the groin, and scalp hair loss. He had felt generally unwell during the past month. Physical examination revealed painless generalised lymphadenopathy in the postauricular (fig 1), posterior cervical, and inguinal regions. He had patchy, non-cicatricial (non-scarring) alopecia with a moth eaten appearance (5 mm diameter patches) all over the scalp. Fungal microscopy was negative. Dermoscopy revealed yellow dots and broken hairs in the alopecia area. A reactive rapid plasma reagin (RPR) test was positive with a titre of 1:64 and the *Treponema pallidum* agglutination test was positive.

What is the diagnosis?

Submitted by Sheng Li and Liming Wu

Patient consent obtained.

Cite this as: *BMJ* 2019;366:l4555

Fig 1 | Alopecia with a moth eaten appearance

If you would like to write a Case Review or Spot Diagnosis for Endgames, please see our author guidelines at http://bit.ly/29HCBAL and submit online at http://bit.ly/29yyGSx

answers

SPOT DIAGNOSIS

Hair loss and lymphadenopathy

What is the diagnosis?

Syphilitic alopecia.

The RPR and *Treponema pallidum* agglutination results indicate that this patient had syphilis. Alopecia occurs in patients with secondary syphilis in 2.9% to 7% of cases. The alopecia can be patchy (with a moth eaten appearance) as in fig 2, or diffuse. It can also be associated with a non-itchy rash.

Painless lymphadenopathy is a common feature in both primary and secondary syphilis; however, in some cases alopecia is the only clinical sign of syphilis.

Differential diagnoses include

- Tinea capitis
- Alopecia areata
- Trichotillomania

Fungal microscopy, dermoscopy, RPR, and *Treponema pallidum* agglutination tests can help distinguish syphilitic alopecia from these entities.

Intramuscular penicillin G benzathine is recommended as the first line therapy for syphilis.

PATIENT OUTCOME

The patient reported no history of genital ulceration or cutaneous rash. He recalled having unprotected sexual intercourse with a female partner approximately two months earlier. The lymphadenopathy resolved within two weeks of starting treatment with intramuscular penicillin G benzathine. When he was reviewed three months later, hair growth was normal.

LEARNING POINTS

- Lymphadenopathy and alopecia may be the only presenting features of secondary syphilis.
- Moth eaten alopecia is a pathognomonic manifestation of secondary syphilis.

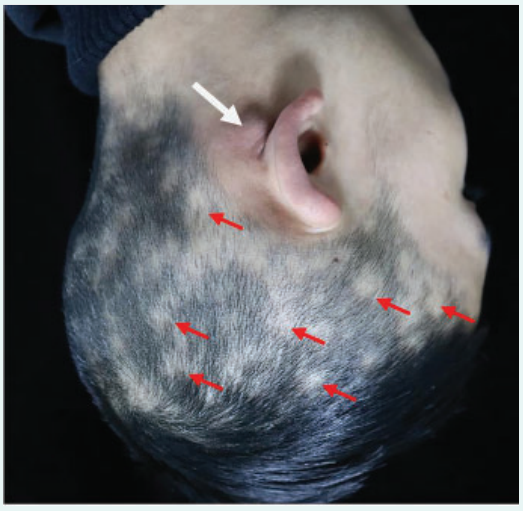


Fig 2 | Tiny patches of non-cicatricial alopecia (red arrows) over the scalp (giving a moth eaten appearance) and an enlarged lymph nodule (white arrow) in the postauricular region

CPD READING
0.5 HOURS

You can record CPD points for reading any article. We suggest half an hour to read and reflect on each.

LEARNING MODULE

Articles with a "learning module" logo have a linked BMJ Learning module at http://learning.bmj.com.

Diffuse melanosis cutis

A 64 year old white man underwent flexible cystoscopy after reporting a three month history of progressive skin hyperpigmentation (figure) and passing dark urine. His history included resection of a papillary bladder tumour and complete excision of a regressed melanocytic lesion on his back two years previously.

Cystoscopy revealed tiny black lesions in the bladder neck with no tumour recurrence. Investigation for suspected obstructive jaundice included blood tests, which showed raised alkaline phosphatase 323 (40-130 IU/L) and gamma-glutamyl transferase 527 (10-71 IU/L) with normal bilirubin 9 (0-20 µmol/L). Computed tomography imaging of the chest, abdomen, and pelvis identified axillary lymph nodes and hepatosplenomegaly with multiple metastases. Axillary node biopsy and bladder neck biopsies were in keeping with metastatic malignant melanoma. Urine microscopy identified melanin casts.

A diagnosis of diffuse melanosis cutis was made. Diffuse melanosis cutis is a rare manifestation of metastatic melanoma in which the entire skin surface is involved. The mean time to death following the onset of DMC is 4.4 months. Our patient was treated with ipilimumab but died a few months later.

Sibel Demirel (sdemirel5@gmail.com); Bruce Sizer, Department of Oncology, Colchester General Hospital, Colchester, UK

Patient consent obtained.

Cite this as: *BMJ* 2019;366:l4901

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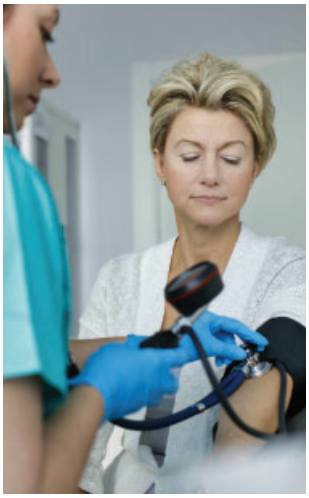
Health checks



Ten years ago, the NHS in England began to offer health checks for everyone aged 40-74. As is often true for these sorts of population wide interventions, the people most likely to take it up are those who need it least. A general practice database study of 130 000 people who went for a health check found that their average values for body mass index and systolic blood pressure were lower than those of a control group who didn't take up the offer, and that fewer of them smoked (*PLoS Med*).

Diets during pregnancy

Strong evidence shows that unhealthy maternal diets in pregnancy have adverse long term consequences for the metabolic and cardiovascular health of the offspring. Whether maternal diet influences neurodevelopment is another matter. A large longitudinal study from Norway suggests that any effect is small (*Am J Epidemiol*). Scores of quality of the prenatal diet were only weakly associated with measures of language and motor development in the offspring at age 5. However, the women in the study were mostly well educated, and had high rates of breastfeeding and low rates of cigarette smoking, so the findings may not apply everywhere.

Kayser-Fleischer rings

Few clinical signs are specific enough truly to merit the label pathognomic but the Kayser-Fleischer rings seen in cases of Wilson's disease come close. Caused by copper deposition, they are visible, sometimes only with the aid of a slit lamp, as a brownish ring at the edge of the cornea. A historical note points out that, in the otherwise meticulous description of the disease that now bears his name, Kinnier Wilson inexplicably failed to mention this sign (https://www.acnr.co.uk/2019/07/historical-note-the-kayser-fleischer-ring/). Indeed, Wilson later said that he had seen the rings on only three occasions.

Calcium intake after menopause

Individual rates of bone loss after the menopause are highly variable, but they have nothing to do with how much calcium a woman eats, according to a large study from New Zealand (*JCEM*).

Among 2000 women aged over 65 who weren't taking calcium supplements or any therapy for osteoporosis, measurements of bone mineral density at the spine or femoral neck showed no relation to dietary calcium intake even after adjustment for height, weight, levels of physical activity, and alcohol consumption. Bone loss during six years of follow-up wasn't related to calcium intake either.

Update in human anatomy

You might have thought that discoveries in human anatomy dried up some time ago. But a review in *QJM* notes several recent observations that have changed thinking about the structure of the human body. One is the glymphatic system—perivascular spaces lined with the leptomeninges and glial cells that drain metabolic waste from the central nervous system (*QJM*).

Another concerns the mesentery, which is now established as continuous along the entire length of the intra-abdominal gut. A third discovery is the interstitium, a network of collagen bound fluid filled spaces, previously thought to be an artefact of histological preparation, but now recognised in many tissues that sustain mechanical compression.

Cite this as: *BMJ* 2019;366:l5308