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Self-Assessment Colour Review of Equine Orthopaedics and Rheumatology

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Equine Orthopaedics and Rheumatology

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Broad Classification of Cases

Listed are the questions and answers that deal with particular topics.

Bone
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Preface

In assessing the cases for this book we have tried to include the broadest possible range of colour images and imaging techniques, including radiography, ultrasonography, nuclear scintigraphy and arthroscopy. To reflect the day to day practice of the veterinarian, the cases are arranged randomly; alternatively, certain categories of condition may be accessed through the Broad Classification of cases (opposite page). The cases provide a fair representation of the spread of orthopaedic and rheumatological problems encountered in equine practice.

Certain conventions in description and display have been adopted to avoid lengthy explanations for each illustration. Lameness is graded on a score of 0–5, where '0' is not lame and '5' is nonweightbearing. Unless otherwise stated, craniocaudal and dorsopalmar/plantar radiographs are orientated with lateral to the right, as are transverse ultrasound images. Ventrodorsal radiographs are displayed according to medical convention, with the left side of the animal to the right of the illustration, but gamma camera images and point scans of the pelvis are illustrated with the right of the animal to the right when viewed from behind or above, and the left to the right when viewed from the front. Longitudinal ultrasound images are displayed with the proximal part of the limb to the right of the picture.

Some readers may be unfamiliar with the use of the point counter in nuclear medicine, despite some advantages over the gamma camera for the general equine practice. If further information is required to help answer these questions, the reader may find the following reference helpful:

Pilsworth RC and Holmes MA (1992) A low-cost, computer-based scintigraphy system for use in lameness investigation in general practice. *Proceedings of the 37th Annual Convention of the American Association of Equine Practice.* pp 327–350.

Abbreviations used in the book are listed on page 177.

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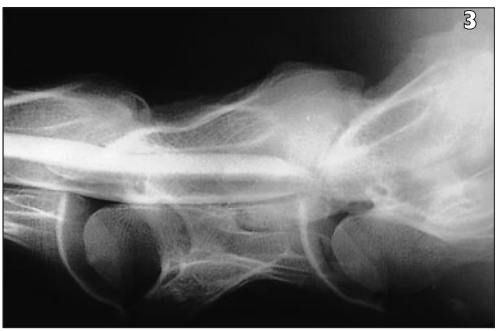
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1 An eight-year-old Thoroughbred gelding presented with a right forelimb lameness, grade 2/5 at the trot, of eight weeks duration. The lameness was insidious in onset, did not improve with rest or exercise, and was the same on any surface.
i. What abnormal features of the right forelimb can be recognised in **1**?
ii. From the history and clinical signs, what causes of lameness would you consider?
iii. What further tests would you perform to confirm your diagnosis?
iv. How would you treat this case?



2 The radiograph illustrated (**2**) was obtained during a prepurchase examination of an ex-racehorse.
i. What is the radiographic projection.
ii. Describe the lesion seen, and comment on its significance.





3 A myelogram of the lower cervical spine of a 16-year-old Thoroughbred mare which had shown progressive hindlimb ataxia over 18 months is illustrated (**3**).
i. What radiological abnormalities are present?
ii. What is your diagnosis?
iii. What other conditions might cause similar signs?

1–3: Answers

1 i. There is marked distension of the digital sheath on the palmar aspect of the fetlock. The distal end of the swelling has a notched appearance. The horse has a slightly broken back hoof–pastern axis and low heels.
ii. Annular ligament syndrome is the most obvious possibility. Superficial or deep digital flexor tendon injuries, or previous penetrating wounds into the sheath, may be contributing factors. But in view of the poor foot conformation, a foot problem should also be considered as the cause of the lameness, since these digital sheath swellings are not always painful.
iii. Intrasynovial analgesia of the digital sheath will not always abolish the lameness, presumably because of adhesions or the mechanical influence of the constricted annular ligament. Analgesia of the palmar nerves proximal to the fetlock is usually effective. Ultrasonography is important for evaluation of the annular ligament and the flexor tendons, and may indicate the presence of adhesions. Regional analgesia of the foot should be performed to ensure that foot pain is not involved.
iv. Acute cases should be treated with rest, possibly combined with both topical and systemic anti-inflammatory drug therapy. If this fails, an annular ligament desmotomy is indicated.

2 i. A dorsolateral–palmaromedial oblique projection.
ii. The dorsal cortical surface of the radial carpal bone is remodelled with organised new bone formation. Such enthesophytes at the attachments of the joint capsule and the dorsal intercarpal ligaments occur commonly in young racehorses, and are of no long-term consequence. (The fifth carpal bone is not a lesion. It is a less common normal variant than a first carpal bone.)

3 i. There is poor definition of the intervertebral facet joints between cervical vertebrae C6 and C7, and almost complete obliteration of dorsal and ventral contrast columns at the same level.
ii. Stenosis of the cervical vertebral canal at the C6/7 level (cervical static malformation). A focal compressive myelopathy is relatively uncommon in a horse of this age, but, with this history, when it occurs, it usually involves static compression in the caudal cervical spine.
iii. Spinal trauma or infection; polyneuritis equi (usually other signs of cauda equina syndrome); EHV-1 myeloencephalitis (usually sudden onset rather than progressive); equine protozoal encephalomyelitis (if the mare is or has been on the American continent); equine degenerative myeloencephalopathy (usually younger horses – forelimbs usually affected as badly as hindlimbs); spinal or vertebral neoplasia.

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4 The veterinary surgeon illustrated in **4a** is drawing up a dose of 99^{m} technetium for use in a scintigraphic examination. Identify three basic errors in radiation safety, together with appropriate devices to protect against the risks.







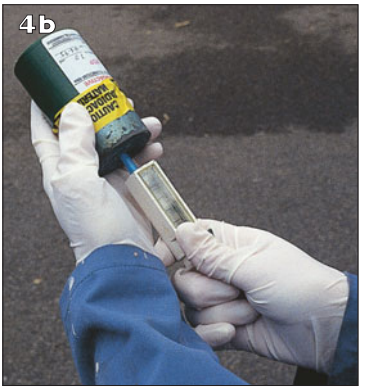
5 i. What injury is common to the two cases shown in **5a** and **5b**?
ii. Does the prognosis differ between the two and, if so, why?

6 The limbs of this six-year-old Anglo-Arab mare have become permanently thickened below the carpus and tarsus (**6**). Firm swellings are present on the long bones, and these are painful on palpation.
i. What is your diagnosis?
ii. What further investigations are indicated?
iii. What treatment is available?
iv. What is the prognosis?



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4–6: Answers



4 • The hands and arms are not protected. The veterinary surgeon should be wearing disposable gloves and a protective overall, as illustrated in **4b.** 99^{m} technetium is not a risk to health when spilled onto gloves and overalls provided these can be removed and stored. After 2–3 days, natural decay will have reduced the radioactivity to a negligible amount. This can be checked with a contamination monitor.
• There is no evidence of a syringe shield. Protection against radiation from 99^{m} technetium in the filled syringe is afforded by a shield of lead-glass and lead of the type illustrated in **4b.**
• The 99^{m} technetium vial has been removed from its lead container. Ideally, the vial should be kept in a canister which allows the syringe to be filled without necessitating such removal (**4b**).

5 **i.** The two lateromedial projections of the carpus each illustrate a fracture of the accessory carpal bone.
ii. In **5a** the typical, simple, frontal plane fracture configuration is seen. Even though such fractures frequently heal by fibrous rather than bony union, many horses return to their original work, following conservative treatment. In **5b**, comminution of the articular facet is evident. This will almost certainly lead to degenerative disease of the antebrachio-carpal joint and chronic lameness.

6 **i.** The horse is suffering from hypertrophic osteopathy (Marie's disease). Fluorosis should also be considered as a differential diagnosis.
ii. Radiographic examination of the affected bones will reveal irregular periosteal new bone formation, particularly on the first phalanx and at the proximal and distal ends of the metacarpus and metatarsus. A detailed clinical examination should be conducted for signs of concurrent disease. Radiographic and ultrasonographic examinations of the thorax are indicated. Haematology and clinical biochemistry should be performed for evidence of chronic inflammatory or neoplastic foci. Classically, in other species, a space-occupying lesion is present in the thorax or abdomen. However, frequently no such lesion is detected in hypertrophic osteopathy in the horse.
iii. None, other than treatment of any underlying cause, if this can be identified.
iv. The prognosis is poor, unless a primary cause, such as an infective focus, can be identified and treated.

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7 A horse went lame and developed a mid-carpal joint effusion the day after a race in which it was placed for the fourth consecutive time in the season. A radiograph (**7**) was taken four days later.
i. What is the radiographic projection, and what are your radiological observations?
ii. Is this an acute or a chronic problem?



8 The figure (**8**) illustrates a 13-year-old show jumping pony with a moderate, sudden onset lameness of the right hindlimb which developed after a fall in a competition.
i. What structure has been damaged?
ii. What is its function?
iii. How does the injury occur?
iv. How would you treat this pony, and what is its long-term prognosis?



9 An eight-day-old filly foal presented with sudden onset severe left forelimb lameness. Rectal temperature was 38.8°C. No focus of pain could be identified in the left forelimb, and all the distal limb joints were palpably normal. No radiological abnormality of the elbow was detected.
i. Describe the radiological features (**9**).
ii. What other assessment would you perform?



7–9: Answers

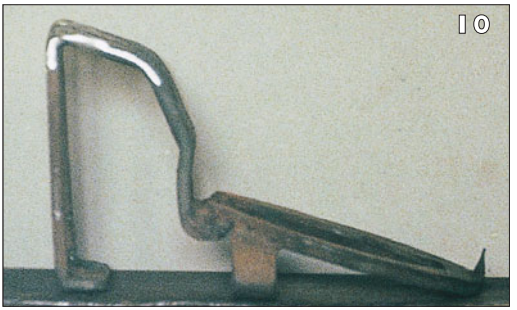
7 i. The radiograph illustrated is a dorsoproximal-dorsodistal oblique (skyline) projection which shows the distal row of carpal bones. The trabeculation in the third carpal bone is coarse. The dorsal contour of the intermediate facet is lost and a central, displaced fragment is evident, highlighted by two converging, poorly marginated radiolucent lines. Considerable new bone has formed dorsally. There are also two divergent radiolucent lines medially in the region of the articulation between the third and second carpal bones. Fractures of the third and possibly the second carpal bones can be diagnosed from this radiograph.
ii. The new bone associated with the fracture of the lateral aspect of the third carpal bone indicates a chronic disease process, which has led to fracture of the bone. The increased use of nuclear scintigraphy in performance horses has revealed that many apparently spontaneous fractures, at classic sites, are preceded by chronic bone remodelling.

8 i. The peroneus tertius has ruptured. The classical signs shown here are extension of the hock with the stifle flexed, and 'puckering' of the Achilles tendon (gastrocnemius and superficial digital flexor tendons).
ii. The peroneus tertius is an almost completely tendinous structure that originates from the extensor fossa of the distal femur, runs over the cranial aspect of the tibia and inserts, after dividing into two, on the fibular, third and fourth tarsal bones and proximal third metatarsus. It is an important part of the reciprocal apparatus, which mechanically flexes the hock when the stifle joint is flexed.
iii. The injury occurs as a result of extension of the hock as the stifle flexes. This can happen when an animal: struggles to free a trapped limb; slips with the limb extended backwards; falls in a full hindlimb cast; exerts itself coming out of a starting stall at the beginning of a race.
iv. There is no suitable surgical treatment. Complete box rest for 6–8 weeks, followed by a graduated exercise programme over the next 8–12 weeks, is the treatment of choice. The prognosis is fair to good. Healing is by scar tissue formation between the ruptured tendon ends. Return to a functional unit may not occur, or the peroneus tertius may be injured when the animal returns to work. The location of the injury affects the prognosis. Avulsion of the origin of the peroneus tertius may result in an intra-articular fracture with a hopeless prognosis.

9 i. This is a mediolateral view of an immature shoulder joint. No significant radiological abnormality can be detected. The two centres of ossification of the cranial aspect of the scapula and the centres of ossification for the humeral tubercles are incompletely ossified.
ii. The foal is likely to have an infected joint. A clinical appraisal of the whole foal should be performed, paying particular attention to the thorax and the umbilical region. Ultrasonographic examination of the latter area should be considered. Serum IgG levels should be assessed to determine efficacy of passive transfer of immunity. In the absence of signs of a problem in the rest of the forelimb, a synovial sample from the shoulder joint should be collected for total and differential nucleated cell counts, total protein concentration, Gram stain and bacterial culture.

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10 i. What type of shoe is illustrated in **10**?
ii. What is it used for?
iii. Why has the heel been raised?
iv. Do you think that it is most likely to be for a fore or a hind foot?







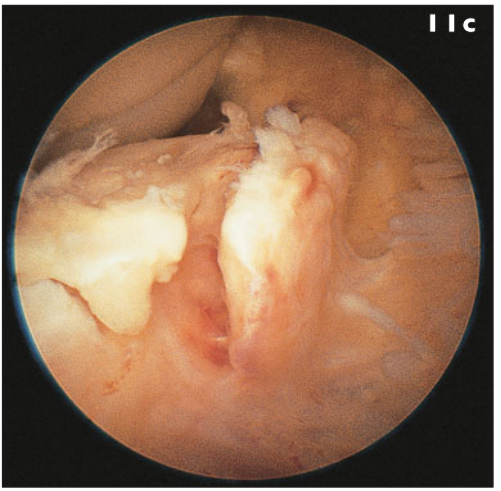
11 A three-year-old Thoroughbred colt presented with an effusion of the left mid-carpal joint (**11a**). A set of radiographs was taken. The dorsolateral–palmaromedial oblique projection is illustrated (**11b**).
i. What is your diagnosis?
ii. How would you treat this case?
iii. What is the prognosis for a return to racing?

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10 & 11: Answers

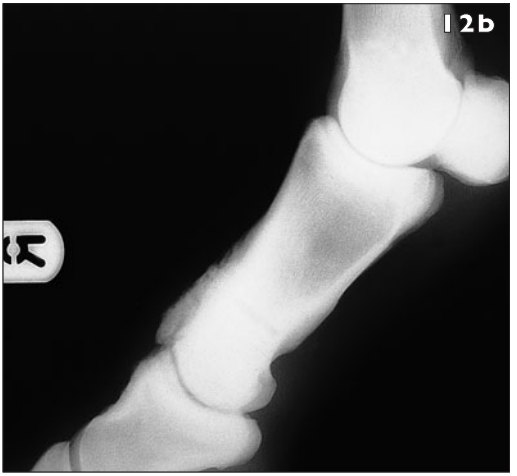
10 i. A 'swan-necked' shoe.
ii. This shoe is used to support the fetlock and pastern, following rupture or severance of the superficial digital flexor tendon. It is not adequate when the fetlock has dropped as a result of complete breakdown of the suspensory apparatus. In these cases the limb should be board splinted or a fetlock arthrodesis performed.
iii. Raising the heel takes tension off the deep digital flexor tendon, suggesting that the horse being treated may have injured that tendon as well.
iv. If these shoes are made with long trailers, these tend to be trodden on by hind feet. The upright support and the way in which its end is turned forwards suggest that this shoe was made for a fore foot.

11 i. Osteochondral chip from the dorsodistal aspect of the radial carpal bone.
ii. The treatment is arthroscopic surgery.
iii. The prognosis is related to the amount of articular cartilage fragmentation. With grade 1 to 2 loss of articular cartilage, over 70% of the horses return to racing at the previous level of performance. If there is greater than 50% loss of articular cartilage or a considerable loss of subchondral bone, then the prognosis decreases to 50%. The arthroscopic view (**11c**) shows a grade 2 lesion, as less than 30% of the articular surface of the radial carpal bone is involved. Therefore, this horse has a 70% chance of racing at its previous level.

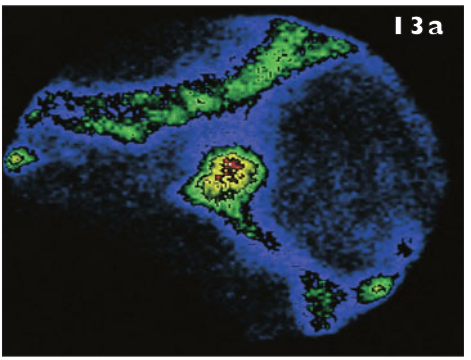


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12 Radiographs of the right hind pastern of a four-year-old Thoroughbred filly which had a grade 2/5 lameness on this limb at the trot (**12a, 12b**). Flexion of the lower limb exacerbated the lameness.
i. What radiological abnormalities are revealed?
ii. What treatment, if any, would you recommend?
iii. What is the prognosis for a return to racing soundness?



13 A five-year-old Shetland pony gelding presented with an acute onset grade 3/5 left forelimb lameness of two months duration. The lameness had been severe (5/5) initially, but improved with box rest. Nerve blocks were performed, up to and including the median and ulnar nerves, but no improvement in the lameness was observed. Gamma scintigraphy was performed a week later (**13a**).
i. What is your diagnosis?
ii. What further investigations would you perform to confirm your diagnosis?
iii. How would you manage this case?

12 & 13: Answers

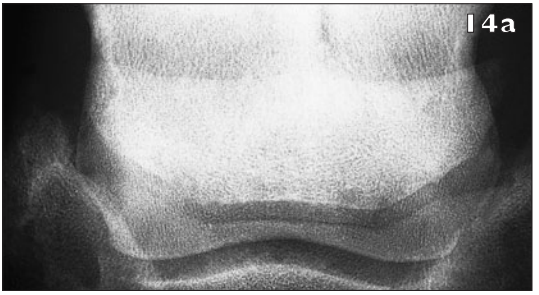
12 i. Degenerative joint disease of the proximal interphalangeal (PIP) joint. The concentration of bone resorption and formation to one side of the joint suggests local damage, possibly an old fracture, as the stimulus for the joint disease.
ii. • PIP joint arthrodesis could be performed in an attempt to restore the filly to racing soundness.
• Continued exercise with concurrent non-steroidal anti-inflammatory drug therapy might encourage natural ankylosis, but, in contrast to the hock, this is rarely successful.
• Box rest could be imposed in an attempt to improve the lameness sufficiently for the filly to be retired for breeding.
iii. Without surgery, the prognosis for a return to racing soundness is poor. Following arthrodesis, 85% of hindlimb cases will return to the track.

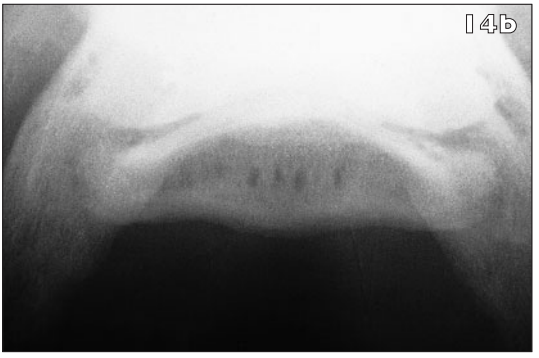
13 i. Idiopathic scapulohumeral osteoarthritis in the Shetland pony.
ii. A mediolateral radiograph of the right shoulder revealed early remodelling of the caudodistal scapula and the caudal margins of the glenoid and humeral head (**13b**). Intra-articular analgesia of the scapulohumeral joint virtually abolished the lameness.



iii. There is relatively little that can be done for these cases. Intra-articular and oral anti-inflammatory medication resulted in only temporary improvement of the lameness.

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14 A seven-year-old gelding developed a persistent right forelimb lameness after being rested for an upper limb wound. Clinical examination revealed muscle atrophy over the right forelimb, a smaller right fore foot and bilaterally distended distal interphalangeal (DIP) joints. Diagnostic local analgesia produced the following results:

- Right fore palmar digital nerve block – 100% improvement; no lameness on the left forelimb.
- Right fore DIP joint – 40% improvement after 10 minutes.
- Right fore navicular bursa – 90% improvement.

Radiographs of the right fore foot are illustrated (**14a**, **14b**).

i. What is your diagnosis, and why?
ii. What is the most unusual feature of this case?
iii. What other test could be employed to support your diagnosis?
iv. What methods of treatment are available and what is the prognosis?
v. Is the history typical, and why?

14: Answers

14 i. Navicular disease – this should be considered a clinical diagnosis, with radiographic changes, if present, helping to confirm the diagnosis. Osteoarthrosis of the DIP joint and navicular disease are difficult to distinguish and rely on the careful interpretation of clinical findings, diagnostic local analgesia and radiography. The use of navicular bursal analgesia can be helpful, although there is still uncertainty about the specificity of all three 'blocks' cited in the question. Examination of the horses at two time points after DIP joint analgesia may help to differentiate DIP joint pain from navicular pain – immediate relief of pain (within 10 minutes) might suggest DIP joint pain while slower relief over 30 minutes might suggest navicular bone pain. In contrast, navicular bursal analgesia will remove pain from the navicular bursal region but may not eliminate pain from the medullary cavity or articular surface of the navicular bone.
The radiographic changes shown are consistent with navicular disease. There is sclerosis of the medullary cavity and loss of the corticomedullary junction, which is best seen in the palmaroproximal–palmarodistal oblique ('flexor') view.
ii. Most cases of navicular disease are bilaterally lame, but it was not possible to show any left forelimb lameness in this animal even after the right forelimb lameness was abolished with local analgesia.
iii. Nuclear scintigraphy can be used to identify those cases of navicular disease with active bone remodelling.
iv. Treatments can be divided into medical or surgical, and disease-oriented or sign-oriented (symptomatic). Whatever is chosen, management is likely to include corrective farriery to return the foot balance towards normal (avoiding long toes/low heels and centring the DIP joint over the weight-bearing surface of the foot). Egg bar shoes may be used to extend the weight-bearing surface of the foot caudally to support the palmar foot region.
• Disease-oriented medical therapy uses drugs, such as isoxsuprine, to try to prevent the venous congestion of the foot which has been proposed as the mechanism responsible for pain. Intrabursal hyaluronic acid (HA) has been tried but with only short-term benefits. This horse received intra-bursal HA and improved sufficiently to return to work.
• Symptomatic medical therapy includes the use of non-steroidal anti-inflammatory drugs and intrabursal steroid injections.
• Navicular suspensory ligament desmotomy has been proposed as a disease-oriented surgical treatment. This operation is thought to allow an improved alignment of the navicular bone, but some have suggested that it provides specific denervation of the navicular bone. Many horses improve with this surgery but lameness can return subsequently, possibly when the nerves regrow.
• Symptomatic surgical treatment consists of palmar digital neurectomy. Care has to be taken with management following this procedure to prevent foot abscesses being unrecognised.
v. Navicular disease often becomes evident after a period of rest. Indeed, older textbooks describe intermittent work regimes as the cause. However, it is now clear that intermittent exercise regimes cause underlying problems, such as degenerative joint disease and navicular disease, to become symptomatic, and thus recognised.

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15 A two-week-old Peruvian Paso foal has abnormal angulation of its hindlimbs (**15a, 15b**). The animal is able to move normally, without lameness, but the owner is concerned because of the 'funny looking' legs.
i. What are the possible causes of this condition?
ii. How would you confirm your diagnosis?
iii. What treatment would you advise?
iv. What is the prognosis for this foal?

16 A three-year-old Thoroughbred filly developed lameness and a swelling of the right forelimb the day after a race (**16**). Three days later the skin over the swelling felt curiously hard and rigid on palpation.
i. What is the most likely cause of the swelling?
ii. How would you confirm your diagnosis?
iii. How is this problem likely to progress?
iv. What is the prognosis for a return to racing?



15 & 16: Answers

15 i. The differential diagnoses include: incomplete ossification of the tarsal bones, periarticular laxity ('wind swept foal'), and asynchronous growth of the physis.
ii. Manipulation (trying to straighten limbs) and radiographs. A lateromedial view of the tarsus and a dorsopalmar view of the carpus may reveal incomplete ossification of the carpal and tarsal bones. Alternatively, a dorsopalmar view of the carpus may reveal abnormal angulation of the limb as a result of a physeal or epiphyseal abnormality. A dorsoplantar view of the tarsal region does not help because the tibia is not in the same frontal plane as the other metatarsal bones. Therefore, variable degrees of angulation can be produced by simply altering the direction of the X-ray beam.
iii. Manipulation revealed joint laxity. Radiography revealed a normal degree of ossification of both the carpal and tarsal bones. The final diagnosis is periarticular laxity, with normal ossification. The best treatment is 'masterly inactivity', meaning box rest for two weeks with the mare being walked out for 20–30 minutes daily. In this case, after two weeks, the foal was almost normal.
iv. The prognosis for full recovery, and an athletic future, is good.

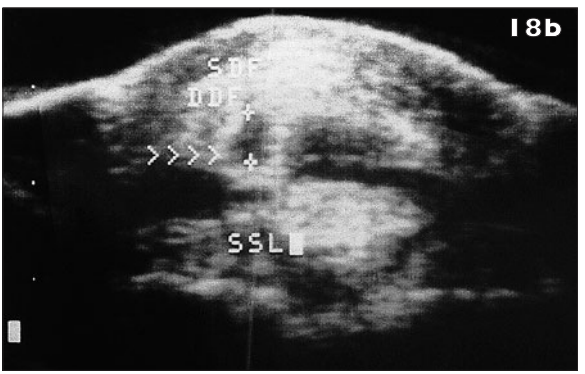
16 i. An overtight exercise bandage. The swelling bears some resemblance to that seen with a strained superficial digital flexor tendon (SDFT), but the skin necrosis indicates a different aetiology.
ii. The skin injury is the main confirming factor. In some cases the bandage may also have damaged skin on the dorsal aspect of the metacarpus. Ultrasonography will reveal subcutaneous oedema, and often the flexor tendons will be normal in appearance. However, a severe injury can lead to concurrent tendinitis, with lesions developing over the course of several days.
iii. The damaged soft tissues are likely to slough. This may include a part of the SDFT as well as the skin. The wound will then heal by granulation, although this may be protracted if there is significant tendon involvement.
iv. If the skin alone is damaged, the prognosis is good. The prognosis is more guarded if the tendon is involved, when it will clearly depend on the extent of the slough.

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17 The horse in **17a** went through a wooden fence the previous evening during a thunderstorm.
i. What is your diagnosis?
ii. What other clinical signs might you expect to develop over the next few weeks?
iii. What further tests might be helpful both now and in the future?
iv. What is your prognosis?







18 A two-year-old Thoroughbred colt presented for acute onset lameness on the left forelimb. There was pain on flexion of the fetlock joint. **18a** shows the appearance of the distal limb. **18b** illustrates a transverse ultrasonographic image of the palmar proximal pastern region.
i. What is the main problem?
ii. How does the ultrasonographic diagnosis explain the external appearance of the limb?
iii. What is the prognosis for a return to soundness, and what treatment would you recommend?

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17 & 18: Answers



17 i. Instability of the shoulder (so-called 'shoulder slip'), probably due to trauma to nerves of the brachial plexus.
ii. Atrophy of muscles in the shoulder region. Supraspinatus and infraspinatus are most commonly affected, but atrophy of triceps, extensor carpi radialis and the pectorals is often seen concurrently. The pattern of muscle atrophy helps to determine which nerves are likely to be affected. Patchy sweating may develop (**17b**).
iii. a) Radiography to exclude the possibility of a concurrent bone abnormality.
b) Electromyography: this is best delayed for at least two weeks in order to obtain accurate results, and can be repeated sequentially. This should indicate which muscles are denervated and if re-innervation is developing.
iv. This depends on the nature of the nerve damage which is difficult to determine quickly. If the nerves are only bruised then a slow, progressive recovery should be seen, but if the nerves have been stretched and neuromata develop, clinical signs are likely to persist.
This horse was humanely destroyed 12 weeks post injury. Post-mortem examination revealed large neuromata of the suprascapular and subscapular nerves in extensive fibrous tissue, with profound discolouration of the subscapular, supraspinatus and infraspinatus muscles.

18 i. An injury of the medial edge of the deep digital flexor tendon just below the fetlock.
ii. The tendon has been injured inside the digital sheath, leading to, or associated with, a synovitis and distension of the sheath.
iii. The prognosis is poor. Box rest combined with intrasynovial medication, such as polysulphated glycosaminoglycan, might help, but despite such treatment this horse remained lame after five months and was humanely destroyed.

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19 A seven-year-old riding horse went acutely and severely lame on the right hindlimb. This was associated with swelling over the point of the hock (**19**).

i. What is your diagnosis and how would you confirm it?

ii. An additional abnormality can be recognised in this picture. What is it?

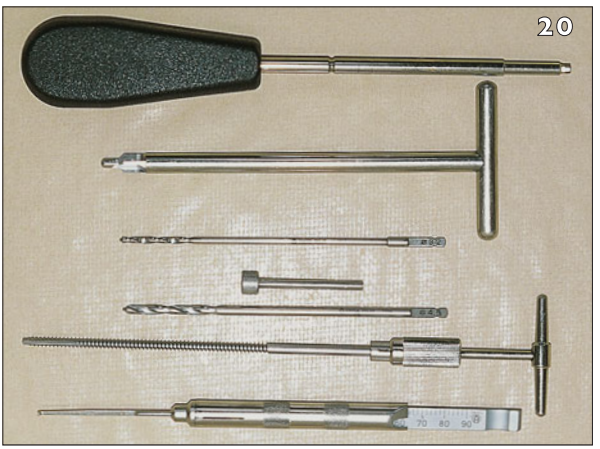
iii. What are the options for treatment of the condition?



20 The illustration (**20**) shows the instruments (excluding the air drill!) required to place a 4.5 mm cortical bone screw across a fracture in a lag fashion.

i. Name the instruments, and list them in the order in which they should be used.

ii. Describe two situations in which this ideal order in which the instruments should be used has to be changed.



iii. What size would the two drills be if you wished to place:

a. A 5.5 mm cortical screw lag fashion?

b. A 3.5 mm screw (new thread) lag fashion?

iv. What is the minimum depth of gliding hole which should be drilled when fixing a third carpal bone slab fracture with a 4.5 mm screw? What is the limiting factor which determines this?

19 & 20: Answers

19 i. This horse has sustained a lateral luxation of the superficial flexor tendon from the calcaneal tuber. This relatively uncommon condition presents as a sudden onset of lameness during exercise, or develops following direct trauma to the point of the hock. There is swelling at the point of the hock initially and this can confuse the diagnosis. In the early stages, besides direct palpation of the luxated tendon and visualisation of movement of the tendon during the walk, ultrasonographic examination can be useful in determining the degree and direction of luxation, and the degree of damage to the fibrous attachments to the calcaneal tuber. Radiographs may also be helpful to rule out damage to bony structures. Medial luxation is much rarer.
ii. This horse also has a distension of the tarsal sheath, known as a thoroughpin, particularly apparent on the lateral side of the hock, dorsal to the tuber calcaneus and luxated superficial digital flexor tendon. This was a chronic lesion, which had been present for several years without any associated lameness.
iii. Conservative treatment, in the form of prolonged rest, usually leads to stabilisation of the tendon in its abnormal position. This may allow a horse to return to work, but often at a lower level than that undertaken before the injury. Therefore, surgical treatment has been recommended to repair the torn tarsal attachments and return the tendon to its normal position. Unfortunately, direct suturing of the attachments is usually inadequate to maintain stability, and additional support, via a synthetic mesh, or occasionally screws/pins, is required. In addition, the limb has to be immobilised with hindlimb casts or a large Robert Jones bandage for a prolonged period.

20 i. 4.5 mm drill, 4.5/3.2 mm insert drill sleeve, 3.2 mm drill, countersink, depth gauge, 4.5 mm tap, screwdriver.
ii. • When using the C clamp, the hole is tapped before the clamp is removed and the depth measured after clamp removal.
• When the transcortex is a relatively narrow fragment, the 3.2 mm hole may be drilled first and the hooked or pointed drill guide used to locate the appropriate site for drilling the 4.5 mm hole after reduction of the fracture.
iii. a. 5.5 mm and 4.0 mm.
b. 3.5 mm and 2.5 mm.
iv. 12 mm. The limiting factor is the nose on the 4.5 mm countersink, which will not allow a seat to be created for the head of the screw if the depth of the gliding hole is less than this. Therefore, although the slab may be only 6–10 mm thick, the gliding hole should continue beyond the fracture to a full depth of 12–15 mm if a 4.5 mm countersink is going to be used.

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21 A ten-year-old Thoroughbred-cross mare was found in the field with a large laceration over the medial heel. The picture (**21a**) was taken 24 hours after injury when the mare was sound at the walk and there was no evidence of hyperextension of the metacarpo-phalangeal or distal interphalangeal joints. There was some distension of the digital sheath.
i. What further diagnostic tests would you employ?
ii. What treatment would you advise?
iii. What potential complications may arise?







22 A two-month old foal has an angular deformity of the left carpal region and lameness in the same limb (**22a**). A dorsopalmar radiograph of the left carpus has been obtained (**22b**).
i. What type of deformity is present, and where is it located?
ii. What additional radiological abnormalities are present?
iii. How should this condition be treated?
iv. What prognosis would you give the owner?

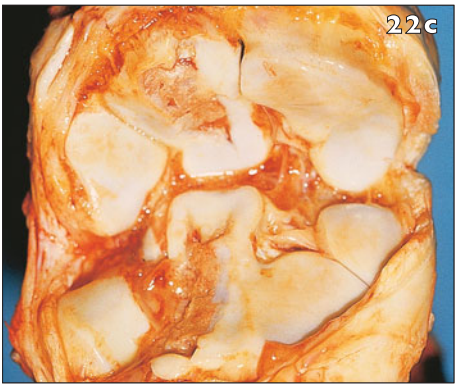
21 & 22: Answers

21 i. • Radiographs – to rule out any bony pathology. None was found in this case.
• Synoviocentesis of the digital sheath, possibly followed by the injection of saline, to determine any involvement in the injury. Leakage of saline from the wound would confirm sheath penetration, but a negative result does not preclude sheath violation and subsequent sealing.
ii. The area should be surgically debrided. If penetration of the digital sheath is confirmed, it needs to be flushed with large volumes of sterile electrolyte solutions. Tenoscopy can be useful to identify and debride the penetration site if it is not immediately apparent. The wound should then be partially closed, with special attention to closing the coronary band defect, and the limb placed in a distal limb cast for 3–4 weeks to achieve the best quality of healing (**21b**).



iii. If the sheath has been penetrated, infection may ensue and not be controlled. Even if not infected, the damage to the sheath can result in adhesions at the site of injury, especially if there is concurrent tendon pathology.
Ultrasonography is not able to produce a satisfactory image of this region in the presence of such a large open wound; therefore, tenoscopy may be beneficial in determining the prognosis and debriding the affected area.
This horse developed adhesions within the digital sheath and remained mildly lame. The damage to the coronary band can lead to a hoof wall defect which may cause problems in the future. Ossification of the collateral cartilage frequently occurs, but does not usually cause lameness.

22 i. The valgus deformity mainly affects the middle carpal joint, with some involvement of the carpometacarpal joint.
ii. The articulation between the fourth carpal and the fourth metacarpal bone is abnormally shaped and exhibits degenerative changes. There is also soft tissue swelling of the carpal region.
iii. Euthanasia should be considered. When associated with lameness, correction of an angular limb deformity in the carpal region will often fail to return an animal to athletic soundness. In most cases, degenerative cartilage lesions are found in one of the joints (**22c**).
iv. The prognosis is guarded.



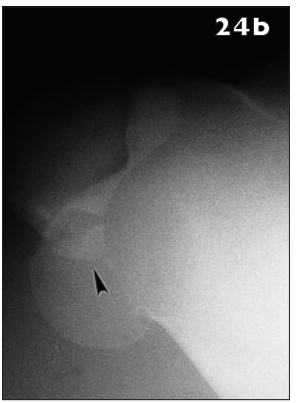
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23 i. What is your diagnosis (**23**)?
ii. Assuming that the injury is not associated with external trauma, how is it likely to have occurred?
iii. What associated structure may have been injured?
iv. If the horse has both problems, which is most likely to cause persistent lameness?

24 A yearling Arab filly was involved in an accident during halter breaking, which led to lameness on the right hindlimb. There was obvious swelling associated with the right stifle, so radiographs of this region were obtained (**24a, 24b**).
i. What radiographic projections are illustrated?
ii. What is your diagnosis?
iii. What treatment would you recommend?
iv. What is your prognosis?





25 A 'full' hindlimb cast is illustrated in **25**. Vetcast/Scotchcast (3M) has been used for most of the cast, and the hoof part covered with Vet-lite (Runlite). The horse had some difficulty using the limb for the first three days, but subsequently learnt how to cope with the cast.
i. Why have two sorts of casting material been used?
ii. Why did the cast make it difficult for the horse to use the limb?
iii. How did the horse overcome this?
iv. What orthopaedic problem may occur if the horse slips and falls in its stable?



23–25: Answers

23 i. A fracture of the distal part of one of the splint bones.
ii. These fractures are thought to occur as a result of stresses placed on the splint bone by the adjacent suspensory ligament. It has been suggested that, during hard exercise, the suspensory ligament snaps back against the relatively fixed small metacarpal or metatarsal bones, causing the distal part of the bone to fracture.
iii. The adjacent suspensory ligament branch may have been sprained or even ruptured.
iv. The splint bone fracture is unlikely to heal by bony union, but the fibrous union formed does not usually cause any problems. However an associated sprain of a branch of the suspensory ligament may well continue to cause lameness.

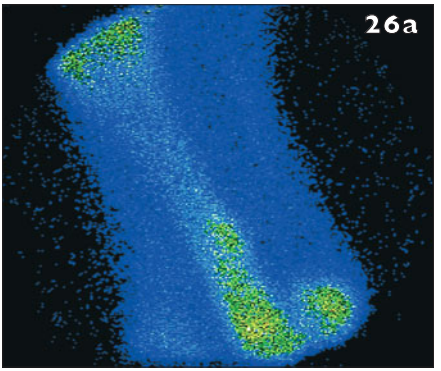
24 i. A lateromedial projection of the stifle joint and a cranioproximal-craniodistal oblique (skyline) projection of the distal femur and patella.
ii. There is a suspicion of a lesion on the proximal aspect of the patella on the lateromedial radiograph. The skyline radiograph shows a fracture of the medial portion of the patella.
iii. The recommended treatment is arthroscopic evaluation and surgical removal of the fragment. This surgery was performed in this case.
iv. The prognosis is good, after an appropriate convalescent period.

25 i. Vetcast conforms well and produces a strong, light cast. However, it is not very resistant to abrasion, so animals tend to wear through the sole, leading to movement of the foot and damage to the skin of the fetlock and pastern regions. Vet-lite is much more abrasion-resistant.
ii. The action of the peroneus tertius means that flexion of the stifle is linked to flexion of the hock. As the hock has been fixed in an extended position, the stifle can not be flexed so the horse has to learn to advance a relatively straight and rigid limb.
iii. After several days, horses learn to cope with full hindlimb casts by lifting the whole limb to protract it.
iv. As the hock is fixed, a fall which results in flexion of the stifle will rupture the peroneus tertius. This is a relatively common cause of this injury. Such a rupture makes it much easier for a horse to use its limb, as it can then flex the stifle!

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26 A five-year-old Thoroughbred gelding pulled up lame on the left hindlimb during a work-out at the gallops. The lameness was severe (4/5) but improved with five days box rest. No abnormalities were found on close inspection and palpation of the limb, but no nerve blocks were performed for fear of exacerbating any injury. The left hindlimb was imaged with a gamma camera, following intravenous injection of 99^{m} technetium MDP (**26a**).



i. What is shown on the scan of the left hindlimb?
ii. How would you confirm your diagnosis?
iii. Is this the most typical location for this abnormality?
iv. How could you manage the case, and what prognosis would you give the trainer?



27 An owner is frustrated because when he rides his nine-year-old hunter gelding around the English countryside it has started to demonstrate the gait abnormality illustrated in **27**.
i. What did the playwright, William Shakespeare, call this condition?
ii. What is the cause, and might this be different if the horse lived in Australia?
iii. What treatment is available, and what is the prognosis following treatment?



28 **i.** At what stage in the development of this animal was this post-mortem radiograph of its carpus obtained (**28**)?
ii. What is the relevance of this radiographic picture to premature/dysmature foals?

26–28: Answers

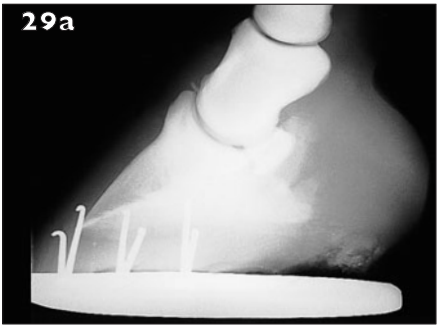


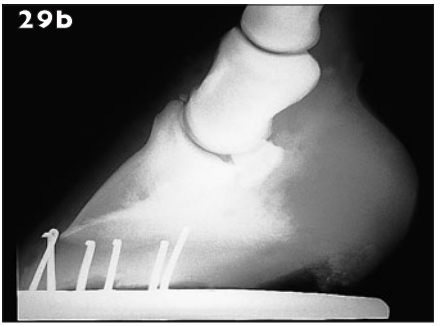
26 i. The lateral bone scan of the distal tarsal region shows a hot spot suggestive of the presence of an incomplete diaphyseal stress fracture of the caudodistal cortex of the left tibia.
ii. Radiography is helpful but not essential for this diagnosis. In this case a short, incomplete radiolucent fracture line can be seen overlying the medullary cavity at the level of transition between the distal and middle thirds of the tibial diaphysis (**26b**).
iii. Initial reports described the occurrence of these fractures predominantly in the proximolateral cortex of the tibia. Other sites (diaphysis, distal caudolateral cortex) are less commonly affected.
iv. The case should be managed with strict box rest for a period of three months. Following this, the prognosis for return to athletic function is favourable, although anecdotal evidence suggests a better prognosis for younger horses with proximal tibial stress fractures (two-year-old and three-year-old horses).

27 i. Springhalt (*Henry VIII*, Act 1, Scene 3, line 13). The modern term 'stringhalt' is supposed to be a corruption of this.
ii. The cause of conventional, sporadic stringhalt is unknown. The epidemic form seen in Australia is thought to be due to a toxin, and is associated with the weed *Hypochoeris radicati*.
iii. Partial myotenectomy of the lateral digital extensor. The prognosis is guarded to favourable. Most horses improve, some almost completely, but the result is not predictable.

28 i. The dorsopalmar projection of the carpus reveals advanced ossification of the diaphyses of the radius and third metacarpal bone, early ossification of the distal radial epiphysis but no evidence of ossification of the carpal bones or epiphysis of the proximal third metacarpal bone. Centres of ossification have usually developed within each of the cuboidal bones of the carpus by 300 days of gestation and ossification of these bones is well advanced by full term gestation. This radiograph was made of an approximately 260-day-old fetus.
ii. The cartilage which forms the bone precursor is relatively soft and easily deformed. In premature and dysmature foals the carpal bones may be only partially ossified and hence prone to plastic deformation on commencement of weight bearing, leading to permanent malformation of the bones.

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29 A seven-year-old show jumper has a history of chronic bilateral forelimb lameness and a 'pottery' gait. The feet are placed toe-first, and the cranial phase of the stride is shortened in both forelimbs. Treatment with corrective farriery (egg-bar shoes) and isoxsuprine has proved unsuccessful. Palmar digital perineural analgesia abolishes the grade 1/5 lameness on the left forelimb, and results in a right forelimb lameness of similar severity. Analgesia of the left distal interphalangeal joint resulted in only partial improvement after 30 minutes. **29a** and **29b** illustrate the lateromedial radiographs of each fore foot.
i. What radiographic changes are present?
ii. What are the differential diagnoses?
iii. How would you investigate the problem further?
iv. What treatment should be recommended?

30 This horse became entangled in barbed wire six weeks previously. The skin wound has improved dramatically, but failed to heal (**30a**).
i. What likely complication is preventing the wound from healing?
ii. Why has this complication developed?
iii. How would you confirm your diagnosis, and what treatment would you recommend?



29 & 30: Answers

29 i. This horse has bilateral extensor process fragmentation, but these fragments are small, rounded, and trabeculated. There is evidence of osteoarthritis of the distal interphalangeal (DIP) joint on the left forelimb, with osteophytes on the palmar aspect of the second phalanx and the proximal articular surface of the navicular bone.
ii. This horse could be suffering from navicular disease and/or degenerative joint disease of the DIP joints.
iii. Navicular bursal analgesia could be used in an attempt to further localise the site of pain (further radiographs should be taken of both the left and right fore navicular bones). DIP joint arthroscopy would allow assessment of the joint and the removal of the extensor fragments if necessary.
This horse had degeneration of the articular cartilage in the left joint, together with hyperplastic synovial membrane, but no such changes in the right, suggesting unilateral DIP osteoarthritis, possibly concurrent with navicular disease.
iv. The extensor process fragments may or may not be significant and can be removed. However, the presence of arthritic changes in the left DIP joint, and possible concurrent bilateral navicular disease, suggests additional pathology which will not respond to simple removal of the fragments. The joints can be medicated with hyaluronic acid and/or steroids. Ultimately, a neurectomy may be the only way to abolish the lameness.

30 i. A bone sequestrum has formed in the depths of the wound. (A foreign body should also be considered.)
ii. The initial injury resulted in stripping of the periosteum over a portion of bone. Blood supply to cortical bone is centrifugal (from the medulla outwards) but the outer third of the cortex will become ischaemic if the periosteum is removed. The bone fragment is unlikely to be resorbed in the presence of infection.
iii. Radiography will reveal the sequestrum (**30b**). However, the fragment of bone may be thin and will only be visible over a narrow range of projections. Accurately recording the anatomical location of damaged periosteum during initial management of the wound will facilitate choosing the correct radiographic projection later. The bone sequestrum must be removed surgically.



31 Three weeks before the picture was taken (**31**), this nine-year-old horse, used for work in the tanning industry, was shocked and in severe pain as a result of an injury to the cranial aspect of its left forelimb. The wound had a serous discharge.
i. What do you think caused the lesion?
ii. What is the appropriate first aid?
iii. What measurements would give you a rough guide to the prognosis?







32 This eight-year-old mare (**32a**) was found severely lame in the field three days previously and had shown no improvement. A radiograph was obtained of the shoulder (**32b**).
i. Describe the radiological features.
ii. What additional information might be useful?
iii. How would you manage this case?

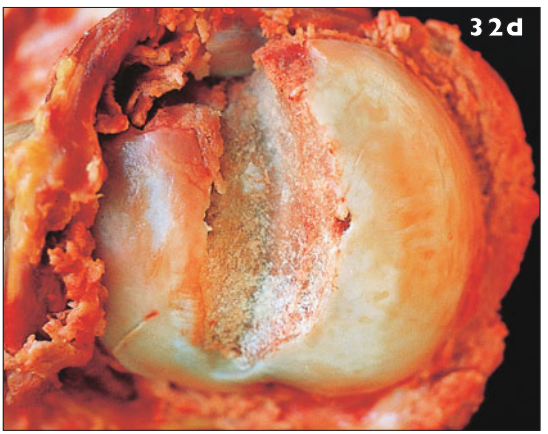
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31 & 32: Answers

31 i. A spill of caustic alkali used in the tanning industry.
ii. If you know the aetiology, the wound can be treated with a dilute acid, such as vinegar. Otherwise, the area can be gently cleaned, with a mild antiseptic saline solution, and covered with antibiotic ointment. If the burn is full thickness and involves more than 15% of the body surface area, supportive therapy will be necessary. Fluid and electrolyte losses should be replaced, avoiding overhydration since the horse will be hypoproteinaemic. The horse may also be hyperkalaemic, so electrolytes should be measured as soon as possible. Analgesics, in the form of non-steroidal anti-inflammatory drugs, antibiotics and tetanus prophylaxis should be administered. A high protein diet should be introduced.
iii. Animals with burns covering more than 50% of their body surface area usually die. This percentage can either be assessed visually or by measuring the burnt area.
Body surface area = 0.1 × body weight in kg × $^{2}/_{3}$ in square metres.

32 i. This is a mediolateral view of the scapulohumeral joint. There is subluxation of the humeral head, which is displaced caudally. A fracture fragment is present, probably displaced from the caudal aspect of the distal scapula.
ii. A craniomedial–caudolateral oblique radiograph would give further information about the direction of subluxation (medial or lateral), the precise location of the fracture and any additional fractures.
The humeral head was displaced medially (**32c**). The fracture involved the caudomedial aspect of the glenoid cavity of the scapula. No other fractures were identified.
iii. Craniolateral luxations, without concurrent fractures, have been successfully managed by reduction under general anaesthesia. Caudomedial subluxations are usually associated with a fracture of the medial aspect of the scapula, and although reduction can be achieved under general anaesthesia, reluxation tends to occur. Secondary changes in the humeral head develop rapidly.
The subluxation in this horse was reduced but recurred, and the horse was humanely destroyed. A very deep sagittal groove had been created in the humeral head (**32d**).





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33 **i.** What structures can be identified in this arthroscopic field (**33**)?
ii. What is the injury?
iii. What is its significance?



34 A 12-year-old pony gelding has been kicked on the elbow region (**34**). Radiographs reveal a fractured olecranon.
i. Is the fracture likely to be displaced or non-displaced?
ii. What two approaches can be adopted for the treatment of fractures of the olecranon?
iii. How should this pony be treated, and what problems are likely to develop if the alternative course is adopted?



35 A Thoroughbred foal, which was born following correction of a dystocia, was unable to stand. Clinical examination revealed a number of deformities of the axial and appendicular skeleton (**35**).
i. From what syndrome is this foal likely to be suffering?
ii. What is illustrated here?
iii. Are any treatments available?



33–35: Answers

33 i. The third carpal bone towards the top, the radial carpal bone towards the bottom and the medial palmar intercarpal ligament (MPICL) between the two.
ii. The lateral aspect of the MPICL has ruptured close to its origin on the palmarolateral non-articular surface of the radial carpal bone. Frayed fibres are suspended in the irrigating fluid.
iii. Ligamentous tears of this type are encountered regularly during arthroscopic surgery for conditions such as carpal chip fractures, and it is thought that they are part of the carpitis syndrome in juvenile racehorses.

34 i. The non-weight bearing stance with the flexed carpus suggests that the fracture is displaced and that the pony has lost the normal function of the triceps muscle.
ii. • Conservative therapy.
• Surgery, involving reduction and stabilisation by internal fixation with a bone plate on the caudal (tension) side of the ulna.
iii. Surgically. Conservative therapy should only be considered in animals with relatively non-displaced fractures which allow them to stand square with a straight limb. Resting the limb is likely to lead to overload of the opposite forelimb during the healing period, and continued flexion of the carpus will lead to carpal contracture. In addition, if it is displaced, the fracture is likely to heal by fibrous union leading to permanent lameness.

35 i. 'Contracted foal syndrome' is a term which has been used to describe a variety of combinations of congenital appendicular and axial contractures and curvatures in the foal. These deformities include arthrogryposis (deformity of the limbs characterised by curvature, multiple articular rigidities and dysplasia of the muscles), torticollis or 'wry-neck', scoliosis, lordosis and kyphosis, varying degrees of flexural deformity involving the limbs, and asymmetric formation of the cranium or 'wry-nose'.
ii. This picture reveals a foal with a flexural deformity of the tarsus, which was bilateral and accompanied by other flexural deformities of the forelimb fetlocks and carpi. Radiographs revealed normal bony structure of all appendicular joints, including the tarsi. Palpation of the flexors of the tarsus revealed increased tension, particularly in the peroneus tertius. A unilateral congenital flexural deformity of the right hock of a foal, resulting from an abnormally short peroneus tertius muscle, has been reported and was treated surgically with favourable results.
iii. If the deformities associated with 'contracted foal syndrome' are mild, then spontaneous resolution is possible, given time and adequate nursing care. Manual manipulation, splints, casts and surgery, such as a check ligament desmotomy, as well as oxytetracycline therapy, can be used where appropriate. Severe deformities, as seen in this case, are best treated by humane destruction. At present there is no evidence of an inherited aetiology.

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36 The illustration (**36**) shows a lateromedial radiograph of the left hind fetlock and pastern of a five-year-old potential event horse.
i. What lesion is present?
ii. What is suggested by the radiographic changes on the dorsal surface of the bone, and what further view should be taken?
iii. How would you treat this?
iv. What is the prognosis for a return to competitive soundness?



37 The hindlimbs of a two-month-old foal with a history of a 'bunny-hopping' gait of four weeks duration are illustrated (**37a**).
i. What is the most likely diagnosis?
ii. How would you confirm your diagnosis?
iii. How would you treat this foal?
iv. What is the prognosis for an athletic future?



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36 & 37: Answers

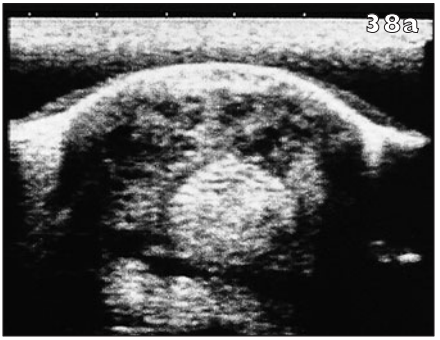
36 i. The radiograph shows a healing fracture in the frontal plane of the first phalanx, three months after initial injury.
ii. The new bone deposition along the dorsal surface suggests that the injury was more complex than a simple frontal fracture. A dorsoplantar radiographic view should be obtained. This case had two fracture planes – sagittal and frontal.
iii. Treatment was conservative, involving box rest, with the horse tied up for the initial four weeks, and the distal limb in a Robert Jones bandage. Alternatively, the fractures could have been stabilised with lag screws, but screw placement would have been complicated by the presence of two fracture planes.
iv. The prognosis is guarded because of the possibility of degenerative joint disease.

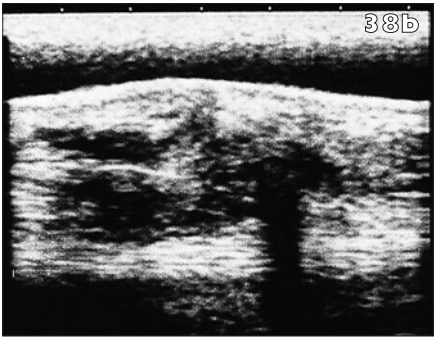
37 i. Collapse of the third and/or central tarsal bones as a result of dysmaturity at the time of birth. The gait is highly suggestive, and the tarsal contour, with a marked dorsal tilt of the proximal calcaneus, makes this the most likely diagnosis.
ii. A lateromedial radiograph of the tarsal region (**37b**) permits evaluation of the shape of the small tarsal bones (mainly the third and central tarsal bones). A fragment of the third tarsal bone has been squeezed dorsally, resulting in partial collapse of the joint and associated lameness.
iii. A tube cast or splinted bandage could be applied for 3–4 weeks to encourage healing of the fracture (**37c**). If lameness persisted, it would be possible, at a later date, to surgically arthrodese the two affected joints.
iv. If natural ankylosis occurs, the lameness is likely to disappear, allowing the animal to be ridden at a later date. In such cases the more severe the degenerative joint disease, the more likely that ankylosis will develop and abolish the pain.





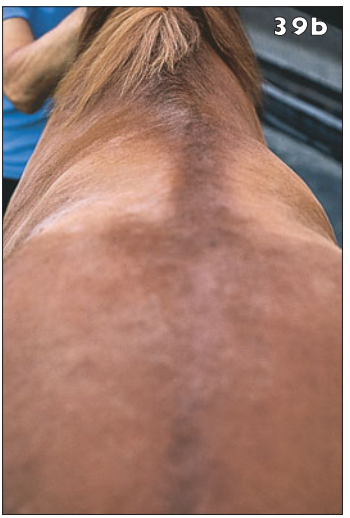
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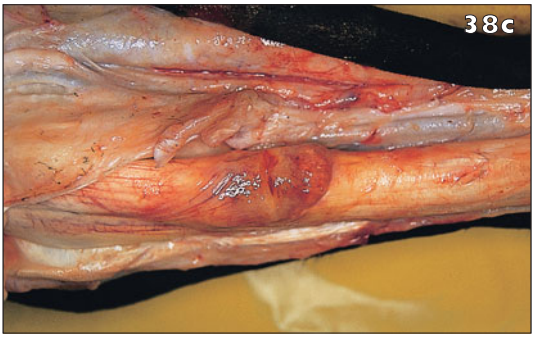
38 A 12-year-old event horse has sustained a wound on the palmar aspect of the distal metacarpal region. The horse has remained lame, with a discharging wound, in spite of treatment with systemic antibiotics. Six weeks after injury a synovial fluid sample obtained from the digital sheath reveals only mild elevations in total protein concentration and total nucleated cell count. The illustrations show ultrasonographs from just proximal to the digital sheath (**38a** – transverse image; **38b** – longitudinal image).
i. Describe the ultrasonographic findings.
ii. What is your diagnosis, and what pathological process is taking place?
iii. What action would you advise?
iv. How could you have improved on the initial therapy?





39 A yearling Thoroughbred presented with a deformity of the back (**39a, 39b**).
i. What two physical deformities of the back are present?
ii. What is the most likely underlying anatomical abnormality?
iii. How would you investigate the case further?

38 & 39: Answers



38 i. In the transverse section, the superficial digital flexor tendon (SDFT) is enlarged and contains numerous anechoic foci. The longitudinal view confirms this disruption of the SDFT and also part of the deep digital flexor tendon (DDFT).
ii. Based on the history and the ultrasonographic features, the horse has suffered a laceration of the SDFT and the DDFT proximal to the digital sheath (at the level of the discharging wound). The discharge suggests that contamination at the time of injury has led to an infective tendinitis. These changes were confirmed at post mortem (**38c**).
iii. The tendons are so severely damaged that the prospect for a full return to athletic work is unlikely. Therefore, euthanasia is probably the best option. If treatment were considered, extensive surgical debridement of the infected tendons (a large portion of the SDFT stretching from the fetlock to the mid-metacarpal region and most of the DDFT in the distal metacarpal region), followed by casting of the limb, would be necessary.
iv. Early surgical treatment, involving debridement of the lacerated tendon ends and suturing using a three-loop pulley suture, would have resulted in less tendon damage before the infection was controlled. At that stage, the absence of involvement of the digital sheath would have led to a better prognosis for recovery.

39 i. Kyphosis ('arching') and scoliosis (lateral bending).
ii. Hemivertebrae, if the deformity is congenital. Trauma or infection would have to be considered if the lesion were acquired.
iii. Vertebral radiography – this demonstrated congenital hemivertebrae in the caudal thoracic spine in this yearling.

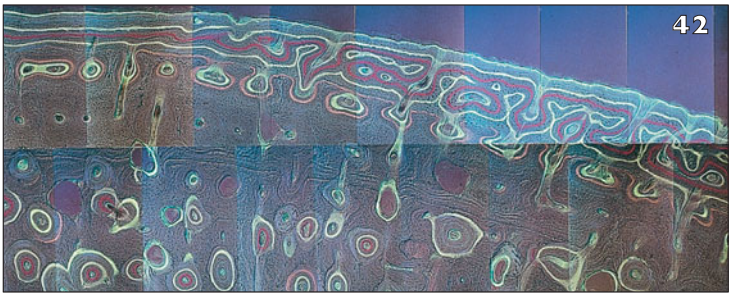
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40 A three-year-old Irish Draught-cross mare was recently 'rescued' by an animal charity. The mare is known to be in foal, and was one of a group of animals in poor condition. Intermittently, the horse has great difficulty using the right hindlimb, which appears stiff and tends to be dragged behind (**40**). Although the problem may last for several minutes, even hours, between bouts the limb is used normally.
i. What is your diagnosis, and is the mare's condition relevant to the problem?
ii. How would you treat this problem?
iii. What complication is thought to result from one of these treatments?



41 An eight-year-old hunter gelding pulled up lame on the left forelimb while out hunting. A horizontal laceration was discovered on the palmar aspect of the pastern (**41**).
i. What important structures could have been injured?
ii. How would you manage this case?
iii. Based on what you can see, do you think the case has a good prognosis?





42 'Modelling' and 'remodelling' are common terms used when discussing bone microstructure.
i. From this composite photomicrograph (**42**) of a transverse section through an equine third metacarpal bone, labelled *in vivo* at one-monthly intervals, what feature(s) are indicative of a. modelling and b. remodelling?
ii. What are the two different histological types of bone forming at the periosteal surface?

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40–42: Answers

40 i. The description and the appearance of the limb support a diagnosis of upward fixation of the patella. In some young animals in particular, loss of condition seems to affect the action of the femoropatellar joint. This may relate to poor quadriceps tone associated with muscle wasting, and/or it has been suggested that reduction in the patellar fat pads allows the patella to sink into the trochlear groove, leading to a firmer hold when it is hooked over the proximal part of the medial trochlear ridge.
ii. • The most conservative approach involves feeding the mare an appropriate ration. Restoration of the patellar fat pads should change the patellar dynamics and eliminate the problem. However, the recurrent lengthy periods of upward fixation, combined with the perceived difficulty of putting weight on an in-foal mare, made the new owners opt for surgical treatment.
• Upward fixation is very effectively treated by medial patellar desmotomy. This prevents the patella 'locking'.
iii. Medial patellar desmotomy may lead to fragmentation of the distal part of the patella. It is suggested that instability following desmotomy predisposes to the development of this condition.

41 i. The important structures are the deep digital flexor tendon, the digital annular ligament, branches of the superficial digital flexor tendon, and the digital synovial sheath.
ii. You should assess carefully any damage to vital structures as this will significantly affect the treatment and prognosis. Immediate and careful debridement with sharp dissection and saline lavage is essential. General anaesthesia may be necessary if vital structures have been injured. If a tendon is severed, without too much tissue trauma and contamination, it can be sutured and the limb cast. If the digital sheath is involved, lavage from proximal to the fetlock, under aseptic conditions, is usually indicated. Some surgeons prefer to leave an indwelling ingress cannula for postoperative treatment with saline and antibiotics. Contaminated wounds are best left open to allow drainage. High levels of parenteral antibiotics, together with anti-inflammatory drug therapy, should be maintained for at least seven days, and much longer in some cases.
iii. This horse has suffered a partial laceration of the deep digital flexor tendon. Such cases often carry a poor prognosis despite good management.

42 i. a. Active periosteal new bone formation – indicated by the layers of new bone which have formed between each coloured line (*in vivo* label). (**Modelling** refers to a process involving either deposition or resorption of bone at the periosteal or endosteal surfaces, and is a mechanism whereby the cross-sectional shape of a bone may be changed, possibly as an adaptive response to changes in its functional loading.)
b. Circular resorption spaces filled, to a greater or lesser extent, with new bone (indicated by circular coloured labels) within the body of the cortex. These indicate secondary osteon formation. (**Remodelling** refers to a process which occurs within the bone tissue and involves removal of a cylindrical 'unit' of bone and its replacement with new osteoid by the coordinated activities of osteoclasts and osteoblasts.)
ii. Circumferential lamellar bone (to the top left of the picture) and primary osteonal bone (to the right). Note the great variation in thickness of total bone added to the periosteal surface over an equivalent time period (indicated by the coloured labels) between the two different bone types.

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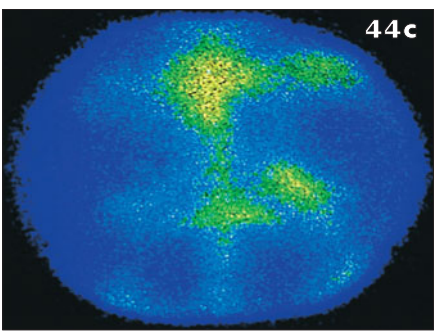
43 A four-year-old Thoroughbred presented with mild chronic bilateral forelimb lameness which responded to palmar digital perineural analgesia (**43a** illustrates a lateromedial radiograph of one of the fore feet).
i. Comment on the foot balance and why this may be significant.
ii. Discuss how this can be improved, and suggest what shoes should be applied.





44 A 12-year-old pony presented with an acute onset, severe right hindlimb lameness of two weeks duration and a tentative diagnosis of upward fixation of the patella.
i. What clinical signs is the pony showing (**44a, 44b**)?
ii. What is revealed in the dorsal bone scan of the pelvis (**44c**)?
iii. What is your diagnosis, and how would you confirm it?

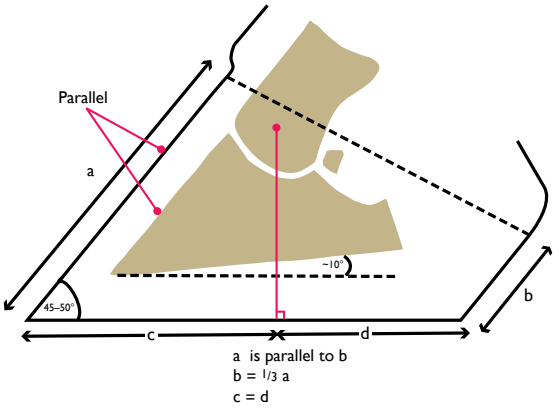




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43 & 44: Answers

43 i. **43a** shows a severely broken back foot–pastern axis, associated with long toe–low heel conformation. The orientation of the solar border of the third phalanx slopes palmarodistally, and the horse has divergent heel and dorsal hoof walls. A perpendicular line from the centre of a circle drawn around the distal interphalangeal (DIP) joint intersects the weight-bearing surface of the foot close to the heels. The ideal foot conformation is shown in **43b**.



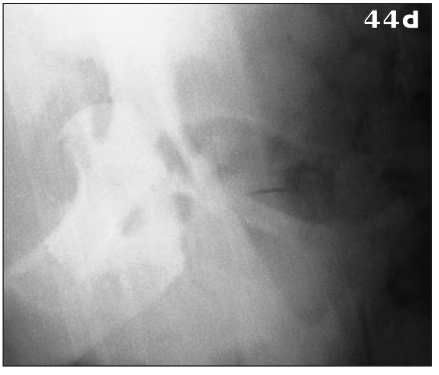
This defective foot conformation is thought to exert abnormal pressure on the palmar soft tissue structures of the foot, leading to pain and possibly eventually navicular disease.

ii. The foot conformation can be improved by trimming the toe. 'Dubbing' the toe will shorten it in a dorsopalmar direction and reduce leverage. If it is possible to shorten the toe in a proximodistal direction, this will improve the angulation of the third phalanx. However, in this case there is too little sole to achieve much at this stage. The heels should be preserved, and shoeing should employ a shoe that extends as far caudally as possible to help support the heels and to shift the centre of weight distribution in a dorsal direction. A suitable shoe would be a wide-webbed, seated-out shoe with the branches extending caudally to the level of the bulbs of the heel. An alternative is the egg-bar shoe, which will often achieve greater caudal support. The shoes should not be nailed on past the lateral and medial limits of the foot, and the shoe should extend at least 3–4 mm outside the limits of the wall to allow heel expansion. Careful attention should also be paid to the mediolateral balance of the foot. This will depend on the presence of limb valgus or varus but, in a straight limb, the medial and lateral walls should be of the same height with the medial wall slightly more vertical than the lateral.

44 i. Clinical inspection reveals a very straight limb conformation – there may be upward fixation of the patella in the right hindlimb. When viewed from behind, the bony prominence of the right calcaneus appears to be located further proximally than the left.

ii. The dorsal bone scan of the pelvis reveals the presence of a hot spot in the region of the right coxofemoral joint.

iii. A standing ventrodorsal radiograph of the pelvis shows a dorsocranial luxation of the right femoral head (**44d**).



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45 The third metacarpal bone illustrated in **45** was obtained post mortem from a two-year-old racehorse which was destroyed after it had sustained a fracture of another bone.
i. How might this bone be identified as being from a young racehorse in intensive, early training?
ii. What are the likely physiological objectives of the process responsible for the apparent changes?
iii. What clinical signs may have been apparent in relation to these changes, and how would you manage them?



46 A nine-year-old hunter-type horse presented with a history of hindlimb stiffness, toe dragging, abnormal hind shoe wear and a reluctance to jump. Clinical examination revealed bilateral hindlimb lameness (exacerbated by flexion of the hock), shortened cranial phase of the stride, lowered foot flight arc and mild distension of the tarsocrural joint.
i. Which projection of the right hock is illustrated in **46**?
ii. What radiographic abnormalities can be identified, and what is your diagnosis?
iii. What other radiographic views should be taken?
iv. How would you confirm this problem as the cause of the lameness?
v. What treatment is available, and what is the most important factor to be considered in arriving at a prognosis for this horse?



45 & 46: Answers

45 i. The dorsal and dorsomedial aspects of the third metacarpal bone are covered by a layer of highly porous, fibrous bone indicative of active periosteal new bone formation at the time of death. Increase in peak strains associated with the beginning of high speed work in young Thoroughbred racehorses stimulates modelling of the third metacarpal bone. Periosteal new bone forms preferentially on the dorsal and dorsomedial cortices due to the change in the distribution of strains within the bone.
ii. Reduction of peak bone strains.
iii. Forelimb lameness of variable intensity. Heat, mild oedematous swelling and pain on palpation of the dorsal aspect of the metacarpus. The intensity of training should be drastically reduced until the signs have subsided. Resumption of high speed work should be gradual.

46 i. The radiograph is a dorsolateral plantaromedial oblique projection.
ii. The radiograph demonstrates advanced degenerative joint disease of the proximal intertarsal joint, with loss of normal joint margins and joint space, subchondral bone lysis and surrounding sclerosis, especially in the distal talus. (The distal intertarsal and tarsometatarsal joints were less obviously affected, with changes restricted to narrowing of joint spaces and small periarticular spur formation, which are not well demonstrated on this radiograph. No abnormalities were noted in the tarsocrural joint.)
iii. Other radiographic views helpful in assessing the extent of the intertarsal and tarsometatarsal joint changes are the dorsoplantar, plantarolateral dorsomedial oblique and lateromedial projections. Since the lameness was bilateral, both hocks were radiographed. The left hock had changes of degenerative joint disease restricted to the distal intertarsal and tarsometatarsal joints. Therefore, this horse has bilateral bone spavin.
iv. Sequential regional analgesia was used to localise the bilateral lameness to the hock region. The lameness shifted from the right limb to the left limb following tibial and fibular (peroneal) nerve blocks. The left hindlimb lameness was abolished by the same nerve block. Intra-articular analgesia of the right tarsocrural joint abolished the majority of the lameness in this limb, confirming the proximal intertarsal joint as the major cause of pain . The left hindlimb lameness was eliminated following tarsometatarsal and distal intertarsal joint analgesia.
v. Numerous treatments have been described for bone spavin. These include: corrective shoeing and trimming; the use of analgesics and continued work to encourage ankylosis; firing and blistering; injection of agents into the joints to decrease pain (corticosteroids); cunean tenectomy; and techniques for both chemical and surgical arthrodesis. Fusion of the affected joints, either naturally or therapeutically, produces the best end result, and will usually allow the horse to return to its previous work – including dressage.
The prognosis for bone spavin is always guarded, and worse if the proximal intertarsal joint is affected. About 80% of horses will return to their previous work level if treated surgically for disease of the distal intertarsal and/or tarsometatarsal joints. However, as with conservative treatment, the prognosis is worse for animals with proximal intertarsal joint involvement. Only about 50% return to work following surgery.

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47 A three-year old Thoroughbred colt presented for a problem of the left mid-carpal joint. The horse had an effusion, and lameness was associated with this joint. A series of radiographs was obtained, but the only radiograph showing an abnormality was the skyline projection of the distal row of carpal bones (**47**).
i. What is your diagnosis?
ii. What treatment is recommended?
iii. What is your prognosis?



48 A grey pony mare, born and bred in England, presented for a problem of the hindquarters (**48**). The pony was not particularly lame and had no history of lameness.
i. What abnormality is present?
ii. What is the likely cause, and might it have been different if the animal had spent time in the USA.
iii. What test is helpful in confirming this problem?



49 The illustration (**49**) shows the lateromedial projection of a carpus.
i. What is your diagnosis?
ii. What associated clinical signs would you expect?
iii. What treatment would you recommend?
iv. What prognosis would you give?

47–49: Answers

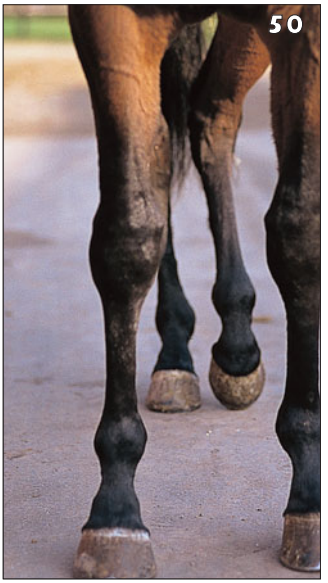
47 i. Osteochondral degeneration of the third carpal bone.
ii. Arthroscopic surgery, with debridement of the defective bone, is the ideal treatment. Surgery revealed depression of the articular cartilage, with degeneration of the underlying subchondral bone. All the defective bone was removed by curettage, and the joint flushed. Following surgery, a case such as this should receive at least six months rest to allow healing of the bone.
iii. If sufficient time is given, there is a reasonably good prognosis for the horse returning to racing. However, in a number of cases, the problem will recur, particularly if it is associated with defective conformation.

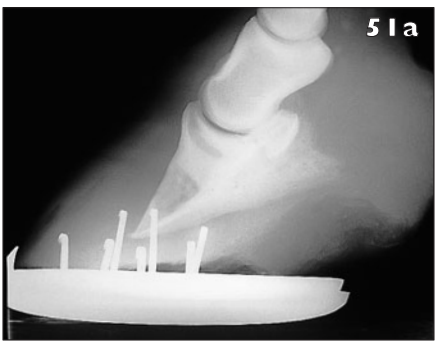
48 i. There is marked atrophy of the gluteal muscles on the left hindlimb.
ii. Muscle wastage as a result of disuse can be ruled out given the lack of a history of lameness. Therefore, the problem must relate to denervation. Trauma is unlikely, suggesting a systemic problem. This is a slightly unusual case of polyneuritis equi (cauda equina neuritis). In the USA, equine protozoal myeloencephalitis would have to be considered in such a case of focal neurogenic atrophy.
iii. An ELISA has been developed to measure the increase in circulating antibodies to P_2-myelin protein seen in cauda equina neuritis.

49 i. Osteochondroma ('cartilaginous exostosis') of the caudodistal radius.
ii. Effusion of the flexor synovial sheath of the carpus. Lameness usually results from the larger lesions, although onset may be insidious.
iii. Surgical removal, either by tenosynovotomy of the flexor sheath or by using an arthroscopic approach.
iv. The prognosis is generally good provided that significant structural damage to the flexor tendons has not occurred.

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50 The right forelimb of a mare with a marked conformational abnormality is illustrated (**50**).
i. What is the name given to this abnormality?
ii. What functional significance is the conformation likely to have?







51 A nine-year-old hunter had a history of intermittent right forelimb lameness over several months. The horse tended to land on its heels at the walk and trot on the right forelimb, and was grade 2/5 lame at the trot on that limb. Flexion tests were negative. Lateromedial and dorsoproximal–palmarodistal oblique ('upright pedal') radiographs were obtained of the right fore foot (**51a, 51b**).
i. What condition does this gait suggest?
ii. Describe the radiological changes.
iii. Discuss the aetiology, bearing in mind the unilateral nature of the condition.
iv. How would you manage this case?

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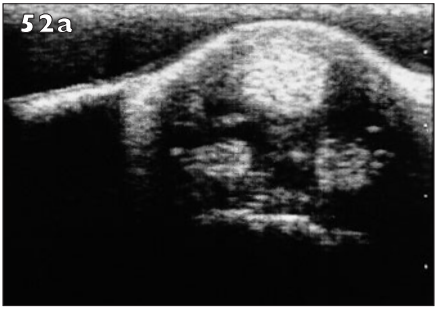
50 & 51: Answers

50 i. 'Bench-knee' or 'laterally offset cannon'.
ii. It has been proposed that this conformation leads to overload of the medial aspect of the carpus and metacarpus, and predisposes to middle carpal joint injuries, most of which occur on the medial aspect (radial carpal bone and radial facet of the third carpal bone).

51 i. This gait is most commonly associated with laminitis.
ii. The radiographs show rotation of the third phalanx in relation to the hoof wall, with little distal displacement ('sinking'). The dorsoproximal–palmarodistal oblique projection shows small solar margin (Type VI) third phalangeal fractures, thought to be associated with fragmentation during rotation of the third phalanx.
iii. Laminitis can be triggered by a number of different factors. The best known and researched is carbohydrate overload in ponies. However, toxaemia, steroid therapy and repetitive trauma can also initiate the condition. In a unilateral case, such as this, repetitive trauma is the most likely explanation ('road founder'). Similar unilateral laminitis is also seen following limb overload.
iv. This horse is in the chronic stage of laminitis, although the history suggests interspersed acute episodes. If the distal phalanx is unstable, the application of shoes can make the condition worse, although some clinicians favour the use of heart bar shoes. Either these can be fitted, or the shoes can be removed and the horse kept on a thick bed. The dorsal hoof wall should be trimmed to return it to a parallel relationship with the distal phalanx. The heels should also be reduced to return the solar border of the distal phalanx to an angulation of 5–10° to the solar surface of the foot. This correction may need to be done over a number of sessions, ideally with radiographic control. If the distal phalanx is stable in the foot, wide-webbed, seated-out shoes can be applied with or without sole pads, depending on the flatness of the solar surface. Careful trimming in this way improved this horse's foot conformation and allowed it to return to work after nine months (**51c**).



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52 A pony was referred with a grade 3/5 right forelimb lameness at the trot, of three weeks duration. A provisional diagnosis of medial suspensory ligament branch desmitis had been made. On palpation, there were oedematous swellings over the palmaromedial aspect of the right metacarpophalangeal joint and on the palmar aspect of the mid-metacarpal region. The following images of the limb were produced.
52a A transverse ultrasonograph of the distal metacarpal region.
52b A transverse ultrasonograph of the palmar aspect of the metacarpophalangeal joint.
52c A transverse ultrasonograph of the palmaromedial aspect of the metacarpophalangeal joint.
i. Describe the ultrasonographic findings in the distal metacarpal and metacarpophalangeal regions.
ii. Do these findings confirm the previous tentative diagnosis of a medial suspensory ligament branch desmitis?
iii. What other tests would you employ?



53 This injury on the medial aspect of the right hock of a 13-year-old riding horse was caused by a kick from another horse (**53**). The horse was initially only stiff following the injury, but 36 hours later it had deteriorated and was very lame.
i. What do you suspect has resulted from this injury?
ii. What tests should be carried out?

52 & 53: Answers



52 i. There is no suggestion of any enlargement or abnormality of the architecture of the medial branch of the suspensory ligament (**52a**). However, on the transverse view of the palmar aspect of the metacarpophalangeal joint, the palmar surface of the medial proximal sesamoid bone is disrupted and seen as a series of multiple parallel echoes. The palmar annular ligament is also prominent. On the transverse view obtained from the palmaromedial aspect of the limb, a hypoechoic cavity is visible over an irregular axial and palmar aspect of the medial proximal sesamoid bone.
ii. No. These findings are very suggestive of infective (septic) osteitis of the medial proximal sesamoid bone after a penetrating injury.
iii. Other tests should include radiography to determine the extent of the damage to the medial proximal sesamoid bone, and digital sheath synoviocentesis to determine if the sheath is infected. A radiograph of this case is illustrated in **52d**. The synovial fluid from the sheath showed only mild elevations in total protein concentration and total nucleated cell count indicative of 'sympathetic' effusion.

53 i. In view of the time lameness took to develop, the most likely diagnosis is tarsal sheath or tarsocrural joint infection by extension from the injury. A fracture of bony structures adjacent to the wound cannot be completely excluded but lameness is usually immediate if this has occurred.
ii. Synoviocentesis under aseptic conditions will confirm joint or sheath infection. This should be performed at a site distant from the injury to avoid introducing infection if the joint is non-infected. An infected sample will appear turbid, with a low viscosity, a nucleated cell count of over $30x10^9$/l (90% neutrophils) and a total protein concentration of over 40 g/l. In the early stages these figures will be lower, so any increase should arouse suspicion. Culture should be attempted using an enrichment medium. The horse may be febrile. Haematology may reveal a leucocytosis with a neutrophilia. Radiography ought to be performed as a precaution, to eliminate concurrent fractures.

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54 A 16-year-old show jumper gelding developed a marked swelling of the left gaskin region over the course of several weeks (**54a**). The animal had a stiff gait, but was very willing to bear weight on the limb, and there was no evidence of any pain on palpation of the swelling.
i. How would you investigate this?
ii. What other organ might be worth examining as part of the investigation of the problem?
iii. What is the likely prognosis?

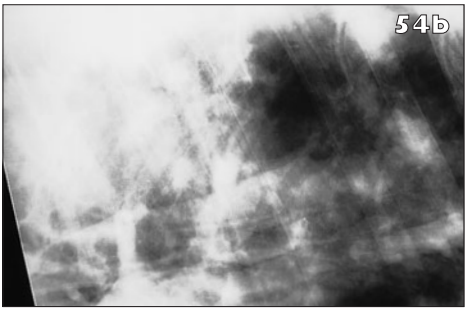


55 An eight-year old Quarterhorse gelding presented with a swelling associated with the carpus (**55a**). No lameness was apparent, but the owner was concerned about the appearance.
i. What is your differential diagnosis?
ii. How might you go about achieving a definitive diagnosis?
iii. If this swelling turned out to be a synovial hernia, what would be the preferred method of treatment?

56 The illustration (**56**) shows a dorsal gamma camera image of the right cranial portion of the pelvis in a five-year-old Thoroughbred racehorse three hours after intravenous injection of 4.5 MBq 99^{m} technetium MDP.
i. What is the most likely diagnosis?
ii. Under what circumstances would this injury be most likely to arise?
iii. What other techniques might help to confirm the diagnosis in the standing horse?



54–56: Answers



54 i. The results of routine haematology and clinical biochemistry were regarded as normal. Ultrasonographs were difficult to interpret; they revealed a thick mass of soft tissue. Radiography of the limb failed to reveal any bony abnormalities.
ii. In view of the likelihood that the lesion is neoplastic, it is worth radiographing the lungs to try to identify metastases. Multiple nodules were identified in the lungs in this case (**54b**).
iii. The age of the animal, the gradual increase in the swelling and the relative lack of lameness all point to the lesion being neoplastic. Therefore, although appropriate investigation is warranted, the prognosis is likely to be poor. Post-mortem examination revealed a sarcoma in the caudal thigh.



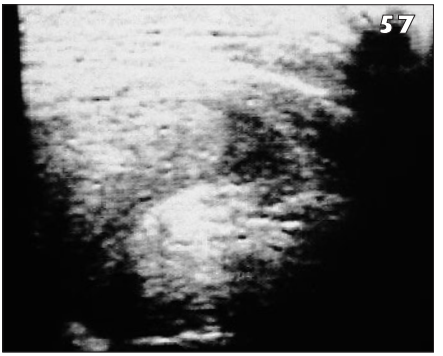
55 i. The differential diagnosis includes synovial hernia or ganglion, and a localised hygroma.
ii. To identify the nature of the swelling, and particularly to find out if there is any communication with a synovial structure (joint or tendon sheath), a contrast radiograph (done aseptically) is recommended. **55b** shows a dorsolateral palmaromedial oblique radiograph after injection of contrast material. It can be seen that there is communication with the mid-carpal joint. The diagnosis is therefore a synovial hernia or fistula associated with the mid-carpal joint.
iii. The best treatment is surgical debridement of the fistula and closure of the hole in the joint capsule. Such surgery was successfully performed in this case.

56 i. The intense 'hot spot' over the cranial ilium suggests a fracture.
ii. Spontaneously, during fast work, usually in racehorses. These are a type of 'stress' or 'fatigue' fracture.
iii. Ultrasonography, possibly radiography. Rectal examination might also reveal localised swelling and tenderness.

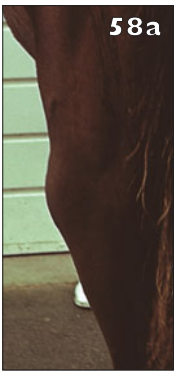
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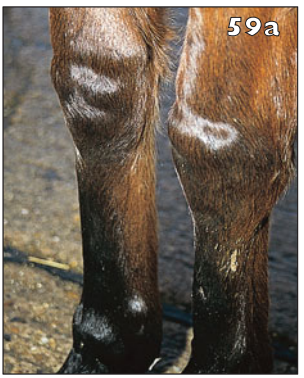
57 An eight-year-old riding horse had a sudden onset of severe forelimb lameness. The cranial phase of the stride was markedly shortened. There was some pain on deep pressure over the intertubercular (bicipital) bursa.
i. Describe the ultrasonographic features illustrated in **57**.
ii. What is your differential diagnosis?
iii. What else would you do diagnostically?
iv. What is your treatment and prognosis?



58 A horse developed a firm, subcutaneous mass over the lateral aspect of the stifle (**58a**). The mass appeared loosely attached to underlying structures, was non-painful and the horse was not lame. Radiography revealed characteristic changes (**58b**).
i. What is your diagnosis?
ii. How would you manage this case?











59 A two-year-old Thoroughbred filly presented with swellings on all four limbs (**59a–59c**). These had been present for eight months, although the horse had never been particularly lame.
i. What is this condition?
ii. What tests would be useful to confirm the diagnosis?

57–59: Answers

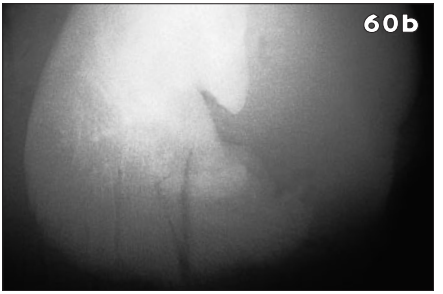
57 i. This is a transverse scan of the intertubercular bursa. There is an abnormal amount of echolucent fluid within the bursa. There is also some echodense material. The tendon of biceps brachii is not totally uniform in echogenicity. This may be a scanning artefact or real. This could be determined by rocking the transducer slightly. The bone contours of the tubercles of the humerus appear normal.
ii. • Infection.
• Trauma.
• Other.
iii. Synoviocentesis: nucleated cell count (total and differential), red blood cell count, total protein concentration, Gram stain, bacterial culture (aerobic and anaerobic).
Both infection and trauma can cause an elevation of nucleated cell count and increased proportion of neutrophils. In association with infection the total nucleated cell count is usually, but not invariably, higher than that seen with trauma, with a higher proportion of neutrophils. An absence of bacteria seen on Gram stain and negative bacterial culture do not exclude infection.
iv. Given the amount of echodense material, surgical exploration is justified, regardless of the primary cause, to debride the intertubercular bursa and the periphery of the biceps tendon, and to facilitate vigorous lavage. If infection was confirmed (most likely), prolonged broad-spectrum systemic antimicrobial therapy is indicated. Even with aggressive therapy, the prognosis is guarded because of the likelihood of postoperative adhesion formation.

58 i. Calcinosis circumscripta. This condition involves dystrophic calcification of subcutaneous connective tissue usually adjacent to joints and tendon sheaths. The lateral aspect of the femorotibial joint is one of the more common sites to be affected and the condition results in a prominent swelling in this location. Radiography reveals irregular radiopaque deposits at the centre of the swelling.
ii. The granulomatous tissue which surrounds and contains the dystrophic calcification can be surgically excised. However, the risk of complications associated with healing of a large surgical wound at this site are high, so surgery is only indicated in the presence of lameness which can be attributed to the lesion.

59 i. Polysynovitis associated with autoimmunity, analogous, in some ways, to systemic lupus erythematosus (SLE) and, in others, to juvenile rheumatoid arthritis in humans.
ii. Following synovial fluid analysis and synovial membrane histology, to identify an inflammatory arthropathy, any tests aimed at confirming an autoimmune problem. These would include tests to confirm the presence of circulating immune complexes and antinuclear antibodies. In man, some cases of SLE have deficiencies in certain complement components or immunoglobulin subclasses. The presence of immune complexes in synovial tissue, and the identification of immune complexes in another organ such as the kidney, would also support the diagnosis.

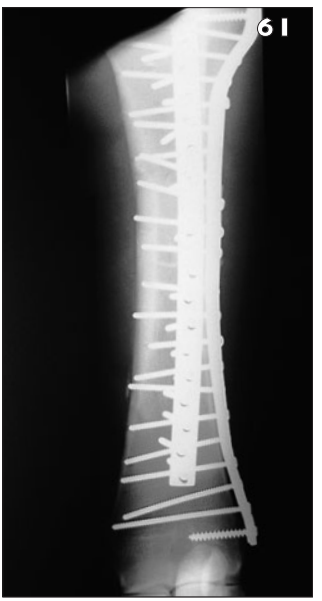
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60 A three-year-old Quarterhorse went suddenly lame on the left forelimb. Clinical examination revealed a hot foot and increased digital pulses. There was limited response to hoof testers and no solar abscess was detected on paring the foot. Preliminary radiographs did not reveal any abnormalities.
The lameness did not improve and the horse was referred for a second opinion after 14 days. It was still severely lame. Hoof testers produced some response over the lateral heel, but no abscess could be located. Further radiographs were obtained (**60a, 60b**).
i. Why was the veterinarian giving a second opinion at a distinct advantage over the first veterinarian in terms of making a diagnosis?
ii. What other procedures might have enabled an earlier diagnosis?
iii. How would you manage this case, and what is the prognosis?

61 The figure (**61**) illustrates a transverse fracture of the radius in a 650 kg horse which has been repaired with two dynamic compression plates (DCPs), one placed laterally and one cranially.
i. Give two reasons why such a fracture is approached from the lateral aspect of the limb, rather than the easier medial approach which might be used in a small animal.
ii. Having done well for four weeks, the horse suddenly deteriorated when the fixation broke down. There was no evidence of any infection. Why did the repair fail?
iii. How might the strength of the repair have been improved?



60 & 61: Answers

60 i. This horse has a 'wing' fracture (Type I) of the distal phalanx. The fracture plane is at an oblique angle to the standard lateromedial and dorsoproximal–palmarodistal oblique ('upright pedal') projections and such fractures are often minimally displaced, making identification on these views difficult. After 14 days, resorption around the fracture gap makes it more visible on radiographs.
ii. A dorsoproximolateral–palmarodistomedial oblique radiograph may have shown the fracture at the first examination. Nuclear scintigraphy would also have revealed a dramatic increase in bone turnover in the distal phalanx, indicative of a fracture.
iii. 'Wing' fractures of the pedal bone (Type I, extra-articular, and Type II, intra-articular) are difficult to stabilise by internal fixation so they are usually treated conservatively. This can either involve a foot cast (**60c**) or a shoe which stabilises the hoof walls (**60d**), such as a rim shoe or a bar shoe with quarter clips. In some cases a foot cast may be used for the first 12 weeks, followed by a bar shoe with clips to further protect the fracture. These fractures may never disappear radiographically, but the horse usually returns to soundness.



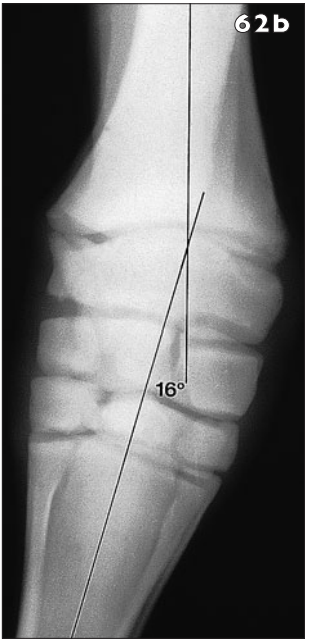


61 i. • Plates need to be placed on the tension side of a bone to produce maximum stability. The craniolateral aspect of the radius is the tension side. Therefore, cranial and lateral plates will produce the appropriate stability, and these are best placed by a lateral approach.
• The musculature on the lateral aspect provides good cover for the implants. Therefore, if there is some superficial wound breakdown, this will not lead to direct exposure and infection of the implants, in the same way as superficial breakdown of a medial wound.
ii. Cycling of the plates results in fatigue failure of the metal, and this will lead to failure of the repair if healing is not sufficiently advanced.
In this horse the lateral plate failed, followed within a short period by the cranial plate.
iii. Replacement of one of the dynamic compression plates with a dynamic condylar screw plate (DCSP) would have given a more rigid fixation. The DCSP is 5.8 mm thick in comparison to the DCP which is 4.8 mm thick. Triple plating is not considered an option as the number of holes required to apply three plates weaken the bone so much that it is likely to fail.

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62 A two-month-old Paint foal had a marked angular limb deformity in both forelimbs (**62a**). A dorsopalmar radiograph of the left forelimb (**62b**) confirms the problem (lateral on left of illustration).
i. What type of angular limb deformity is present?
ii. How would you treat it?







63 The picture above illustrates part of the examination of a horse with a subtle, chronic forelimb lameness.
i. How is this examination likely to aid the investigation?
ii. If the horse only appears lame on this rein, which limb is most likely to be painful?



64 A radiograph of a horse which suffered a synovial penetration on the dorsal aspect of the carpus is illustrated (**64**). What structure was penetrated?

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62–64: Answers

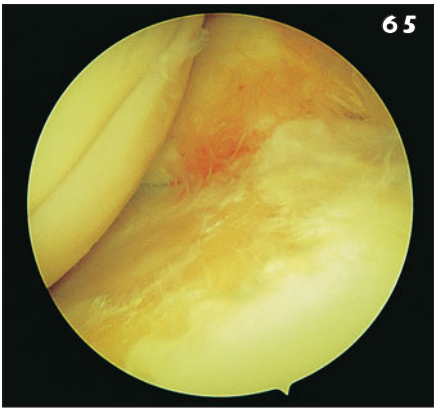
62 i. The foal has a valgus deformity of both carpi.
ii. Hemicircumferential periosteal transection on the concave aspect of each distal radius. To achieve a faster correction in an older foal, this procedure can be combined with a growth retardation procedure on the medial aspect of each distal radius, using staples, screws and cerclage wires, or screws and a small bone plate. These implants would have to be removed after correction had occurred.

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63 i. Lunging a horse in circles will often exacerbate a lameness. This is particularly true if the animal is trotted in tight circles on a hard surface. In addition, bilateral lamenesses, which tend to balance out on the straight, are usually exposed by circling.
ii. Lameness is usually most obvious when the lame limb is on the inside of the circle. Therefore, this animal is likely to be lame on the left forelimb. In a small percentage of cases the lameness is more obvious when the limb is on the outside of the circle, and some clinicians have tried to use this as an indication of the site of pain. However, individual examples of virtually any condition can be found which show this more unusual response to circling.

64 The common digital extensor (CDE) tendon. The radiographic projection is dorsomedial–palmarolateral oblique. Therefore, it is the dorsolateral aspect of the carpus that is highlighted. Palisading new bone is present on the lateral extensor ridge of the distal radius. These features indicate that inflammation of the sheath of the CDE is the most likely pathological process because the extensor carpi radialis tendon lies more medially. New bone on the extensor ridges is characteristic of sepsis in the adjacent tendon sheaths, and the predominance of change on a particular ridge can give useful clues as to the structure involved, which might be difficult to discern visually or by palpation.

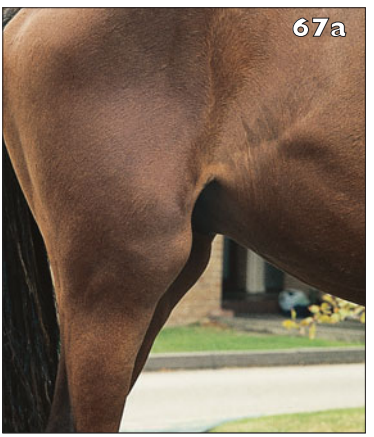
65 A 10-year old Quarterhorse roping gelding presented for sudden onset lameness of the left forelimb. An arthroscopic view of the left midcarpal joint is illustrated (**65**).
i. What lesion is present?
ii. What is the likely diagnosis?
iii. What would be the best approach to treating this horse?
iv. What is your prognosis?



66 A seven-year-old steeplechaser injured one of its hocks six weeks previously. The lameness improved steadily until the horse was only just perceptibly lame at the trot. However, the trainer was concerned that the hock remained very swollen, and that the horse responded dramatically to hock flexion.
i. What is the diagnosis (**66**)?
ii. Might the diagnosis have been harder to reach in a foal, and why?
iii. What is the treatment and prognosis?



67 A yearling colt presented with a history of a sudden onset swelling on the right hindlimb of four weeks' duration. The region of the swelling was very painful on palpation and manipulation, but the limb did not appear to be unstable (**67a, 67b**).
i. How lame is the colt ?
ii. Why is the region swollen?
iii. List the possible diagnoses.





65–67: Answers

65 i. Cartilage loss/erosion on the medial palmar aspect of the distal articular surface of the radial carpal bone.
ii. Osteoarthritis of the left mid-carpal joint.
iii. The defect, which was confined to the medial aspect of the radial carpal bone, could be debrided. In addition, the joint could be treated intra-articularly with hyaluronan or polysulphated glycosaminoglycan, supplemented with systemic therapy with these drugs and possibly non-steroidal anti-inflammatory agents.
iv. When osteoarthritis is present and appears to have occurred insidiously, the prognosis is guarded. Even if the problem is resolved in the short term, the owner needs to be warned that the lameness could recur at any time, and on subsequent occasions it may be refractory to further treatment.

66 i. Fracture of the lateral malleolus of the distal tibia.
ii. In a foal the lateral malleolus is a separate centre of ossification which fuses to the rest of the tibia at about six months of age. Therefore, in such an animal, great care must be taken before diagnosing a separate fragment in this area as a fracture.
iii. Opinions vary as to whether these fragments should be removed or treated conservatively. In the past some such cases were treated conservatively, and returned to racing following a period of rest. This, at first sight, surprising result may relate to the nature of the fractures, the majority of which are usually extra-articular. However, in theory, as they have an intra-articular component, fragments are best removed to reduce the likelihood of secondary degenerative joint disease. (The predominantly extra-articular location of these fragments means that these fractures are not candidates for arthroscopic surgery.)

67 i. The marked muscle atrophy on the right side, which has developed over only four weeks, suggests a severe lameness.
ii. The bulk of the swelling would appear to be in the patellar region, and involves a femoropatellar effusion.
iii. • Infective arthritis of the femoropatellar joint.
• Severe trauma to the stifle, possibly including a fracture.
• Osteochondritis dissecans of the femoropatellar joint, although the degree of lameness/pain makes this unlikely.
Radiography revealed a sagittal fracture of the patella. There was no evidence of joint infection.

68 **i.** What clinical signs are being shown by the Thoroughbred stallion illustrated in **68a**?
ii. What is the cause of the problem?
iii. Is any treatment possible?







69 The radiographs illustrated in **69a** and **69b** show the right fore pastern region of an aged riding horse.
i. How might you determine if the distal interphalangeal joint is involved?
ii. How would this affect the prognosis?

70 Bran is a popular feed for horses.
i. Name a condition affecting the skeleton which may arise from its over-feeding and list three clinical features.
ii. What are the pathological mechanisms behind this disease?
iii. How would you diagnose the condition?

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68–70: Answers

68 i. • Marked swelling of the whole of the left forelimb from the elbow to the foot.
• Flexural deformity of the carpus and, more markedly, the fetlock.
• Muscle wastage in the shoulder region.
ii. The swelling is due to (sporadic) lymphangitis; prominent lymphatics can be seen on the lateral aspect of the forearm. Often the cause of this is unknown. The flexural deformities and muscle wastage suggest chronic lameness, so the thickening is likely to be chronic involving fibrosis as well as oedema. (The horse was retired from racing after an injury on the dorsal metacarpus – the scar is just visible. Healing was protracted and the limb became progressively more oedematous).
iii. Once lymphangitis becomes chronic, the oedema is rapidly replaced by fibrous tissue. The bulk of the swelling is then irreversible. Phenylbutazone may be used to make the animal more comfortable.

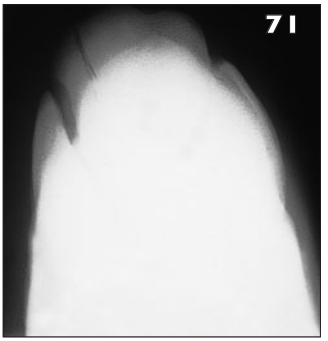
69 i. Contrast arthrography could be performed. Diagnostic arthroscopy would be difficult as the fracture is on the palmar aspect.
ii. Involvement of the distal interphalangeal joint would lead to a much poorer prognosis, although whatever the case, the prognosis for athletic soundness is guarded.

70 i. Nutritional secondary hyperparathyroidism:
• Intermittent, shifting lameness.
• Dental disease, secondary to resorption of alveolar bone.
• Bilateral enlargement of the mandibles and facial bones (in younger animals), 'Big Head', due to excess bone resorption and its replacement with profuse fibrous osteoid (osteodystrophia fibrosa).
ii. Bran has a high phosphorus and low available calcium content. When fed to excess, and/or in the absence of another dietary calcium source, absorption of calcium from the gastrointestinal tract is reduced while absorption of phosphorus is increased. Decreased serum calcium triggers secretion of parathyroid hormone which, in the presence of normal or elevated serum phosphorus levels, stimulates an increase in bone resorption, calcium absorption from the gastrointestinal tract and renal phosphorus excretion. If the dietary imbalance is maintained, chronic excessive bone resorption results in loss of mineralised bone mass and its replacement with poorly mineralised, fibrous osteoid.
iii. Serum calcium and phosphorus levels are often normal but fractional excretion of phosphorous (FEP) is elevated (> 0.5%). FEP may return to normal within 24 hours of feeding a balanced diet, emphasising the need for a detailed history, including dietary information, in the diagnosis of this condition. More recently, parathyroid hormone assays have become available.

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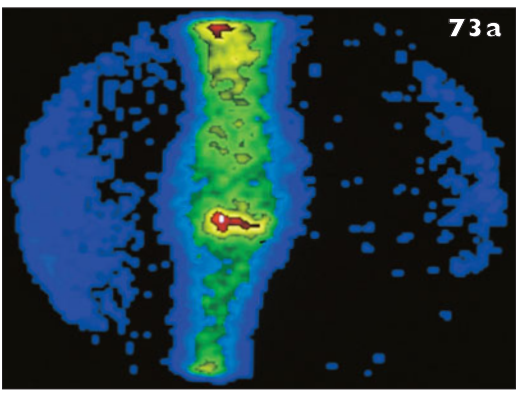
71 A two-year old Quarterhorse filly presented for an effusion of the middle carpal joint. The grade 2/5 lameness was improved by intra-articular analgesia. A full series of radiographs was obtained of the right carpus, but the only view that showed any abnormalities was the skyline radiograph of the distal row of carpal bones (**71**).
i. What is your diagnosis?
ii. What are the options for treating this horse?
iii. What is your prognosis?



72 This radiograph is a dorsolateral-plantaromedial oblique projection of the left tarsus of a 13-year-old heavy hunter with a history of sudden, violent exercise in a field, following turnout, after a period of box rest for another injury (**72**). The horse was acutely and severely lame on the leg, with no apparent physical abnormalities. The lameness was localised to the hock using a combination of regional and intra-articular analgesia.
i. Describe the regional and intra-articular analgesic techniques you would have used to localise the lameness.
ii. What is the diagnosis, and what other radiographic views would you take?
iii. How would you treat this case, and what is its long-term prognosis?



73 A five-year-old Thoroughbred racehorse pulled up lame following a race two weeks previously. Standard carpal radiographs failed to identify any significant abnormalities. A gamma camera image of the left carpus was obtained following intravenous injection of 99^{m} technetium MDP (**73a**).
i. What is revealed?
ii. What would you do next?

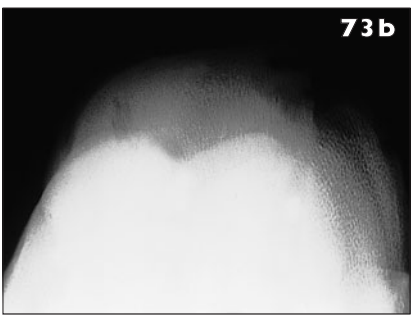


71–73: Answers

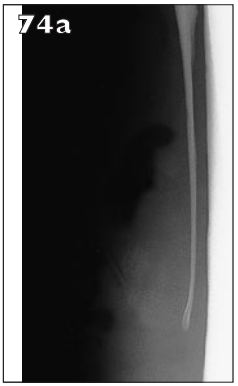
71 i. The horse has a sagittal slab fracture of the medial side of the third carpal bone (radial facet).
ii. The literature reports a 50% success rate with conservative treatment of such fractures. However, as a result of personal experience with conservative treatment, the contributor of the question prefers lag screw fixation, which was achieved in this case with a 3.5 mm diameter, 26 mm long cortical screw placed lag fashion across the fracture.
iii. The prognosis is guarded to fair, but improved success has been seen with the lag screw fixation technique.

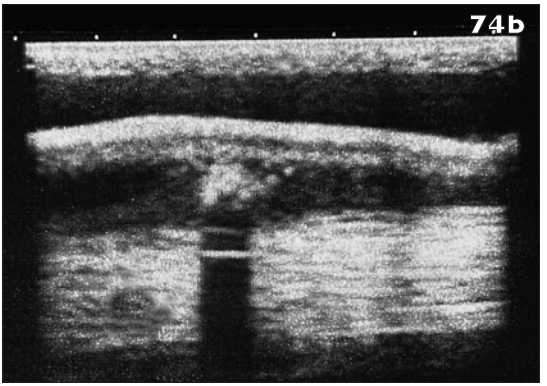
72 i. • A six-point nerve block, blocking the plantar nerves, plantar metatarsal nerves and dorsal metatarsal nerves, above the fetlock, will eliminate the fetlock and more distal regions if the lameness is not abolished.
• Subtarsal regional nerve blocks will similarly eliminate the cannon region as the site of pain.
• Tibial and fibular (peroneal) nerve blocks can then be performed. If the lameness is abolished, as in this horse, this confirms pain in the hock region.
• Alternatively, or on another day, intra-articular analgesia can be performed. Analgesia of the distal intertarsal and tarsometatarsal joints may confirm pain in these areas. Analgesia of the tarsocrural joint may confirm pain in that joint or the proximal intertarsal joint. Combined analgesia of the tarsocrural, distal intertarsal and tarsometatarsal joints in this horse only partially alleviated the lameness.
ii. This horse has a fracture of the dorsomedial aspect of the fourth tarsal bone. Small bone fragments can be seen dorsal to that bone and plantar to the central tarsal bone. Other radiographic views taken included lateromedial, flexed lateromedial, dorsoplantar, dorsomedial-plantarolateral oblique and flexed dorsoplantar projections. The fracture was just visible, with hindsight, on the lateromedial view.
iii. The fourth tarsal bone is only partially fractured, with the bone fragments all arising from the medial aspect of the bone. Since surgical repair is not a viable option, and removal of the fragments would involve a difficult approach with the possibility of additional damage, the horse was treated conservatively. This treatment consisted of box rest for eight weeks, followed by exercise in a yard for four weeks. Further radiographs taken at the end of this period failed to show any evidence of osteoarthritis of the intertarsal joints, and the horse was not lame at the walk. The final outcome was not known as the horse was retired for other reasons.

73 i. The bone scan shows an accumulation of radiopharmaceutical in the region of the third carpal bone.
ii. A skyline radiograph of the third carpal bone (dorso 30° proximal-dorsodistal oblique) should be obtained to assess the internal structure of the bone (**73b**). This shows sclerosis of the radial facet of the third carpal bone, with a focal area of decreased radiopacity superimposed. In view of the increased radiopharmaceutical uptake, this must be considered a 'prefracture' abnormality.


73b

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74 An eight-year-old gelding presented with a grade 4/5 right hindlimb lameness after it sustained a wound of the distal metatarsal region following kicking through a wooden wall. There was pronounced swelling together with a small wound on the plantaromedial aspect of the distal metatarsus, but minimal distension of the digital sheath in the pastern region. A synovial fluid sample obtained from the distal pouch of the digital sheath (pastern region) had a nucleated cell count of 5.9×10^9/l with a total protein concentration of 23 g/l. A dorsomedial–plantarolateral oblique radiograph and a longitudinal ultrasonograph of the distal metatarsus are illustrated (**74a, 74b**).
i. Does this animal have digital sheath sepsis?
ii. What is causing the severe lameness?
iii. What limits the information obtained from the ultrasonograph in this case?
iv. How would you treat this case, and what complications may arise?

75 A two-year-old Thoroughbred colt was off its food as a result of the problem illustrated in **75**.
i. What is your diagnosis?
ii. How does this condition develop?
iii. What treatment would you recommend, and what prognosis would you give?
iv. Why does the prognosis differ from that which you would give for a similar problem elsewhere in the body?



74 & 75: Answers

74 i. No, the synovial fluid analysis is not consistent with synovial sepsis. Synovial fluid values of >40 g/l total protein and >30×10^9/l nucleated cell count with >90% neutrophils are usually considered diagnostic of sepsis. The mildly elevated values in this case are suggestive of sympathetic effusion within the digital sheath (effusion within a synovial cavity in close proximity to, but not confluent with, a septic focus).
ii. The radiograph reveals faint parallel linear gas shadows in the soft tissues (difficult to see). The ultrasonograph shows a hyperechoic focus in the middle of a hypoechoic region in the subcutaneous tissues. This hyperechoic focus is casting an acoustic shadow over the digital flexor tendons. These changes are consistent with a foreign body within a subcutaneous abscess, which would correspond with the linear gas shadows on the radiograph. In view of the history this is most likely to be a wooden foreign body. All foreign bodies cause shadowing on ultrasonographs, with metal frequently producing a reverberation artefact depending on its size and shape. In this case a piece of wood had entered the superficial digital flexor tendon immediately proximal to the proximal limit of the digital sheath. The digital sheath had not been violated.
iii. The acoustic shadowing produced by the foreign body prevents evaluation of the structures deep to the surface of the foreign body. The degree of involvement of the flexor tendons and other structures can be better assessed by moving the probe to the medial and lateral aspects of the limb.
iv. The wooden foreign body was removed through a stab incision in the skin. The area was flushed, the wound left open and the limb bandaged. Improvement was immediate, but a low grade lameness persisted. Ultrasonographic examination revealed localised disruption of the superficial digital flexor tendon at the level of the penetration. This gradually healed over the following six months to leave a functional tendon with a good cosmetic result. Potential complications include septic tendinitis, tendon rupture and adhesions. Septic tendinitis is a rare complication, as tendon tissue seems relatively resistant to infection. It can be identified by serial ultrasonography which reveals rapid destruction of tendon tissue over a few days. Rupture of the tendon is unlikely, and depends on the degree of tendon damage. More than 60% of the cross-sectional area needs to be transected to create a significant risk of spontaneous rupture under normal weight bearing conditions. However, box-rest and controlled exercise would be advisable for approximately three months to minimise this risk. Return to normal exercise can be recommended once the tendon has healed as determined ultrasonographically. Adhesions can form between the damaged tendon, and the surrounding skin and subcutaneous tissues. These are less likely to limit the horse's usefulness than adhesions within a tendon sheath.

75 i. An open fracture of the rostral mandible caudal to the incisor teeth.
ii. Animals catch their lower jaw under a manger or through a ring on the stable wall. In their panic they pull back and avulse the lower jaw.
iii. The fracture can be reduced and stabilised on its oral (tension) side by means of wires placed around the incisors anchored either to the canines or to cortical screws placed in the diastemal region on each side. The prognosis is good.
iv. With the exception of small fragments which can be removed, an open contaminated fracture elsewhere carries a very guarded, if not hopeless, prognosis due to the high incidence of osteomyelitis of the fracture leading to failure of healing. The superior blood supply to the mandibular region means that, despite gross contamination, these fractures virtually always heal without complications.

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76 Two dorsoplantar, postoperative, radiographic views of the tarsal region of different foals are illustrated (**76a, 76b**).
i. What type of surgical procedure was performed?
ii. Describe the difference between the two.



77 The radiograph (77) was submitted for advice on treatment of a carpal fracture.
i. What treatment would you recommend?
ii. How would you describe the osseous body that has been revealed?



78 An 11-year-old eventer injured the dorsal aspect of its right hock on a wire fence (78).
i. What important structures do you think have been damaged?
ii. What clinical signs are likely to be present?
iii. Is treatment likely to be successful?

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76–78: Answers

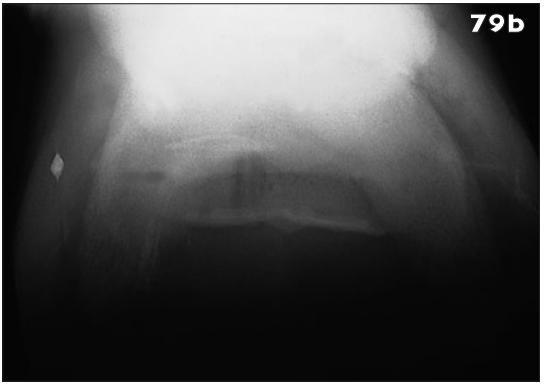
76 i. A growth retardation procedure for correction of an angular limb deformity, using 4.5 mm cortical screws and one strand of cerclage wire, applied in a figure-of-eight pattern with the 'hook in eye' technique.
ii. The distal screw in **76b** is longer and has penetrated the tarsocrural joint. This screw must be changed for a shorter one, to prevent damage to the articular cartilage.

77 i. None.
ii. The 'fragment' which was thought to be from the palmar aspect of the second carpal bone is, in fact, a vestigial first carpal bone. These are not uncommon and take many shapes. Lucent areas in adjacent bones (in the case shown the second carpal and second metacarpal bones are affected) are also frequent. The finding is likely to be bilateral. Vestigial fifth carpal bones also occur laterally, but are much less common. In rare instances individuals may have both first and fifth carpal bones present.

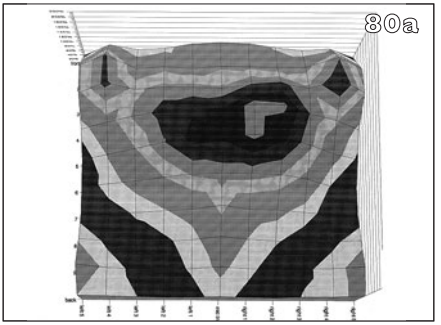
78 i. The long digital extensor tendon has been completely severed. The periosteum has been stripped off the dorsal surface of the third metatarsus.
ii. Lameness, together with loss of extensor function in the distal limb revealed by the horse being unable to extend the fetlock.
iii. Most horses regain extensor function with conservative management. Even injuries as severe as this will recover eventually with careful, assiduous nursing. Sequestration of superficial dorsal metatarsal bony cortex may occur at 2–3 weeks post injury.

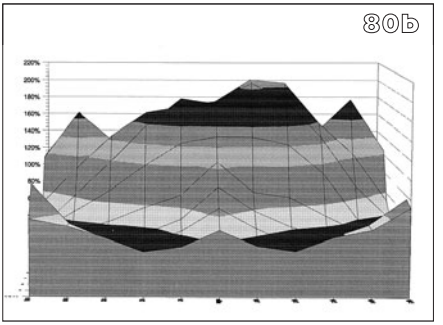
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79 A 14-year-old pony became suddenly severely lame on the left hindlimb after a kicking episode in the box when it broke the wooden panelling. The lameness was alleviated by abaxial sesamoid perineural analgesia. Radiographs obtained are illustrated (**79a, 79b**).
i. What is your diagnosis?
ii. Why should you be cautious about diagnosing this condition in a single dorsoproximal–plantarodistal oblique projection?
iii. What are the options for treatment?



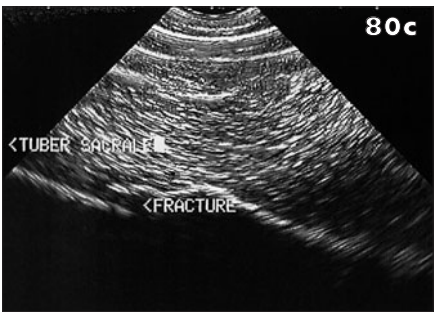


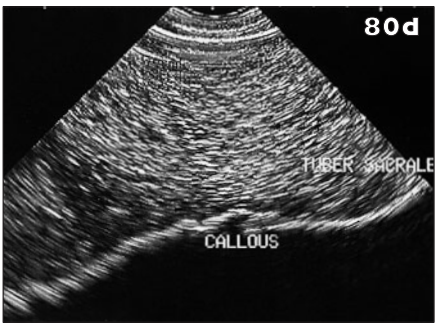
80 The illustrations (**80a, 80b**) are computer-generated plots obtained from point counting the pelvic region of a horse after intravenous injection of technetium 99^{m} MDP.
i. Where is the abnormality located?
ii. What type of problem is affecting this horse?
iii. What clinical signs would this animal have been showing?

79 & 80: Answers

79 i. This pony has suffered a fractured navicular bone.
ii. Frog shadows can mimic this fracture. Cleaning out the foot again and re-packing, obtaining other dorsoproximal–plantarodistal oblique projections at different angles, and the use of the plantaroproximal–plantarodistal oblique ('flexor view') projection can each help to confirm the diagnosis.
iii. These fractures are best managed by inserting a lag screw in a horizontal fashion through the navicular bone. A special jig and radiographic control are required to ensure accurate placement of the screw. Conservative management usually results in non-union, which may lead to osteoarthritis of the distal interphalangeal joint, damage to the deep digital flexor tendon and chronic lameness, necessitating a plantar digital neurectomy to return the animal to work.

80 i. Markedly increased uptake of 99^{m} technetium in the sacroiliac region on each side of the pelvis is revealed in **80a** and **80b**.
ii. This horse could have one or more of the following abnormalities affecting each side: ilial wing fracture, sacroiliac luxation, or sacral fracture in association with some other ilial wing damage. In this case an ultrasonographic examination revealed a displaced transverse fracture approximately 10 cm from the tuber sacrale on the right side (**80c**). On the left side, the fracture was not displaced and was associated with abundant periosteal new bone formation (**80d**).





iii. • Horses with sacral fractures usually show severe neurological impairment and cauda equina syndrome.
• Horses with sacroiliac luxation can show variable degrees of lameness but often show profound pelvic asymmetry involving both the tuber coxa and the tuber sacrale.
• Ilial wing fractures are often accompanied by ventral displacement of the tuber sacrale alone. Severe bilateral cases are often very lame. However, early cases with incomplete fractures will have low grade, rapidly resolving lameness which is recurrent with exercise.

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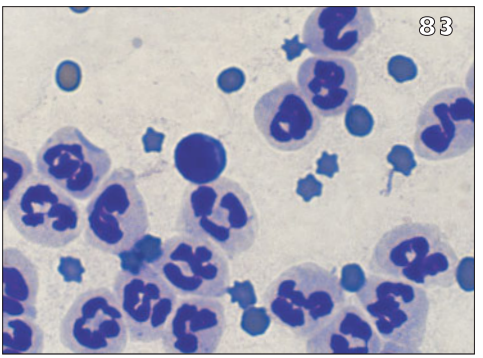




81 The illustration (**81**) is an ultrasonographic scan of the terminal aorta of a nine-year-old Thoroughbred gelding used for National Hunt racing.
i. What abnormality can you see?
ii. What clinical signs might the horse have shown?
iii. What causes this condition?
iv. How would you treat the condition?

82 A four-year old Quarterhorse racehorse pulled up lame after a race. After 'cooling out', there was considerable swelling associated with the carpus, and the horse was reluctant to bear weight on the limb. A lateromedial projection of the carpus is illustrated in **82**.
i. What is your diagnosis?
ii. What are the options for treatment? Give the complications expected for each.

83 A smear prepared from synovial fluid taken from a joint is shown in **83**.
i. What cells are present?
ii. If you could only perform three other tests on this fluid, what would they be?
iii. If there is no history of trauma, what would be your main concern about this case?



81–83: Answers

81 i. An echogenic mass within the lumen of the terminal aorta.
ii. Transient, intermittent hindlimb lameness during or after exercise. However, some cases may show more severe signs of pain, including sweating (other than on the affected limb), an increased pulse rate and 'colicky' signs.
iii. The cause is unknown. An association with vascular parasitism has been suggested, but this is not always present at post-mortem examination. There is no known association with cardiac disease, as in the cat.
iv. Larvicidal anthelmintics and non-steroidal anti-inflammatory drugs are usually employed but their efficacy in the face of an organised thrombus is uncertain.

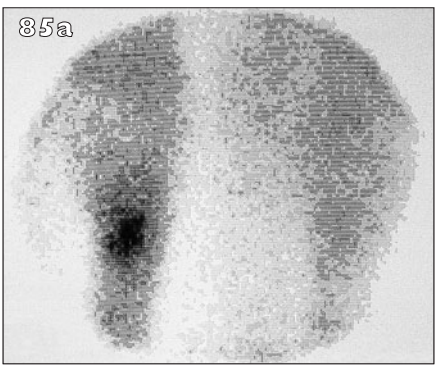
82 i. The horse has a displaced, collapsing fracture of the third carpal bone.
ii. The options for treatment are conservative or surgical management. Conservative management will lead to progressive carpal collapse and varus deformity, with eventual loss of the ability to bear weight on this limb. Laminitis, with rotation of the third phalanx, in the opposite forelimb, is the most likely problem after this. The best treatment is surgical provision of as much stability as possible by reconstruction of the collapsed row of carpal bones. If necessary, the limb should also be placed in a cast.

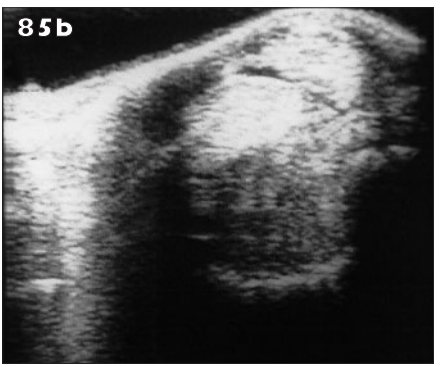
83 i. Mainly polymorphonuclear neutrophil leucocytes, with some erythrocytes and a single small lymphocyte.
ii. A total nucleated cell count, total protein concentration and bacterial culture.
iii. The main concern is infective arthritis, which should be confirmed by the cell count and the protein measurement. A positive culture would allow appropriate antibiotics to be chosen.

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84 A horse was at pasture with other horses when it was found with a large soft tissue swelling, associated with a small skin wound, over the proximo-lateral aspect of the metacarpus (**84**), six weeks previously. A short course of potentiated sulphonamides was prescribed, but the wound failed to heal.
i. What is the most likely cause of the persistent discharge, and how would you confirm your diagnosis?
ii. How would you treat this case?
iii. With the benefit of hindsight, could the case have been managed more effectively?







85 A six-year-old Cob gelding presented with a grade 2/5 lameness of six weeks duration on the left hindlimb, following a day hunting. Clinical inspection revealed diffuse oedema of the lower limb, up to the level of the tarsus, and hyperextension of the left hind fetlock (dorsal fetlock angle 118°). A low six-point nerve block failed to abolish the lameness, and radiographs of the hock and stifle were thought to be unremarkable on initial examination. A plantar gamma scan of both tarsal regions (**85a**), as well as a transverse ultrasonograph (**85b**) and a dorsoplantar radiograph (**85c**) are illustrated.
i. What is your diagnosis?
ii. How would you confirm this?
iii. How would you treat this case?
iv. What is the prognosis for this case?



84 & 85: Answers

84 i. Infective (septic) osteomyelitis of the fourth metacarpal bone secondary to a contaminated, open fracture of this structure. At this stage, radiography would reveal irregular radiolucent areas surrounding the fracture associated with florid periosteal new bone formation. (A foreign body is a less likely possibility.)
ii. Surgical excision of the infected portion of bone in combination with a course of systemic antibiotics, ideally selected on the basis of the sensitivity of organisms cultured from the depths of the wound.
iii. Yes. Radiographic examination of the region at the time of injury would have revealed damage to the fourth metacarpal bone and the risk of infective osteomyelitis could have been anticipated. Debridement and lavage of the wound with the horse standing, under sedation, and a course of systemic, broad-spectrum antibiotics may have prevented infection becoming established within the bone.

85 i. The gamma camera image reveals a very high, focal increase of radiopharmaceutical uptake in the proximal plantar metatarsal region. Radiography shows disruption of the normal trabecular pattern and patchy areas of sclerosis in the proximal plantar cortex of the metatarsus. Ultrasonographic examination shows a large increase in the size of the proximal part of the suspensory ligament with a diffuse loss of echogenicity throughout its entire cross-section. These findings reflect the presence of severe proximal suspensory desmitis.
ii. A positive response to a high six-point nerve block, at subtarsal level, would lend further support to this diagnosis.
iii. The treatment of choice is three months box rest, with supportive shoeing (egg-bar shoe).
iv. The prognosis for return to athletic function for horses with proximal suspensory desmitis in a hindlimb is guarded to poor. Some horses may return to work following a partial tibial neurectomy.

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86 A three-year-old Thoroughbred colt returned lame from exercise. There was pain on flexion of the fetlock joint and on palpation of the dorso-proximal aspect of the first phalanx. The region was radiographed (**86**).
i. What is the significance of the presence of more than one line in the first phalanx?
ii. What are the risks associated with conservative treatment of this injury?
iii. What risks are associated with internal fixation?
iv. What other factors would influence your choice of treatment?



87 The illustration (**87**) shows a dorsopalmar projection of the carpus of a foal.
i. What type of deformity is at risk of developing in this foal?
ii. How would you protect against this?



88 A three-year-old Thoroughbred colt developed a sudden onset moderately severe left forelimb lameness. The lameness improved markedly after several days box rest, but recurred when light work was resumed. Median and ulnar nerve blocks did not alter the lameness.
i. Describe the radiological features (**88**).
ii. What is your differential diagnosis?
iii. How might you acquire additional information?
iv. What is your prognosis?



86–88: Answers

86 i. The colt has a sagittal fracture of the first phalanx, with a single fracture plane. The lines represent separation of the fracture fragments in both dorsal and palmar cortices of the bone.
ii. Conservative treatment is very effective in young horses with sagittal first phalangeal fractures, provided the limb is properly supported in a Robert Jones bandage or cast. The major risk is propagation of the fracture and displacement of the fracture fragments. Other problems include pressure sores and bandage injuries. Degenerative joint disease is a potential problem but, perhaps surprisingly, it does not occur with any great frequency following conservative treatment of young animals.
iii. The risks of internal fixation include general anaesthesia and recovery from this, failure of implants, and infection.
iv. • The cost of surgical treatment may be prohibitive in some cases.
• Temperament is important when selecting cases for conservative treatment.
• Whether a front or hindlimb is involved. Forelimb injuries carry a more grave prognosis for return to athletic soundness, whereas hindlimb injuries are more difficult to recover safely from general anaesthesia.

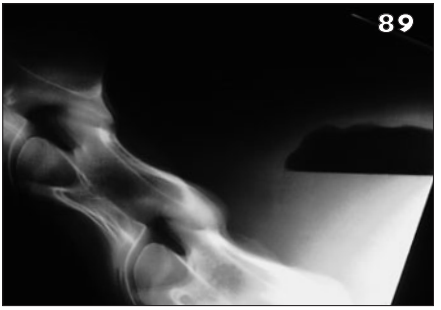
87 i. Carpal valgus. The lateral aspect of the third carpal bone and possibly the styloid process of the distal radial epiphysis appear hypoplastic, leaving the lateral aspect of the carpus susceptible to injury on loading and hence to a valgus deformity.
ii. Restriction of exercise and possibly protection of the carpus in a tube cast (from elbow to fetlock) are indicated while the carpal bones ossify. (This is best checked radiographically.)

88 i. There is periosteal new bone formation on the craniodistal aspect of the humerus.
ii. • Humeral stress fracture: this is a relatively common site.
• Trauma: much less likely, especially in view of the protective overlying soft tissues.
iii. • Additional radiographic views, including the more proximal humerus.
• Nuclear scintigraphy.
iv. Good, with adequate rest to allow healing, although had the horse been kept in work a catastrophic fracture may have ensued. This horse made a complete recovery.

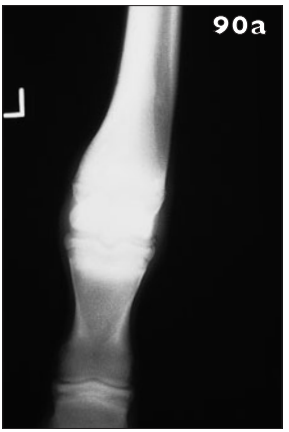
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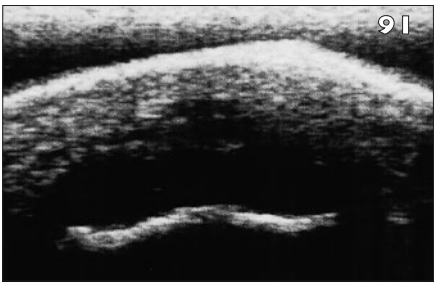
89 The illustration (**89**) shows a lateral radiograph of the mid to cranial third of the neck of a 10-month-old Thoroughbred foal.
i. What are the radiographic findings, and what is the most likely cause?
ii. What other diagnostic aid might be useful in assessing this abnormality?
iii. How would you treat this condition?



90 A dorsopalmar radiographic view of the distal metacarpal region of the left forelimb of a two-month-old foal is illustrated (**90a**). The foal was not lame but the limb 'looked funny', according to the owner.
i. What is your diagnosis?
ii. How would you treat this problem?



91 A five-year-old Thoroughbred-cross event horse is found one morning in its box severely lame on a forelimb, one day after shoeing. A swelling is evident above the dorsal aspect of the coronary band. Radiographs are negative. The swelling appears to be fluid filled and a sample obtained from the swelling has a total nucleated cell count of 97.3×10^9/l consisting predominantly of neutrophils. The horse has a history of a corn on the same foot that was examined and pared out six weeks previously. There are no other signs of solar abscessation. A transverse ultrasound scan is shown of the dorsal swelling (**91**).
i. What does the dorsal swelling represent, and what is your diagnosis?
ii. What treatment would you advise?
iii. What prognosis would you give the owner?



89–91: Answers

89 i. The large gas- and fluid-filled structure is most likely to be an abscess. This has almost certainly been caused by an intramuscular injection into the neck.
ii. Diagnostic ultrasound and ultrasound guided aspiration of the fluid.
iii. You should establish surgical drainage and lavage the cavity repeatedly with dilute antiseptic solutions. The foal should also be treated with systemic antibiotics, based on culture of an aspirate and establishing the antimicrobial sensitivity of any organisms grown.

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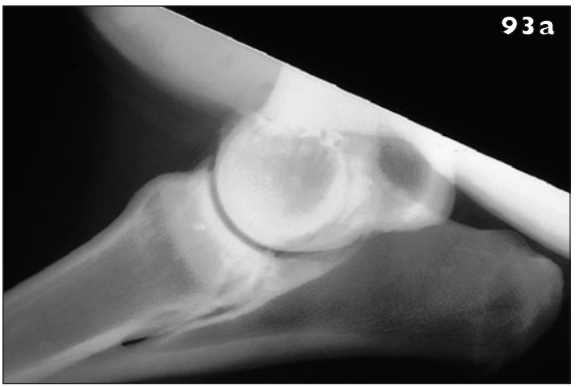
90 i. Metaphyseal angular limb deformity of the distal part of the third metacarpal bone. The physis is not involved.
ii. Periosteal stripping of the concave aspect of the distal metaphysis and diaphysis of the involved bone . This results in faster bone growth in that region.
Prior to treatment, the entire bone should be evaluated radiographically to ensure that lines drawn through the metacarpophalangeal and carpometacarpal joint spaces converge towards the concave aspect of the bone.
Periosteal stripping should result in correction of the deformity (**90b**). If both articular surfaces are parallel, the treatment of choice is rest rather than surgery, which could aggravate the problem.



91 i. The dorsal swelling is the dorsal pouch of the distal interphalangeal (DIP) joint. This horse is suffering from infective (septic) arthritis of the DIP joint.
ii. Immediate flushing of the joint, ideally using four portals – dorsolateral, dorsomedial, palmarolateral and palmaromedial. Care should be taken to avoid penetrating the digital sheath and navicular bursa when establishing these portals. Sampling of the navicular bursa, and the digital sheath if distended, should also be considered to ensure these structures are not involved. Arthroscopic egress cannulae can be used to provide large enough drainage portals to eliminate free fibrin. However, fibrin, which is not removed by simple flushing, rapidly collects and organises into pannus in the dorsal and palmar pouches. This is most likely to be the reason for failures in the treatment of these cases, especially if the infection is established (>24 hours duration). In such cases, synovial resection and removal of fibrin from the dorsal and palmar pouches by arthroscopy probably gives the best chance of success, although this is technically more demanding.
iii. The prognosis for successful management of DIP joint sepsis is guarded. Because of the financial commitment required to control the infection, euthanasia may be considered in cases in which the problem has been present for some time.

92 The radiograph illustrated in **92** shows the left hind fetlock of a yearling Thoroughbred filly presented for left hindlimb lameness. There was no joint distension but the lameness was relieved by intra-articular analgesia of the metatarsophalangeal joint.
i. What abnormalities are demonstrated?
ii. What, if any, treatment would you recommend to return this animal to soundness?







93 A 16-year-old riding school pony developed severe left forelimb lameness after falling in the indoor school three months previously. The pony had been restricted to box rest and had improved considerably, but still exhibited a bilaterally shortened forelimb stride with intermittent, very lame steps on the left forelimb. Palmar digital nerve blocks resulted in an increased stride length, but intermittent, severely lame steps persisted on the left forelimb. The latter were unaffected by median and ulnar nerve blocks, intra-articular analgesia of the elbow and shoulder joints, and analgesia of the intertubercular bursa.
i. Describe the radiological features (**93a, 93b**) and their significance.
ii. How could you obtain additional information about this injury?
iii. Can you explain the response to the nerve blocks?

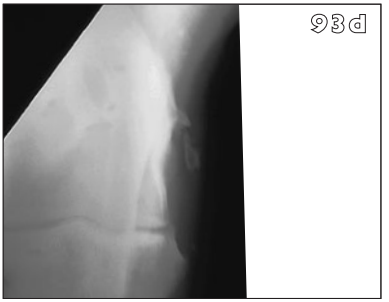
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92 & 93: Answers

92 i. There is a narrow, short articular defect in the lateral condyle of the metatarsal bone. There is also a less obvious area of reduced radiopacity in the medial condyle. The sagittal ridge is remodelled and the proximal articular surface of the first phalanx is irregular. The diagnosis is osteoarthritis, associated with bone remodelling of the distal articular surface of the third metatarsal bone.
ii. Intra-articular medication with sodium hyaluronate might be helpful, although the prognosis is poor.

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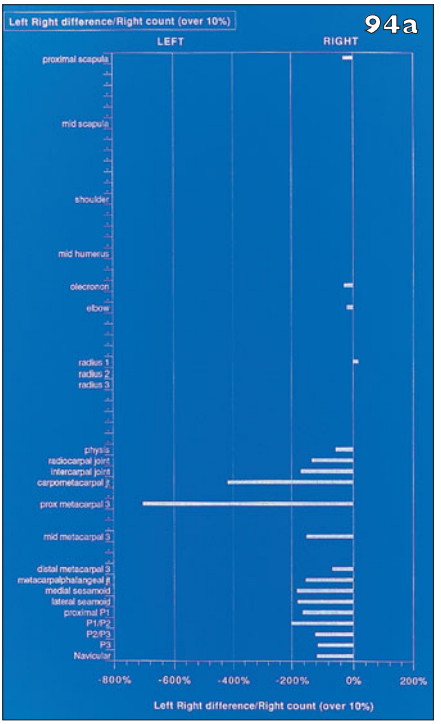


93 i. In the mediolateral view of the elbow there is modelling of the craniodistal aspect of the humeral condyles; the condyles have a patchy increase in opacity. There is osteophyte formation on the cranioproximal aspect of the radius and modelling of the anconeal process of the ulna. These radiological abnormalities are consistent with degenerative joint disease.
In the craniocaudal view of the elbow there is modelling of the lateral aspect of the condyle and dystrophic mineralisation, probably in the lateral collateral ligament. There is also slight modelling of the proximomedial aspect of the radius. Damage to the lateral collateral ligament must be suspected.
ii. Ultrasonographic examination of the lateral collateral ligament of the humeroradial joint. The ligament was massively enlarged compared to the contralateral limb, and of patchy echogenicity (**93c**).
iii. • The pony had two sources of pain, the front feet and the elbow joint.
• A negative response to intra-articular analgesia may be seen in the presence of severe degenerative joint disease (**93d**).

94 The figure (**94a**) illustrates the point count results following intravenous injection of 99m technetium MDP into a horse with an acute onset left forelimb lameness. The histogram shows the difference in counts between the same point on each forelimb, expressed as a percentage of the counts obtained at that point in the non-lame right forelimb. The lameness was abolished by injection of a local analgesic agent into the middle carpal joint. Radiographic examination failed to reveal any abnormality of the carpus.

i. What is the diagnosis?

ii. How can you explain the effect of the local analgesic agent?



95 A nine-year-old pony gelding was slightly lame on its right hindlimb. For some time a swelling had been present in the fetlock region (**95a**), but similar swellings had developed at the same time on the other three limbs as well.

i. What is the likely diagnosis?

ii. How would you confirm this?

iii. What treatment could you offer?



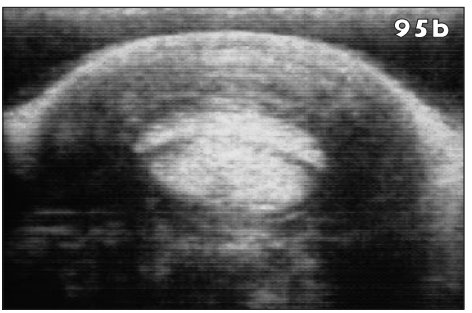
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94 & 95: Answers



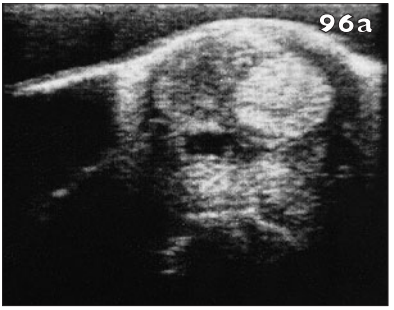
94 i. This horse had sustained a 'fatigue' avulsion fracture of the palmar cortex of the proximal metacarpus associated with the origin of the suspensory ligament (**94b**). This has resulted in focally increased uptake of 99^{m} technetium MDP in the proximal metacarpus of 700% when compared to the contralateral limb. There is associated increased uptake throughout the remainder of the forelimb.
ii. Many cases of proximal suspensory desmitis respond positively to intra-articular analgesia of the middle carpal joint. The reasons for this are probably due to diffusion of local analgesic agent out of the joint and a close association between the synovial joint capsule of the middle carpal joint and the palmar metacarpal nerves.
Any case in which lameness can be alleviated by intra-articular analgesia of one of the carpal joints should be re-evaluated if radiography fails to reveal a lesion. The use of other regional blocks, and ultrasonographic and radiographic imaging of the proximal metacarpus, may confirm a problem in the proximal metacarpal region rather than the carpus.

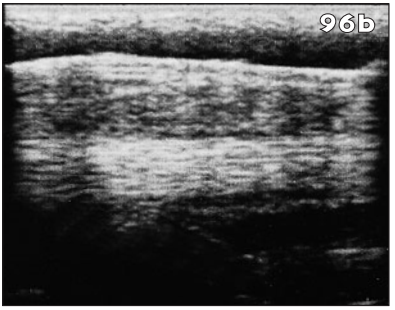
95 i. This is a true annular ligament desmitis. In contrast to the notched appearance created when the annular ligament fails to expand with an abnormal digital sheath, the annular ligament itself has swollen in a plantar direction and the sheath is relatively normal.

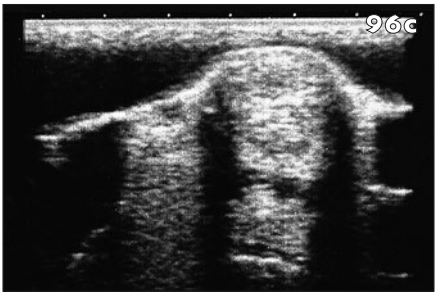


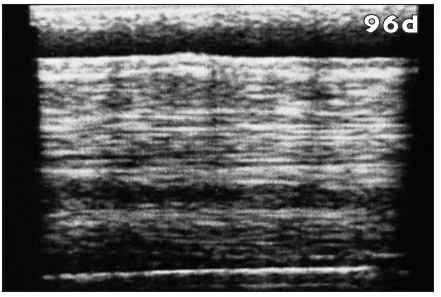
ii. Ultrasonography confirmed marked thickening of the annular ligament in all four limbs (**95b**).
iii. If the annular ligament is the cause of the lameness, which could be established by means of local analgesic techniques, conservative therapy should be considered in the first instance. If the pony failed to respond, a desmotomy in that single limb might be considered. However, it is possible that the desmitis in the other limbs may compound the problem in the future.

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96 A five-year-old racehorse pulled up very lame at the end of a race. There was swelling on the palmar aspect of the right metacarpus, while the left forelimb appeared to be normal. There was some sinking of the fetlock of the right forelimb when the animal bore weight. Ultrasonographic scans from the mid-metacarpal region of the right (**96a, 96b**) and left (**96c, 96d**) forelimbs are illustrated.
i. Describe the ultrasonographic abnormalities.
ii. What injury has this horse sustained?
iii. What is the prognosis and what treatment would you advise?

97 A small wound was noted on the medial aspect of the left proximal thigh of a seven-year-old eventer when the horse was brought in from pasture. There was no significant lameness, and initially the wound healed. However, two weeks later this discharging sinus developed (**97**) and persisted intermittently for three weeks.
i. What is the most likely reason for persistence of the sinus?
ii. How would you investigate the wound?
iii. What treatment would you recommend?



96 & 97: Answers

96 i. On the right forelimb there is enlargement and displacement of the superficial digital flexor tendon (SDFT) medially, with a loss of echogenicity in the mid to distal metacarpal region. The longitudinal view shows loss of the normal striated pattern of the SDFT. The left forelimb shows evidence of a core lesion in the SDFT, although this tendon is not enlarged. This is confirmed in the longitudinal view as a loss of the striated pattern, making differentiation of the two flexor tendons in this limb easier.
ii. The horse has a bilateral SDF tendinitis. In the right forelimb the displacement of the tendon medially, its very hypoechoic cross-section and the clinical signs of a sinking fetlock on loading the limb indicate significant fibre rupture.
Many cases of tendinitis, as revealed here, have bilateral lesions on ultrasonographic examination, even if the contralateral limb does not appear to be clinically affected.
iii. The severity of this injury limits the prospects for this horse being able to return to full athletic activity. However, the tendon will heal and the animal may be able to perform satisfactorily in another sphere.
If treatment is contemplated, anti-inflammatory therapy should be instigated immediately in the form of the application of cold bandaging and non-steroidal anti-inflammatory drugs for pain relief. Placing the limb in a cast for 4–6 weeks could be considered to prevent further damage. Intratendinous sodium hyaluronate or polysulphated glycosaminoglycan may be used to reduce inflammation and encourage synthesis of replacement extracellular matrix. Intratendinous treatment with β-aminoproprionitrile, for a limited period, is also being evaluated for the treatment of tendinitis. This substance inhibits the enzyme lysyl oxidase which is responsible for forming collagen cross-links, and early results suggest it may improve collagen fibril orientation after healing. Tendon splitting and superior check ligament desmotomy could also be considered, although the former is usually advocated in cases with core lesions, surrounded by a 'normal' ring of tendon tissue which is preventing the removal of damaging proteolytic enzymes.

97 i. The presence of a foreign body is the commonest cause of a persistent discharge, in these circumstances, at this location.
ii. Palpation and probing of the wound may be helpful. Radiography, with and without contrast, should be undertaken if a foreign body has not already been found. Ultrasonography could be used as an alternative.
iii. Surgical exploration is indicated. A small piece of wire was removed from this site.

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98 A three-year-old Thoroughbred flat racehorse filly had a sudden onset, moderately severe right forelimb lameness. The lameness was substantially improved by intra-articular analgesia of the right elbow joint. Two radiographic views of this region are illustrated (**98a, 98b**).
i. Describe the radiological features.
ii. What are the treatment options?

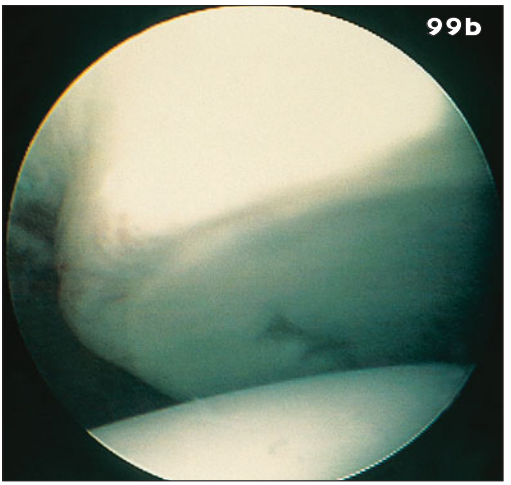
99 A nine-month old Quarterhorse colt presented with obvious lameness on the right forelimb, of three weeks duration. On clinical examination the point of the right shoulder was more prominent and it was felt that this could be related to a minor degree of muscle atrophy. A radiograph was made of the shoulder (**99a**).
i. What is your diagnosis?
ii. What further diagnostic test might you consider?
iii. How would you treat this horse?



98 & 99: Answers

98 i. In the craniocaudal view of the elbow there is an osseous cyst-like lesion in the proximomedial aspect of the radius. No radiographic communication to the humeroradial joint can be seen. There is slight surrounding sclerosis. The medial cortex of the proximal radius has a slightly irregular contour due to periosteal new bone formation.
In the mediolateral view the proximal radial physis is diffusely sclerotic with a central osseous cyst-like lesion.
ii. • Conservative. Box rest, controlled exercise and intra-articular medication.
• Surgical. Forage of the cyst-like lesion via an extra-articular approach.
The filly was successfully treated conservatively. The joint was medicated with sodium hyaluronate twice at a 10-day interval. The lameness resolved completely and the filly raced eight times over the following two years.
Surgical treatment has been successful in a small number of cases, but postoperative complications, such as fracture of the proximal radius, have been encountered.

99 i. Radiographic lucency in the caudal aspect of the glenoid suggests osteochondritis dissecans.
ii. Intra-articular analgesia of the right shoulder joint. Any improvement would indicate that this is likely to be the seat of the horse's clinical problem. The response to local analgesia is frequently less than 100%, because of intact cartilage overlying the surface of the lesion. Further radiography might involve taking a film with the affected shoulder down, in recumbency, prior to surgery, and even contrast arthrography to identify a cartilage defect or flap.
iii. The best treatment is arthroscopic surgery. Surgery identified the presence of a defect in the articular surface of the caudal aspect of the glenoid (**99b**). Exploration revealed a more extensive area of undermined, unattached cartilage, typical of osteochondritis dissecans.



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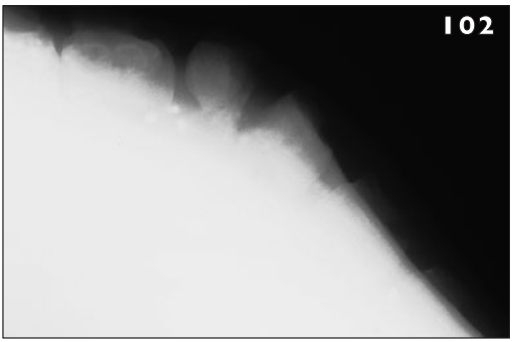
100 A six-month old Thoroughbred foal presented with lameness of the right carpus associated with effusion of the right antebrachiocarpal joint. The dorsolateral-palmaromedial oblique radiograph of this area is illustrated in **100**.
i. What is your diagnosis?
ii. How should this case be treated?
iii. What is your prognosis?



101 A ten-week-old Clydesdale filly foal has a history of a bony swelling on the lateral aspect of the left calcaneus which has been present since birth. There has been a gradual increase in size of the lump, but no lameness. The illustration (**101**) shows a dorsolateral-plantaromedial oblique projection of the region.
i. What abnormality can be seen on the radiograph, and what other views would be useful?
ii. List the possible diagnoses.
iii. How would you proceed with this case?



102 The figure (**102**) is a lateral radiograph of the tail of an 11-year-old mare.
i. What abnormality can you see?
ii. The mare also had a discharging sinus lateral to the anal sphincter. What might be the cause of this?



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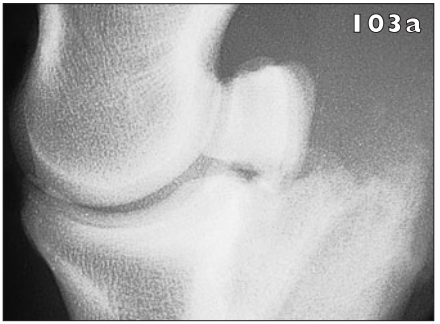
100–102: Answers

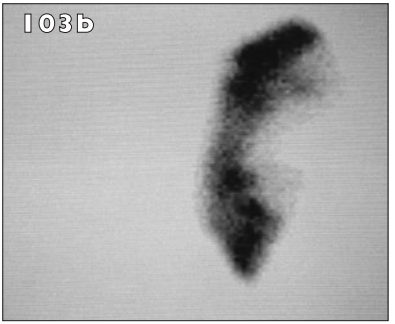
100 i. There is subchondral lucency of the distal radius. In a horse of this age the most likely diagnosis is osteochondritis dissecans.
ii. The most appropriate treatment is arthroscopic evaluation of the joint. The diagnosis of osteochondritis dissecans, involving a large area of the medial aspect of the distal radius, was confirmed. The defect was debrided.
iii. The prognosis in these cases is always guarded to poor. In a limited series of cases seen by the contributor, some degree of lameness has persisted associated with continued fragmentation of the distal radius.

101 i. A well-circumscribed osseous mass is present adjacent to the calcaneal epiphysis. The other radiographs obtained were lateromedial, dorsoplantar, dorsomedial-plantarolateral oblique and dorsoplantar 'flexed' (sustentaculum tali view) projections. These confirmed the location of the osseous mass as proximolateral to the calcaneus, and revealed a small amount of periosteal roughening on the dorsal border of the calcaneus.
ii. Possible diagnoses include: dystrophic mineralisation following trauma or chronic localised infection, calcinosis circumscripta and osseous neoplasia.
The mass was removed and has not recurred. The histological diagnosis was of a solitary osteochondroma. These are cartilage-capped bony projections from the external surface of a bone. Both multiple and solitary forms have been recorded in the horse, the former being the most common. Solitary forms have been most commonly reported at the distal end of the diaphysis and metaphysis of the radius.
iii. In the absence of lameness the mass can be regarded as a blemish of cosmetic significance only. However, as draught breeds are now kept more for showing than work, the owner may opt for surgical removal, as in this case.

102 i. A displaced frontal plane fracture of a coccygeal vertebra.
ii. Associated sequestration of a bone fragment on the ventral aspect of the fracture. The bone fragment was subsequently removed via the sinus tract.

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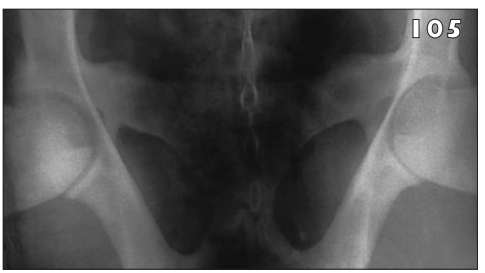


103 A 12-year-old show jumper displayed an acute grade 3/5 right hindlimb lameness following landing over a jump at a show. The lameness improved slowly over the next six weeks, but the horse remained 1/5 lame on the right hindlimb. The lameness was abolished by both intra-articular analgesia of the distal interphalangeal joint and also by a palmar digital nerve block.
i. A lateromedial radiograph of the right hind foot (**103a**) shows two lesions. Can you identify them?
ii. Scintigraphic imaging (**103b**) associates increased radiopharmaceutical uptake with only one of these. Which one do you think is clinically significant?
iii. Does this fit with the results of the regional analgesic techniques?

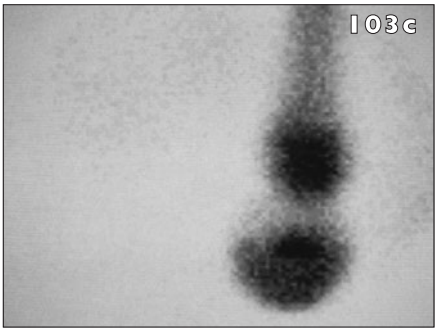
104 The picture shows a wound on the medial aspect of the left hindlimb of a three-year-old Welsh Mountain pony mare (**104**). The wound occurred when the pony caught the limb on the edge of a piece of corrugated iron. Following the injury, the pony would not bear any weight on the limb.
i. What part of the wound would most concern you?
ii. If the injury is as bad as you suspect, is any treatment possible?



105 The figure (**105**) shows a ventrodorsal radiograph of the pelvis and hips of a 19-year-old part-Thoroughbred gelding which had been persistently lame on the left hindlimb for five months.
i. What are your radiological findings, and what is the diagnosis?
ii. What other diagnostic tool could have been used to demonstrate this disease process?



103–105: Answers



103 i. The lateromedial radiograph of the foot shows fragmentation of the extensor process of the third phalanx, probably a chip fracture. There is also a mineralised opacity adjacent to the distal border of the navicular bone, possibly associated with an avulsion injury of the impar ligament.
ii. Only the navicular abnormality is associated with an increased uptake of radiopharmaceutical revealed in the lateral (**103b**) and solar (**103c**) views and, therefore, increased bone turnover compatible with a fracture.
iii. Abolition of the lameness by both the palmar digital nerve block and intra-articular analgesia of the distal interphalangeal joint suggests that pain is more likely to arise from the plantar foot (i.e. avulsion fracture of the impar ligament) than from the extensor process.

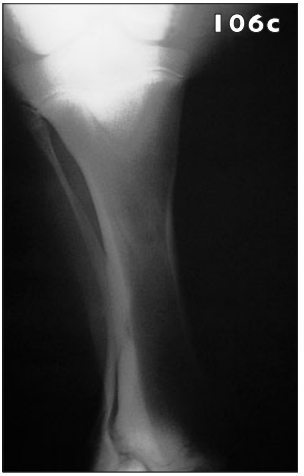
104 i. The medial fetlock should cause most concern during your examination. In fact, a portion of the medial joint capsule had been lost and small sections of the third metatarsus and first phalanx abraded.
ii. Some animals with this type of injury are salvageable, depending on the extent of joint involvement. Thorough surgical debridement, antibiotics, non-steroidal anti-inflammatory drugs and casting the limb are the first stages of treatment. If infection is controlled, healing of the superficial tissues can be expected in 4–6 weeks. When there is no significant articular damage, this will often produce a satisfactory end result. However, with severe joint damage, a fetlock arthrodesis may be necessary. Careful case selection is vital before such an undertaking.

105 i. Periarticular new bone around the left cranial acetabular edge and femoral neck – indicative of degenerative joint disease of the left coxofemoral joint.
ii. Nuclear scintigraphy would reveal the increased bone turnover associated with the joint degeneration as a 'hot spot' in the region of the left coxofemoral joint.

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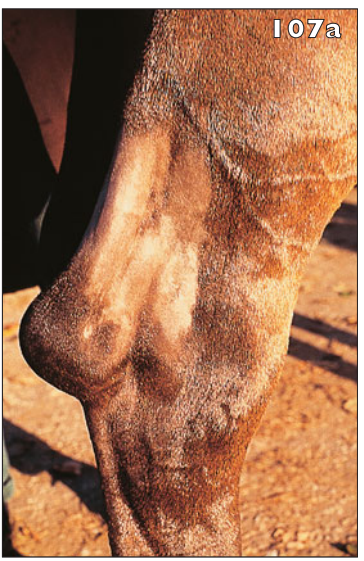






106 A three-month-old miniature horse exhibited marked angular limb deformity on both hindlimbs (**106a**). **106b** and **106c** illustrate lateromedial and caudocranial views of the radius and tibia respectively.
i. What type of angular limb deformity is present?
ii. What abnormal findings are present in these radiographs?
iii. What term is used to describe this type of problem?
iv. How would you treat the deformity?

107 An eight-year-old part-Thoroughbred eventer sustained an injury to the right hind tarsus whilst in a field with other horses. Originally, there was extensive swelling of the plantar aspect of the hock, but this has gradually resolved into a discrete swelling over the point of the hock (**107a**). The horse is still lame, and the swelling is painful on palpation, particularly medially.
i. What is your diagnosis?
ii. Does the presence of lameness suggest this case is unusual and, if so, how would you investigate it further?



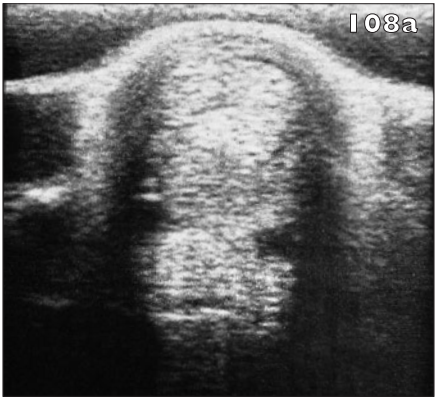
106 & 107: Answers

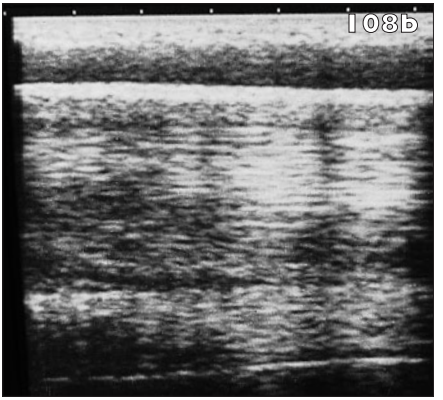
106 i. Valgus deformity of the tarsal region in both hindlimbs.
ii. Unusually for a horse or pony, this animal has a complete ulna and a complete fibula.
iii. This is an 'atavism' – a characteristic presumed to have been present in ancestors, but lost from recent generations. The anomaly is more common in miniature horses and ponies.
iv. Treatment may be too late for this foal. There has to be sufficient growth left in the distal tibial physis to correct the deformity. Additionally, the completeness of the ulna and especially the fibula prevents unification of the styloid processes with the distal carpal and tarsal epiphyses respectively, causing a malformation of the lateral trochlear ridge of the talus, leading to degenerative joint disease.
In a younger animal, treatment would consist of the removal of a 1 cm long piece of ulna and fibula, together with lateral periosteal transection and screw fixation of the distal fragment.

107 i. This horse appears to have a 'capped hock', which is classically an acquired bursa plantar to the tuber calcis. The condition results from direct trauma to the point of the hock, often self-inflicted and repetitive. However, not all cases develop a subcutaneous bursa and in this case 'the cap' was firm and fibrous.
ii. The presence of continuing lameness and the pain on palpation is unusual and warrants further investigation. Ultrasonographic examination of the area revealed subcutaneous fibrosis, but no evidence of an acquired bursa or damage to the underlying superficial digital flexor tendon or its retinacula. However, there was evidence of disruption of the bone/soft tissue interface on the medial aspect of the tuber calcis suggestive of a fracture and/or periosteal damage.
A dorsoplantar (flexed) radiographic projection (**107b**) subsequently revealed a small fracture from the medial aspect of the calcaneus, and periosteal bone modelling. This flake of bone was surgically removed and the horse made an uneventful recovery.



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108 A 15-year-old horse presented with a history of right forelimb lameness of three months duration. The lameness had improved but the horse was still grade 3/5 lame at the trot in a straight line. There was distension of the medial palmar vein and swelling to the proximal half of the metacarpus, which was sensitive to digital pressure. Transverse and longitudinal ultrasonographs were obtained of the metacarpal region (**108a, 108b**).
i. Describe your ultrasonographic findings.
ii. What is your diagnosis?
iii. What is the prognosis, and what potential complications can occur?

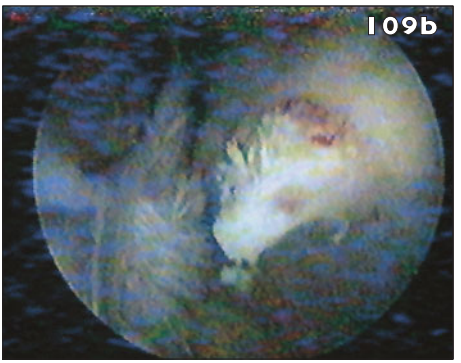
109 A two-year old Thoroughbred, in training for racing, presented because of a fluid swelling visible on the lateral aspect of the carpus (**109a**). The trainer was uncertain as to whether or not the horse was lame.
i. What is your differential diagnosis?
ii. How would you further investigate this case?
iii. Give the treatment for each possible diagnosis.



108 & 109: Answers

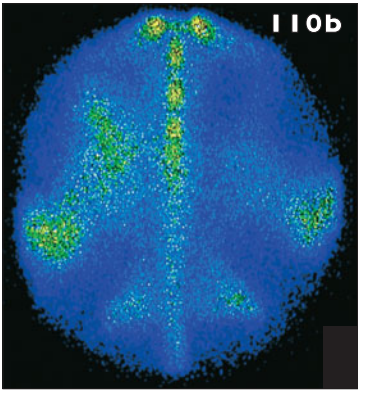
108 i. The accessory ligament of the deep digital flexor tendon (ALDDFT) (also known as the inferior check ligament) is hypoechogenic and thickened. In the longitudinal view there is a reduction in the normal striated pattern of the ALDDFT. The enlargement of the ligament has resulted in the loss of the normal 'space' between the deep digital flexor tendon and the suspensory ligament – a useful indicator of ALDDFT pathology.
ii. The horse is suffering from ALDDFT desmitis.
iii. The prognosis is favourable, with about 80% of cases returning to full work. However, the prognosis is reduced if there is concomitant superficial digital flexor tendon (SDFT) tendinitis or if adhesions form between the ALDDFT and the SDFT. These usually occur laterally, but in severe cases adhesions can result in a fibrous ring around the normal deep digital flexor tendon. Improvement of the more severe cases with chronic problems can be achieved with ALDDFT desmotomy, although owners should be warned of the possibility of recurrence.

109 i. Possible diagnoses include: primary carpal canal tenosynovitis, or tenosynovitis secondary to an osteochondroma of the distal radius, or fracture of the accessory carpal bone.
ii. Radiographs need to be taken to look for the presence of an osteochondroma or a fracture of the accessory carpal bone. (In this case the diagnosis was of an osteochondroma.)
iii. The treatment for an osteochondroma is removal under arthroscopic visualisation, and this was achieved. It was found that the osteochondroma was predictably sharp at the point (**109b**) and had caused damage to the deep digital flexor tendon. If no radiographic changes had been present, the horse would have been treated as a case of primary carpal canal syndrome and initially managed conservatively. Surgical release of the carpal retinaculum could have been considered subsequently if the animal failed to respond to conservative medical therapy. A classic, non-articular accessory carpal bone fracture would usually be treated conservatively.



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110 A seven-year-old steeplechaser presented with a chronic problem of poor performance and poor hindlimb action (**110a**). On clinical examination, the horse had a grade 1/5 lameness on the left hindlimb, exacerbated to 2/5 by flexion. The lameness was abolished by a low six-point nerve block. A dorsoventral gamma camera image of the horse's pelvis, obtained after intravenous injection of 99^{m} technetium MDP, is asymmetric (**110b**). Explain this phenomenon.



111 What is the likely cause of the lesion illustrated in **111**?



112 A nine-year-old horse has suffered from intermittent moderate to severe lameness for several weeks, coinciding with the development of an inguinal swelling.
i. Describe the ultrasonographic findings shown in **112a.**
ii. What is your diagnosis, and what is the likely sex of the animal?

110–112: Answers

110 Chronic lameness has resulted in pronounced muscle atrophy over the horse's left quarter and gluteal region, even though the problem is situated in the distal limb. Attenuation of the gamma radiation emitted from the skeleton is directly related to tissue thickness. The tissue half thickness for 99^{m} technetium gamma rays is 4 cm, which means that 4 cm of muscle effectively halves the amount of gamma radiation measured on the skin surface. The muscle atrophy over the left hemipelvis is sufficient to make it appear more 'hot' on a gamma scan.

111 This is an iatrogenic wound caused by inadequate bandaging: too tight, not enough padding or left on too long. The prominence of the accessory carpal bone, which is relatively unprotected by soft tissues, is a classic site. A smaller wound can also be seen on the medial aspect of the carpus.

112 i. The ultrasonograph has been obtained without a stand-off and shows an elliptical hypoechoic region surrounded by thick fibrous tissue. This is most likely to represent an abscess cavity with a thick fibrous wall. In the centre of the hypoechoic region there are two hyper-echoic foci with acoustic shadowing extending deep to them.
ii. This ultrasonographic appearance is very suggestive of a foreign body – hyperechoic focus – with either acoustic shadowing or a reverberation artefact deep to it. It is frequently not possible to identify the nature of the foreign body ultrasonographically, as acoustic shadowing will occur with most foreign bodies. However, a reverberation artefact is usually associated with a metallic foreign body or air/gas (the latter tends to have a combination of shadowing and reverberation artefact).
The most likely cause of a foreign body here is a non-absorbable suture used to ligate the vascular pedicle after castration (the horse is a gelding). This was surgically removed and the horse made a full recovery (**112b**). The owner reported that the horse had been castrated as a two-year-old, illustrating how foreign bodies can remain dormant for many years before producing clinical signs.



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113 A horse presented with a grade 2/5 lameness, at the trot, in a straight line, on the left forelimb. The lameness was increased when the horse was trotted in a circle with the lame leg on the outside. Flexion tests failed to exacerbate the lameness, but hoof testers produced a positive result on the hoof's medial aspect. **113** illustrates the sole of the left fore foot after paring.
i. What condition is illustrated?
ii. Why is the lameness worse in the affected limb outside the circle?
iii. What causes this condition?
iv. How would you treat this horse?



114 A nine-year-old Shetland pony had a history of intermittent upward fixation of the patella. A week before the pony was due to have a medial patellar desmotomy, it went severely lame on the right hindlimb. **114** shows the pony after treatment for this severe lameness.
i. What name is given to a bandage of the configuration shown on the hindlimb, and why has it been applied?
ii. How may this pony's problem have been related to the patellar fixation?



115 The illustration (**115**) shows the lateromedial projection of the right fore fetlock joint of a 9-year-old eventer gelding.
i. What is your diagnosis?
ii. How would you confirm the precise location of the problem?
iii. If the owner wants 'the best possible treatment for the horse', what would you advise?
iv. How is this injury thought to occur, and what other damage may be caused by this mechanism?



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113–115: Answers

113 i. A 'corn' – bruising of the sole in the angle between the medial hoof wall and the bar (the 'seat of corn').
ii. The bruising is usually present on the medial side of the fore feet. Lameness will be more severe when loading of this area is greatest and, in the case of the medial side, this will be when the affected limb is on the outside of the circle.
iii. 'Corns' are usually caused by badly fitting shoes. This can occur if shoes are too small, when the branches will lie over the 'seat of corn' and will result in bruising of this region. Alternatively, correctly fitting shoes which are left in place for long periods will move to cover this sensitive area as the foot grows.
iv. The badly fitting shoe should be removed, and the affected area pared out. Paring should be halted once the bruised area is identified. If the 'corn' has become infected, paring should be continued to establish drainage (as for a solar abscess). The foot can be left for a few days for the bruising to heal and the horse to become sound. When shoes are re-applied, care must be taken to avoid pressure in this region – shoes can have the caudal end of the medial branch seated out, and in some cases the heel widened so that it covers and protects the affected area while still being supported by the wall.

114 i. An Ehmer sling. This is used, particularly in small animals, to prevent reluxation of a dislocated coxofemoral joint. In this pony the hip dislocation was easily reduced, but without the sling the femoral head rapidly reluxated.
ii. The dislocation may have resulted from the animal falling with a rigid limb as a result of the upward fixation of the patella.

115 i A comminuted apical fracture of one of the proximal sesamoid bones.
ii. A well-penetrated dorsopalmar projection of the fetlock joint, or the two oblique projections – dorsolateral-palmaromedial oblique (for lateral proximal sesamoid bone) and dorsomedial-palmarolateral oblique (for medial bone).
iii. Removal of the bone fragments avulsed from the proximal sesamoid bone by arthroscopic surgery in the palmar pouch of the fetlock joint. In one series this produced a significantly better result in racehorses than conservative management.
iv. Overextension of the fetlock joint during weight bearing at speed or over jumps. This may cause other sesamoid fractures (basilar and mid-body), as well as damage to the suspensory ligament or distal sesamoidean ligaments (sprain or rupture), sesamoiditis, and fragmentation of the dorsoproximal aspect of the first phalanx.

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116 A man and a horse have both been involved in regular, intensive physical exercise (**116**).
i. From what condition are they both suffering?
ii. What signs was the horse likely to have shown?
iii. Could this condition have been prevented?
iv. How should it now be managed?
v. Which metatarsal bone is affected in the man?





117 This seven-year-old hunter gelding was lame at the walk following a wire cut (**117**).
i. What are your concerns at your preliminary examination?
ii. What is the most suitable treatment?



118 A four-week-old foal sustained a displaced fracture of the olecranon, which was repaired by open reduction and internal fixation.
i. Describe the radiological features (**118a**).
ii. What complications might occur?

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116–118: Answers

116 i. Incomplete cortical fractures secondary to fatigue damage ('stress fracture').
ii. Lameness of variable severity, soft tissue swelling and localised pain over the dorsal–dorsolateral aspect of the metacarpus.
iii. Possibly: experimental studies have shown that the strain pattern within the third metacarpal bone changes with speed of exercise. Training a horse at slow speeds will stimulate an adaptive modelling response of the bone which may be inappropriate for racing speeds, therefore bone strains at racing speeds remain high. The risk of fatigue damage occurring is dependent on peak strain magnitude and number of cycles. Hence, persistence of high strains will reduce the number of strides a horse can take before fatigue damage may occur. Other studies have revealed that only a few loading cycles are required to stimulate an adaptive modelling response by bone. Training regimes whereby the horse is worked at racing speeds for short intervals stimulate an appropriate modelling response without incurring the risk of fatigue damage, thereby reducing the risk of stress fractures.
iv. Conservative therapy involving rest, controlled walking and a gradual return to work may be successful in some cases. Others remain recalcitrant to this approach and surgery involving an intra-cortical lag screw or drilling of the cortex at the site of fracture (osteostixis) may be employed to stimulate healing.
v. The third metatarsal bone.

117 i. The horse has a deep laceration with damage to the coronary band. Disruption of the coronary band will lead to abnormal hoof growth. Movement in this area will promote the development of proud flesh if the wound is allowed to heal unaided, and damage to the vascular supply to the area may complicate this healing process. Involvement of the distal interphalangeal joint should be considered, and the depths of the wound should be explored for foreign material. In this case a 'barb' from the barbed wire which caused the injury was found deep in the wound.
ii. Exploration of the wound and surgical debridement are often most effectively performed with the horse under general anaesthesia. Following cleaning of the wound, primary closure can sometimes be achieved, but in any case the limb should be cast for at least two weeks. If the distal interphalangeal joint is involved, this should be lavaged.
Management of this type of wound without a cast usually leads to wound breakdown and slow second intention healing with severe scarring. It is also a false economy, as the requirement for long-term bandaging soon leads to a charge for materials which exceeds the extra initial cost of the cast.

118 i. This is a mediolateral radiograph of an elbow of an immature foal. There are separate centres of ossification for the apophysis of the ulna, and the caudodistal aspect of the humerus. The distal physis of the humerus and the proximal physis of the radius are open. There is a complete articular fracture of the olecranon, stabilised using a plate and seven screws, four cancellous and three cortical bone screws. The four distal screws pass into the radius. One of these appears to impinge on the proximal radial physis. The most distal screw appears to contact the transcortex.

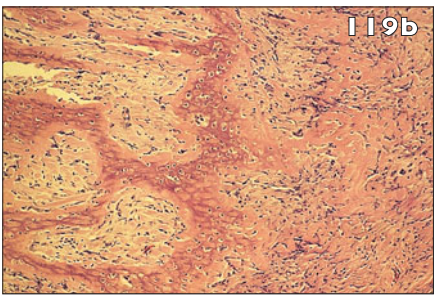


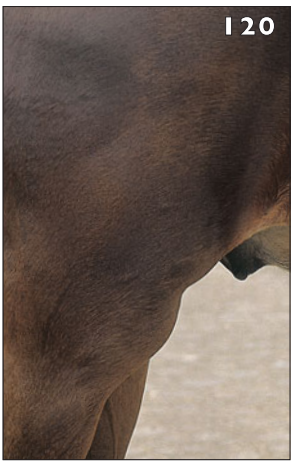
ii. Elbow dysplasia due to differential growth of the ulna and radius. Trauma to the proximal radial physis may stimulate premature closure. **118b** shows the same foal at 13 months of age. The plate had been removed 10 weeks postoperatively but mild lameness had persisted, with recent exacerbation. The normal relationship of the humeral condyles with the semilunar notch of the ulna has been completely lost.

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119 A 12-year-old Andalusian gelding presented with a history of chronic, progressive hindlimb lameness associated with a large, firm swelling over the lateral aspect of its right thigh. There was no history of trauma. A lateromedial radiograph of the right stifle revealed a radiodense mass, within the soft tissues, proximal to the patella (**119a**).
i. What differential diagnoses would you consider?
The horse was destroyed at the owner's request and a firm, ovoid mass was dissected free from the quadriceps femoris muscle. The mass, which had an outer shell of hard tissue, was not attached to the femur. Histological sections were prepared from the tissue (**119b**).
ii. What is your diagnosis?
iii. What pathological processes are involved in this condition?





120 A yearling Thoroughbred filly presented with effusion of the right femoropatellar joint but minimal lameness (**120**).
i. What is the most likely diagnosis, and how would you confirm it?
ii. Presuming your likely diagnosis is correct, what treatment would you recommend?
iii. What factors would you consider in calculating the prognosis for this case?

121 Your practice wants to set up a gamma camera facility. The partners approve of the financial implications but nobody is really sure about the safety regulations associated with handling radioactive materials.
i. What formal steps should be taken to satisfy the UK Ionising Radiation Regulations and the Radioactive Substances Act?
ii. What are the major sources of radiation hazard associated with this procedure?
iii. How should the horse and its stable be managed during its stay at the gamma camera facility, and are you aware of any time limits which should be imposed?

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119–121: Answers

119 i. • Calcification of a haematoma or abscess.
• Calcinosis circumscripta.
• Myositis ossificans.
• Bone neoplasia.
ii. The histological section reveals a trabecular network of bone and osteoid surrounded by proliferating fibroblasts. These findings are indicative of heterotopic bone formation, consistent with a diagnosis of myositis ossificans.
iii. The pathogenesis of the condition is poorly understood. It has been suggested that an initiating factor, such as trauma, may result in proliferation of mesenchymal tissue which subsequently undergoes maturation to bone.

120 i. The most likely diagnosis in a horse of this age is osteochondritis dissecans. Radiographs were taken and these showed a lesion on the lateral trochlear ridge of the distal femur. (Less frequently, lesions occur on the medial trochlear ridge of the femur and the patella.)
ii. Unless the lesion is very mild (a small area of flattening or shallow cavitation unassociated with fragments), the recommended treatment is arthroscopic surgery.
iii. The size of the lesion and the presence of a similar problem in the other stifle. The results, with arthroscopic surgery, are very good but are related to the size of the lesion. Based on retrospective work, 80% soundness can be anticipated when the lesions are 2 cm or less, with the prognosis going down to 55% when the lesions are greater than 4 cm in total length. Radiographs should also be made of the other stifle, as bilateral osteochondrosis would reduce the prognosis in proportion to the severity of the lesions involved.

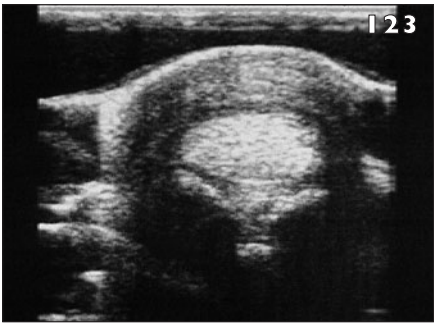
121 i. Authorisation should be sought from and fees paid to Her Majesty's Inspectorate for Pollution. The principal of the practice should take advice from the local Radiation Protection Adviser to draft Local Rules and a Written System of Work. Written records should be kept of all disposals of radioactive waste.
ii. The major sources of radiation hazard are: the radiopharmaceutical before injection, the horse after it has been injected, the horse's urine produced in the first few hours after administration and, consequently, the urine-contaminated bedding.
iii. The time spent near the horse should be minimised from the time of injection up to 16 hours after injection. This is the time after which the controlled (instantaneous dose rate of 7.5uSv/h) area around the horse is reduced to 0.5m from its skin surface. The horse should be confined to its stable except when the scanning procedure is performed. Stable staff must spend an absolute minimum of time in the horse's box. The stable should be clearly labelled as a controlled area. The horse's bedding should not be handled for at least 45 hours, which is the time needed for radioactivity to fall below controlled area limits.

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122 The right forelimb of a four-week-old colt foal born with an abnormality (**122**).
i. Name this deformity
ii. What treatment would you advise?





123 A nine-year-old pony mare has a left hindlimb lameness of two months duration. The lameness has not responded to rest. On clinical examination, the pony is only mildly lame but this is exacerbated by distal limb flexion. There is a digital sheath effusion and a 'notch' on the plantar aspect of the metatarsophalangeal joint.
i. Describe the ultrasonographic findings revealed in **123**.
ii. What is the diagnosis?
iii. What complications may be present?
iv. What methods of treatment are available, and what is the prognosis?

124 A weanling Shire horse presented with bilateral tarsocrural joint effusions and mild hindlimb 'stiffness'. Both hocks were radiographed, and the plantarolateral-dorsomedial oblique projection of the right hock is illustrated (**124**).
i. What are your radiological findings?
ii. What other areas of the tarsocrural joint does this problem affect?
iii. What other joints in the hindlimb may be affected by this condition?
iv. How would you treat this condition in this horse?

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125 You are asked by a horse rescue charity to examine the feet of an aged pony. You note a foul-smelling odour from the feet, and an abnormal appearance of the solar surface (**125a**).
i. What condition is this?
ii. Why is the charity likely to have been involved with the pony?
iii. How would you treat this condition, and what is the prognosis?



126 A one-month-old Shetland pony foal has been unable to extend its hindlimbs since birth (**126a**). It is able to move around reasonably well, but the owner now wants advice on the problem.
i. What is your tentative diagnosis?
ii. How would you confirm this diagnosis?
iii. How would you treat the problem?
iv. What prognosis can you give the owner?



127 The illustration (**127**) shows a foal born with an orthopaedic problem. What is your diagnosis, and what might have caused this abnormality?



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125–127: Answers



125 i. The solar surface of the foot is covered by hyperplastic sole and frog. This condition is known as 'canker'.
ii. Canker, which is rare, is frequently associated with neglect, when the animal is kept on soiled bedding for long periods without attention to the feet. However, there may be circumstances when neglect is not a factor.
iii. The hyperplastic horn and frog should be removed (**125b**) and the foot bandaged with an antiseptic and astringent dressing. This bandage should be changed regularly and the pony kept on clean bedding. Antibiotics can be used locally and systemically, but their contribution to the treatment of canker is questionable. In view of the history of the horse, tetanus antitoxin should be administered unless there is clear evidence that it has been vaccinated.
The prognosis is poor because the condition frequently recurs just as it seems to have been controlled. Even in successful cases, many months convalescence may be required before normal sole is obtained.

126 i. Lateral luxation of the patella.
ii. Palpation of the stifle region of both limbs, followed by a radiographic examination.



The caudocranial view (**126b**) clearly shows that the patellae are located on the lateral aspects of both stifle joints.
iii. Desmotomy of the lateral femoropatellar ligament and imbrication of the medial aspect of the femoropatellar joint capsule and retinaculum. A sulcoplasty could also be performed.
iv. The prognosis is good for saving the animal, and since Shetland ponies rarely participate in athletic events, any residual low grade lameness is likely to be acceptable.

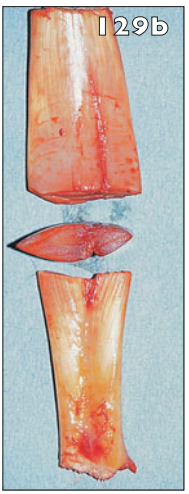
127 The foal has a congenital flexural deformity of the carpus. This is usually attributed to uterine positioning. However, the cause is likely to be multifactorial, with genetic and teratogenic influences in some cases.

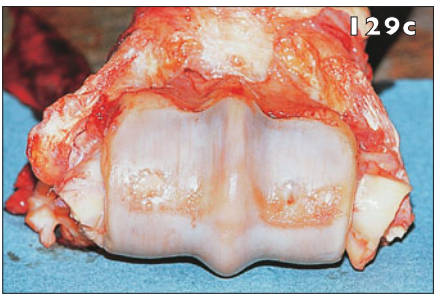
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128 A six-month-old Thoroughbred filly foal presented with moderate left forelimb lameness of two weeks duration, associated with some atrophy of the infraspinatus and supraspinatus muscles.
i. Describe the radiological features illustrated in **128a**?
ii. What is your diagnosis, treatment and prognosis?







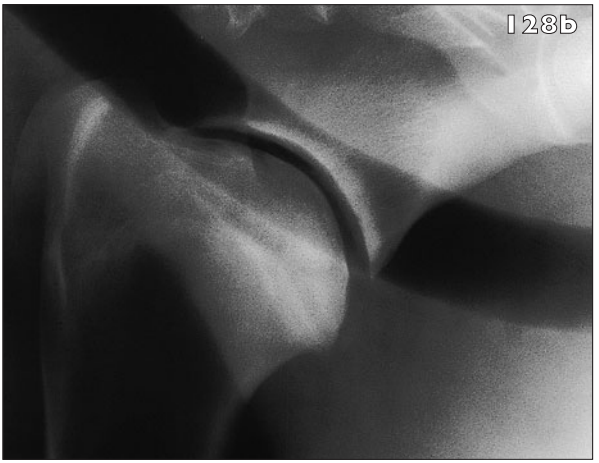




129 A nine-year-old Thoroughbred gelding, with a history of a fetlock problem, broke down on the racecourse and was destroyed.
i. What treatment had the horse received for its chronic lameness (**129a**)?
ii. What long-standing problems were present in the limb (**129b, 129c**)?
iii. What was the catastrophic injury which was responsible for the animal's demise (**129d**)?

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128 & 129: Answers



128 i. This mediolateral view of the scapulohumeral joint reveals modelling of the ventral angle of the scapula, with an irregular increase in opacity of the caudal aspect of the subchondral bone plate of the caudal scapula. A poorly defined, large lucent area is present in the caudal aspect of the humeral head, with surrounding sclerosis.
ii. • Osteochondritis dissecans of the humeral head.
• Conservative: very poor prognosis.
• Surgical: guarded prognosis.
The scapulohumeral joint is a major weight-bearing joint and is less 'forgiving' than many other joints with osteochondritis. Secondary bony changes develop rapidly. Even with arthroscopy, surgical access is rather limited. However, this filly was treated by surgical debridement and the scapulohumeral joint underwent remarkable remodelling (**128b**). The filly raced successfully as a two-year-old.

129 i. The horse had been pin-fired over the palmar aspect of the fetlock (**129a**), an old treatment for what were considered obscure fetlock problems.
ii. • A longitudinal split in the deep digital flexor tendon at the level of the fetlock (**129b**).
• Degenerative joint disease of the fetlock joint in the form of erosions of the articular cartilage of the distal cannon just palmar to the transverse ridge demarcating the phalangeal and sesamoid articular surfaces (**129c**).
iii. Rupture of the distal sesamoidean ligaments (the animal also has basilar fractures of both proximal sesamoid bones) (**129d**).





130 A two-year-old Thoroughbred filly was examined after becoming acutely lame on her left forelimb at exercise. There was pain on flexion of the distal limb. Radiographs taken at this time did not reveal any abnormalities. Eleven days later, further radiographs were taken (**130**). At this time there was a small, firm lump on the palmaromedial aspect of the distal cannon.
i. What is your diagnosis?
ii. What treatment would you recommend?

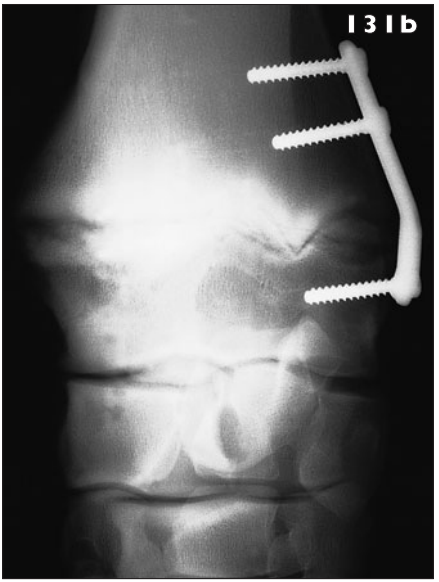
131 A seven-month-old Irish Draught x Thoroughbred filly has developed a forelimb problem (**131a**).
i. What is the problem?
ii. Why might this have developed?
iii. How would you treat this?

132 This is a lateral radiograph of the thoracic dorsal spinous processes of an 11-year-old cross-bred gelding (**132**).
i. What abnormality is present?
ii. What clinical signs would the horse have shown?
iii. How did this horse injure itself?



130–132: Answers

130 i. The radiograph shows a cortical stress fracture of the palmaromedial aspect of the distal third metacarpal bone, with early callus formation and sclerosis adjacent to the fracture line.
ii. Treatment in this case was three months box rest. Osteostixis might have been indicated if the fracture had not shown evidence of healing. However, surgical access is complicated by the fracture's proximity to the palmar insertion of the joint capsule.





131 i. A varus deformity of the left carpus.
ii. Asynchronous bone formation by the growth plate. A possible cause would be limb overload due to a past lameness on the right forelimb.
iii. The filly is already past the ideal age at which to treat this condition and, particularly if radiography reveals evidence of degenerative joint disease of the carpus, it might be decided that the horse is not a good candidate for surgery. If surgery is undertaken, every method available for adjusting the residual growth of the distal radial physis must be employed. Thus a periosteal transection should be performed medially and a bridge applied laterally which is applied in a compression mode. In this case a small bone plate was applied, with the screws placed eccentrically in relation to the holes to provide compression (**131b**). After four months, the angular deformity had corrected (**131c**).

132 i. Fractures with, in some cases, marked displacement of the dorsal parts of the dorsal spinous processes of the cranial thoracic vertebrae.
ii. Swelling, pain and distortion (often marked lowering) of the withers region.
iii. Affected horses usually have a history of rearing, falling over backwards and landing on the withers.

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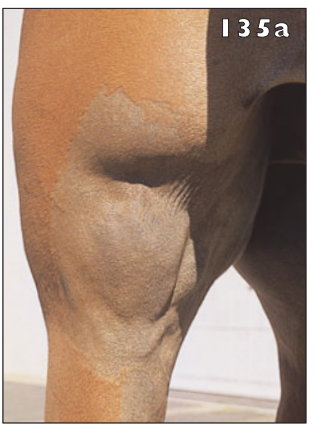


133 This horse developed a firm, painful swelling over the lateral aspect of its proximal metacarpus (**133**).
i. What is the diagnosis?
ii. Is this the usual location for such a lesion?
iii. Why should one side of the limb be more prone to this condition than the other?
iv. What radiographic features would help you to determine the clinical significance of the lesion?



134 The radiograph illustrated in **134** shows the fetlock/pastern region of the right forelimb of a young mare used for general riding. She underwent surgical repair of a fracture approximately three months prior to this radiographic examination.
i. What was the nature and configuration of the original injury?
ii. What is going to be the limiting factor in this mare's return to soundness?

135 A four-year old cross-bred horse presented with a severe right hindlimb lameness after running into a fence. There was an obvious effusion of the femorotibial joint (**135a**). Radiographs failed to reveal any abnormalities.
i. What are your provisional diagnoses?
ii. How would you further investigate and treat this case?
iii. What is the likely prognosis if the ligaments of the stifle are all intact?

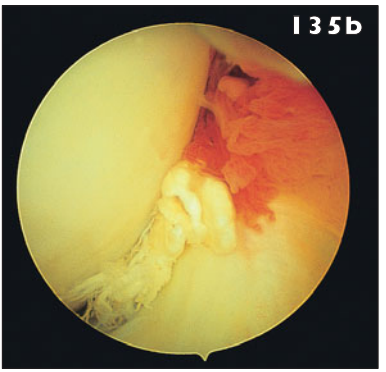


133–135: Answers

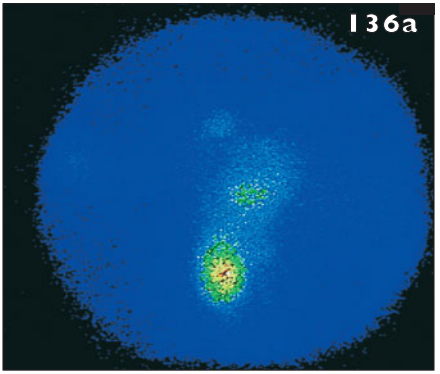
133 i. An exostosis of the fourth and third metacarpal bones – 'splint'.
ii. No, splints usually occur on the medial aspect of the limb, affecting the second and third metacarpal bones.
iii. A number of factors may predispose the medial aspect of the limb to these lesions:
• Strain gauge studies show that the metacarpus bends during functional loading such that compressive loads are concentrated on its medial side.
• Whereas the fourth metacarpal bone articulates proximally with just the fourth carpal bone, the second metacarpal bone usually articulates with the second and third carpal bones. This additional articulation may result in an outwards force on the second metacarpal bone and predispose to tearing of the interosseous ligament between it and the third metacarpal bone.
• External trauma to the second metacarpal bone occurs more frequently than to the fourth metacarpal bone due to the increased chance of interference between limbs during locomotion.
iv. Splints are usually only of clinical significance during the phase of inflammation and active bone formation. Relatively radiolucent bone with an indistinct, irregular margin is indicative of active formation, whereas uniformly opaque bone with smooth, regular margins indicates quiescence.

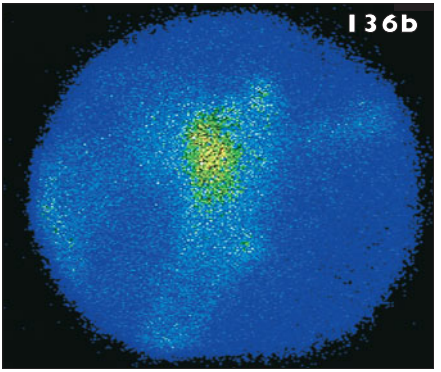
134 i. A complete, longitudinal fracture of the first phalanx, spiralling distally and involving both articular surfaces.
ii. Degenerative joint disease of the proximal interphalangeal and the metacarpophalangeal joints.

135 i. The horse has traumatic synovitis and capsulitis, and this may be associated with osteochondral damage that cannot be diagnosed by radiographs, a meniscal tear or ligamentous damage.
ii. Diagnostic analgesia to confirm the association of lameness and swelling, followed by diagnostic arthroscopy. In this case, diagnostic arthroscopy revealed synovitis and a tear of the most axial portion of the medial meniscus (**135b**).
iii. Although there is limited information on cases with meniscal tears, where the damage is localised and debridement of the torn portion is possible, a fair number of horses can return to soundness following surgery.



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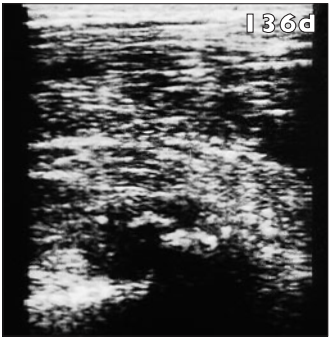


136 A 14-year-old Grand Prix dressage horse was found cast in its box. There were obvious signs of struggling in the bedding, and when the animal was eventually helped to its feet it was found to be unable to bear weight on the right hindlimb. The lameness improved to grade 1/5 over the next week, but remained consistent at this level. Nerve blocks up to and including the tibial and fibular nerves were performed, but failed to improve the lameness. Radiography of the stifle did not show any abnormalities. Gamma camera images of the right hip (**136a**, cranial to the right) and left hip (**136b**, cranial to the left) were obtained following intravenous injection of 99^{m} technetium MDP.
i. With which anatomical landmark is the 'hot spot' associated?
ii. What is your tentative diagnosis?
iii. How would you confirm this?

137 An eight-year-old Thoroughbred eventer presented with an acute onset, right hindlimb lameness following a fall at a fence. The lameness was increased by a flexion test of the hock.
i. What is the swelling in the region of the hock (**137**)?
ii. How would you assess its significance in relation to the lameness?
iii. Do most swellings of this structure require treatment?



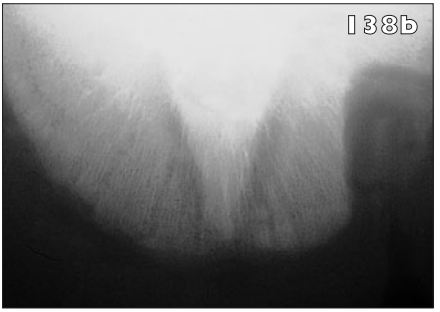




136 i. In contrast to the normal left proximal femoral region, the scintigraph of the right hip shows an increased uptake of radiopharmaceutical in the region of the third trochanter of the right femur.
ii. Focal increase in uptake of this nature is compatible with the presence of a fracture. Whether this fracture is the result of direct trauma or an avulsion of the insertion of the superficial gluteal muscle is uncertain.
iii. Further information can be gained by attempting skyline radiography of the third trochanter (**136c**), or imaging the area ultrasonographically (**136d**). Both imaging techniques revealed the presence of irregular mineralised densities adjacent to the third trochanter, confirming structural bone damage in this area.

137 i. Distension of the tarsal sheath, which encloses the deep digital flexor tendon as it passes through the tarsal canal. The condition is often called a 'thoroughpin'. This is a typical example with a discrete swelling located either side of the plantar aspect of the hock at the level of the proximal calcaneus.
ii. • Intrasynovial analgesia of the tarsal sheath.
• A plantarolateral-dorsomedial oblique projection of the hock, skylining the sustentaculum tali of the fibular tarsal bone which forms a pivot point for the deep digital flexor tendon. A fracture of this structure or new bone formation on its surface will cause synovitis and damage to the deep digital flexor tendon.
In this case the clinical history obtained from the owner suggested the thoroughpin might have been present prior to the start of lameness, although on a smaller scale. Tibial and fibular (peroneal) nerve blocks failed to improve the lameness. However, intra-articular analgesia of the medial and lateral femorotibial joints did reduce the lameness. The thoroughpin was considered an incidental finding. Other techniques available to investigate synovial effusions of tendon sheaths include aspiration and analysis of synovial fluid, ultrasonography, plain and contrast radiography, and tenosynovioscopy.
iii. No. In the absence of lameness, thoroughpins should be regarded as blemishes. Horses should be worked as normal, and the distension may decrease with exercise.





138 A 12-year-old gelding presented with a history of right forelimb lameness of two weeks duration after losing a shoe. However, even after the shoe was replaced, the animal still had a grade 1 lameness, at the trot, on the right forelimb. **138a** illustrates the appearance of the sole, and **138b** is a dorso 60°proximal palmarodistal oblique projection of the third phalanx.
i. What condition is present in this animal?
ii. What are the differential diagnoses?
iii. How would you treat this case?



139 What are the possible diagnoses for the swelling illustrated in **139**?



140 This yearling has a severe orthopaedic problem.
i. What abnormality is present?
ii. What structures have failed?

138–140: Answers

138 i. The clinical findings and radiographic appearance are consistent with a diagnosis of keratoma.
ii. The radiological differential diagnoses include infective osteitis of the third phalanx after a solar penetration, local resorption of the third phalanx associated with a long-standing solar abscess (without sepsis of the bone), or third phalangeal fracture. However, the distinct outline of the lucency in the third phalanx, together with the clinical evidence of a mass, confirm the diagnosis of keratoma.
iii. The keratoma should be removed under general anaesthesia. The wall overlying the keratoma is removed using an electric burr and the underlying keratoma cut away until only normal hoof wall and underlying distal phalanx remains. Particular care should be taken to remove the origin of the mass. The hoof defect can be packed initially with povidone–iodine soaked swabs and the foot bandaged. Once secondary horn has formed over the defect, it can be packed with commercially available hoof filler. A metal plate can be screwed across the defect to provide stability so that intact horn is encouraged to grow down from the coronary band without the development of a hoof wall crack. Regrowth of the keratoma is a possibility if its origin has not been completely removed.

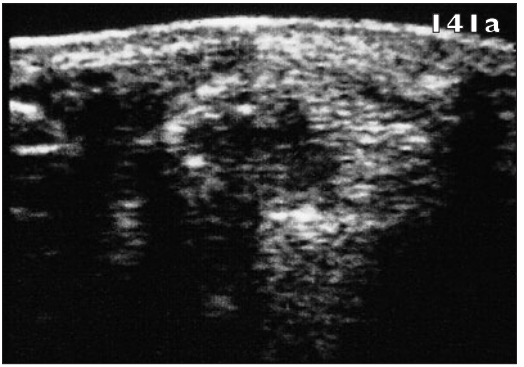
139 A discrete fluid-filled structure overlies the dorsomedial pouch of the radiocarpal joint. Its boundaries rule out a tendon sheath effusion which would occur further proximal and distal, and in any case, careful inspection reveals the tendon of the extensor carpi radialis lying lateral to the structure. A joint effusion is unlikely, given the lack of distension of the lateral pouch. This leaves synovial hernia or ganglion as the most likely diagnoses. Ganglia arise as non-synovial structures close to synovial cavities. Synovial herniae arise as prolapses of synovial membrane through defects in the fibrous joint capsules. The two can be difficult to distinguish clinically, but synovial herniae are the more common and, as in the case shown, the carpus appears to be a predilection site.

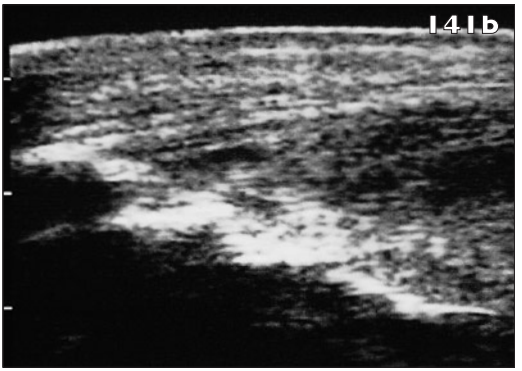
140 i. Both carpi demonstrate extreme hyperextension caused by a traumatic incident.
ii. The substantive support structure on the palmar aspect of the carpus is the palmar carpal ligament. Post-mortem examination confirmed bilateral rupture in this case.

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141 A 14-year-old event horse had a history of non-specific enlargement of the palmar aspect of the left fore fetlock region two years previously. It had since performed satisfactorily until six weeks before ultrasonographic examination, when it pulled up lame at the end of the cross-country phase of a one-day event. There was considerable swelling over the medial branch of the left fore suspensory ligament. Intra-articular analgesia of the left metacarpophalangeal joint resulted in an 80% improvement in the lameness. The ultrasonographs illustrated are a transverse scan of the medial aspect of the distal metacarpus (**141a**) and a longitudinal scan of the medial aspect of the distal metacarpus (**141b**).





i. A number of lesions can be identified ultrasonographically. Describe these.
ii. What is your diagnosis?
iii. What other tests would you employ?
iv. How do you explain the response to intra-articular analgesia?
v. What is the prognosis, and what treatment would you recommend?

141: Answers

141 i. The transverse and longitudinal scans show gross enlargement and almost complete disruption of normal ligamentar tissue. Some bright hyperechoic foci, with deeper acoustic shadowing, are also present. The bony abaxial surface of the proximal sesamoid bone has a very irregular surface with 'steps' in its normal 'ski-jump' outline.
ii. This horse is suffering from medial suspensory ligament branch desmitis. The combination of hyperechoic and hypoechoic changes indicates that this is most likely to be a recurrence of a previous problem, which would be consistent with the history. The irregularities on the abaxial surface of the proximal sesamoid bone are characteristic of enthesophytosis.
iii. • Ultrasonography of the contralateral suspensory ligament (and possibly also the hindlimb suspensory ligaments) should be performed. Suspensory ligament desmitis is frequently a generalised condition.
• Radiographs should be obtained to characterise the bony change in the proximal sesamoid bones, and to look for other abnormalities such as osseous bodies on the palmar aspect of the metacarpophalangeal joint which can co-exist with overextension injuries such as this.
iv. The response to intra-articular local analgesia has two possible explanations:
• Local analgesic agent diffused out of the joint into the adjacent suspensory ligament branches. There is a close association between the suspensory ligament branches and the palmar pouch of the metacarpophalangeal joint.
• The suspensory ligament lesion is only part of an overextension injury (sudden or, more likely, repetitive) which has also damaged the metacarpophalangeal joint.
v. The prognosis as an advanced event horse is extremely poor. Even if the medial branch heals satisfactorily, it is at risk of reinjury (as has already occurred) and the other branches are also at risk of subsequent injury.
If treatment were contemplated, the limb could be cast for 6–8 weeks or the horse box rested, with appropriate anti-inflammatory therapy, until the acute inflammation had disappeared. The horse could then be walked out in hand, with a gradual increase in exercise dictated by serial ultrasonographic examinations. The metacarpophalangeal joint could be medicated with sodium hyaluronate or polysulphated glycosaminoglycan, to treat the concurrent damage to this articulation.

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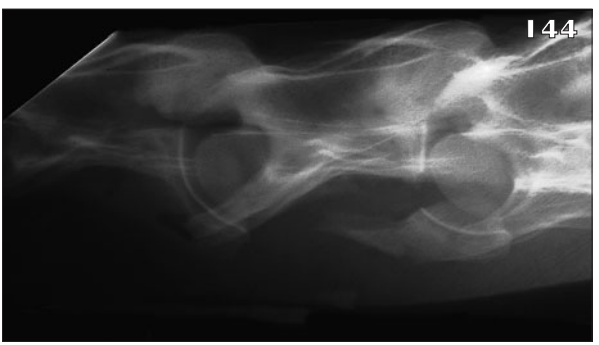
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142 A three-year old Quarterhorse, that had recently gone into training for cutting, went lame on the left hindlimb. Radiographs of the stifle were taken, as the lameness improved after intra-articular analgesia of the medial femorotibial joint. The caudocranial projection is illustrated in **142.**
i. What is your diagnosis?
ii. How would you treat this case?
iii. What is your prognosis?



143 A 10-year-old event horse fell on a cross-country course and was immediately lame. When examined two months later the mare would bear full weight on the limb, but was very lame at the walk.
i. Describe the radiological findings in the mediolateral projection of the shoulder (**143**).
ii. What is your diagnosis?
iii. What is your treatment and prognosis?





144 This lateral radiograph (**144**) shows the cervical spine of an eight-year-old Thoroughbred gelding.
i. What is your diagnosis?
ii. What clinical signs might the horse have shown?
iii. How would you treat this injury?

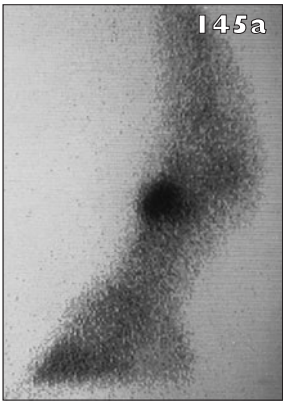
142–144: Answers

142 i. Subchondral cystic lesion of the medial condyle of the distal femur.
ii. Arthroscopic surgery and debridement of the cystic lesion.
iii. Following surgical treatment, 65–70% of horses become sound for their intended use. This compares to a much lower success rate for conservative management.

143 i. There is a radiolucent line through the caudal cortex of the scapula, traversing the body of the scapula and extending proximally cranial to the scapular spine. There is marked sclerosis involving the caudodistal scapula.
ii. A non-articular fracture of the scapula.
iii. • Conservative: cross-tying, box rest. Re-evaluate in six weeks unless lameness deteriorates.
• The prognosis is fair.
The mare was substantially improved six weeks later. The fracture was still detectable but much less obvious. The mare was walked in hand for the following 12 weeks, but mild lameness persisted. She was turned out for a further 12 weeks, after which she appeared sound. She then slowly resumed work and had no recurrence of lameness. She died due to an intrathoracic haemorrhage three years later. No abnormality of the scapula was detected when it was boiled out.

144 i. Displaced fracture of the caudoventral vertebral body of the fifth cervical (C5) vertebra with slight dorsal subluxation of the remaining caudal body of C5 with respect to cranial C6.
ii. Localised swelling, heat and pain. Neck stiffness and torticollis. Reluctance to move the neck. Neurological deficits in the fore or hindlimbs. Horner's syndrome.
iii. This particular horse was managed conservatively by box rest. The fracture healed radiographically within three months and the horse made a full clinical recovery.
Screw fixation of the fracture would probably also have been possible, but this would have carried some risk of exacerbating any spinal cord damage during induction, recovery and manipulation of the neck while the horse was under general anaesthesia.

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145 A six-year-old Warmblood gelding presented with a grade 2/5 right forelimb lameness of three months duration, which increased to 3/5 when the horse was circled to the right. The lameness improved following intrasynovial analgesia of the distal interphalangeal (DIP) joint and the navicular bursa. It was abolished by a palmar digital nerve block, which also revealed a 1/5 left forelimb lameness. Radiographs of the front feet failed to reveal any bony abnormalities, and a diagnosis of dorsopalmar foot imbalance was made. This improved with corrective shoeing, and the owner was advised to work the horse on a regular basis. However, several weeks later, although the horse would be sound at the start of exercise, the right forelimb lameness would gradually get worse during work, up to a point where the horse was hardly able to bear weight. A bone scan was advised. **145a** illustrates a lateral gamma camera image of the right fore fetlock following injection of 99^{m} technetium MDP. **145b** and **145c** show lateromedial and dorsopalmar radiographs of the right fore fetlock joint obtained at the same time.

i. What is your diagnosis?

ii. What is your interpretation of this scenario?



146 A one-month-old foal presents with marked swellings of the left carpus and tarsus, and marked lameness on these limbs (**146a**). The owner thinks the mare trod on the foal 10 days previously when the problem started.

i. Is the owner right, and what is the most likely diagnosis?

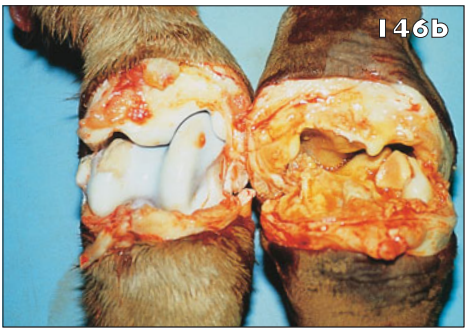
ii. How would you confirm the diagnosis?

iii. How would you treat this foal?

145 & 146: Answers

145 i. There is a clear 'hot spot' associated with the dorsoproximal aspect of the first phalanx. Radiography reveals smooth, well-defined and remodelled new bone on the dorsal aspect of the first phalanx, extending for about 2 cm from the fetlock joint distally. The dorsopalmar projection shows a short, incomplete fracture of the first phalanx, starting in the sagittal groove. Even though radiography shows a chronic fracture, scintigraphy reveals an intense increase in bone turnover in this area, indicating that the process is still active.
ii. One possible explanation for this scenario is that the lameness observed on presentation to the diagnostic centre, when the horse was out of work, related to the foot. This was addressed and greatly improved by corrective shoeing. However, when the horse was put back into ridden work, the fracture probably became more painful, which explains why the animal deteriorated whenever the owner tried to ride it.

146 i. The owner is probably wrong. Lameness in the neonatal period often seems to be blamed on mares treading on foals. However, infective (septic) arthritis should always be considered, particularly if one or more joints are swollen.
ii. A thorough clinical examination of the foal, followed by radiographic examination of the joints involved, and arthrocentesis. Total nucleated cell count, differential cell count and total protein concentration should be measured in the synovial fluid. A Gram stain may identify the presence of bacteria, or alternatively the fluid can be cultured. In this case, radiographs of the tarsus revealed severe destruction of the joint, so further investigation was not thought necessary.
iii. The foal was destroyed due to the advanced changes present in the hock. The *post-mortem* appearance of the left tarsocrural joint shows the advanced destruction of the joint, including the articular cartilage (**146b**).

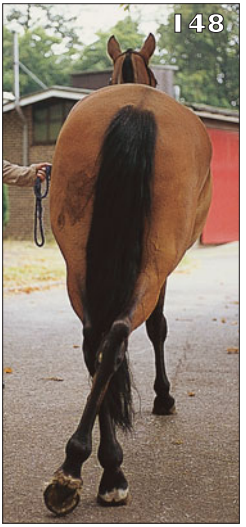


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147 A dorsopalmar projection of a fractured third metacarpal bone in an event horse (**147a**). **147b** illustrates the fracture four months later.
i. What technical error has been committed in the repair of the fracture?
ii. What disaster has been narrowly avoided?



148 A 12-year-old Polo pony presented for investigation of a slowly progressive gait abnormality which seemed to be causing problems when the animal turned suddenly (**148**).
i. Is the horse trying not to urinate?
ii. What is the general term given to horses with this type of problem?
iii. What specific functional deficit does the animal have?
iv. The pony also had forelimb problems. Where is the primary lesion most likely to be located?



149 This is a radiograph (**149**) of a hind fetlock joint of a three-year-old Thoroughbred colt which became lame soon after a race.
i. What other radiographic projections could have been obtained to assess the degree of damage?
ii. What other diagnostic procedure might you perform?
iii. What treatment would you recommend? What is/are the alternatives, if any?
iv. What prognosis would you give for a return to racing soundness, and what is likely to be the limiting factor?

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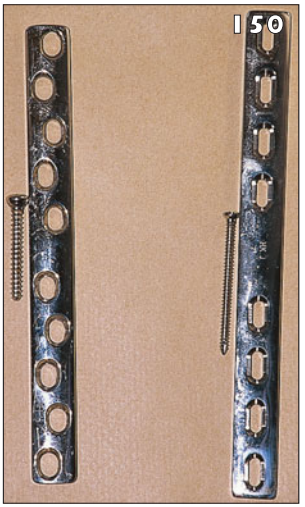
147–149: Answers

147 i. The radiograph reveals a medial condylar fracture which is spiralling proximally. This fracture configuration is less common in the forelimb than the lateral condylar fracture, and it requires a different approach to its management. In this case the fracture has been fixed like a lateral condylar fracture with three lag screws, whereas the spiral should have been followed with a series of screws or a plate, up the bone to the carpus, or, alternatively, conservative management in a cast considered.
ii. Distal fixation of a spiral fracture results in stress concentration above the proximal screw. This often leads to a transverse fracture of the third metacarpal bone, on recovery from general anaesthesia or soon after. **147b** shows the new bone formation on the medial cortex related to the stress concentration effect, suggesting that in this case a catastrophic transverse fracture has been narrowly avoided.

148 i. No. The horse has its legs crossed because it has a neurological problem.
ii. This horse is a 'wobbler', as a result of ataxia.
iii. The animal has defective proprioception. Therefore, the pony did not know where its hindlimbs were and could be persuaded to adopt all manner of abnormal postures for extended periods.
iv. The pony is likely to have a lesion causing pressure on the spinal cord in the cervical region.
In the USA one would need to rule out equine protozoal myelitis.

149 i. This dorsoplantar radiograph reveals a displaced fracture of the proximal part of the abaxial surface of the lateral proximal sesamoid bone. A dorsolateral–plantaromedial oblique view would highlight this sesamoid bone and a lateromedial projection might help in the identification of any articular involvement. Finally, a proximomedial–distolateral oblique projection would skyline the abaxial surface of the sesamoid bone, revealing the location of the fracture on that surface.
ii. An ultrasonographic examination of the suspensory ligament to determine the degree of damage to this structure. Diagnostic arthroscopy could also be performed to assess the involvement of the articular surface.
iii. If the fragment is articular, it should be removed arthroscopically and the horse given a period of box rest to allow the suspensory wound to repair. Intra-articular medication with sodium hyaluronate might help to limit the development of any secondary degenerative changes in the joint. If the fragment is non-articular, an alternative to surgery would be box rest alone to allow the fracture to heal by fibrous union.
iv. If the fracture is uncomplicated, the prognosis is good for a return to racing soundness. The limiting factor is concurrent, severe, suspensory ligament damage.

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150 Two plates are illustrated with their appropriate screws (**150**). Both the plates have elongated holes, but these have different configurations.
i. Name the four implants.
ii. What is the difference between the two screws?
iii. What is the difference between the two plates?



151 A seven-year-old Irish Draught gelding developed a soft swelling on the left hindlimb (**151**). This was not associated with any marked lameness, and there was no history of severe trauma to the region.
i. What is this condition?
ii. How could you confirm your diagnosis?
iii. How would you treat the condition?



152 A dorsoplantar radiograph (**152**) of a horse's right fetlock, which was immobilised in a rigid cast for eight weeks as part of the treatment for a severe tendon laceration.
i. Describe the radiographic appearance of these bones.
ii. What is your diagnosis?
iii. How would you manage this case?

150–152: Answers

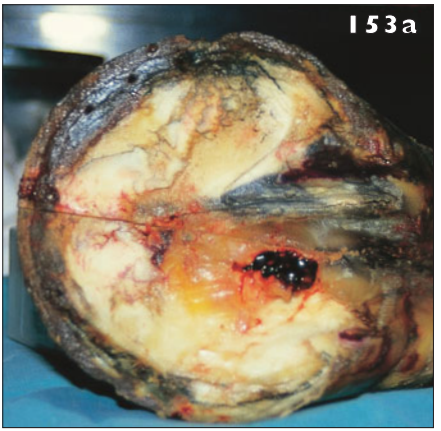
150 i. Cortical bone screw, dynamic compression plate, Sherman self-tapping screw, heavy duty slotted bone plate.
ii. The cortical screw is designed to be inserted into a tapped hole, which is a good fit for the screw. The self-tapping screw cuts its own thread, but the hole has to be relatively larger so that the swarf, accumulated as the screw is inserted, does not prevent its insertion.
iii. The hole in the dynamic compression plate is designed so that an eccentrically placed screw will slide, as it is tightened, towards the midpoint of the plate. Thus, if the plate is centred over the fracture, the screws either side should compress the fracture as they are tightened. The hole in the slotted bone plate is neutral. It is not designed to produce any movement in the plate or the bone as the screw is tightened.

151 i. Prepatellar bursitis. The other possibility is a haematoma, which may ultimately lead to this type of bursal swelling.
ii. • Radiography to confirm a swelling of fluid/soft tissue opacity.
• Ultrasonography to confirm a fluid-filled structure.
• Sampling to investigate the nature of the fluid.
iii. Having confirmed, with a contrast study, that the bursa did not communicate with any other synovial structures, the bursa could be drained and an attempt made to obliterate the secretory synovial lining.

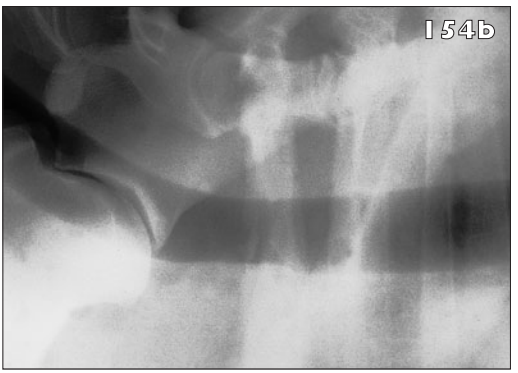
152 i. There is generalised loss of contrast between the cortices of the distal third metacarpal bone and surrounding structures, and multiple areas of lucency give the bones (particularly the proximal sesamoid bones) a honeycomb appearance.
ii. Disuse osteoporosis.
iii. The loss of bone mass will result in relative weakening of the bones and hence predispose to fractures (pathologic fracture). However, it is unlikely that this effect will be sufficient to significantly increase the risk of fracture while the horse is sedentary, and bone mass will steadily be restored on resumption of weight bearing. Management of the tendon injury would require a prolonged period of box rest and this would not need to be modified on account of the osteoporosis.

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153 A 15-year-old Thoroughbred mare presented with a grade 4/5 lameness on the right forelimb following a solar penetration three days previously. A defect was visible medial to the frog (**153a**).
i. What structural damage should be considered?
ii. How would you investigate this case?
iii. What treatment would you advise?
iv. What is the prognosis?







154 Two horses were turned out in a field together six weeks previously, and both became severely lame. One sustained a fracture of the supraglenoid tubercle of the scapula. The horse illustrated (**154a**) was moderately lame on the right forelimb at the walk, and had slight instability of the shoulder.
i. Describe the clinical signs.
ii. Are there any radiological abnormalities (**154b**)?
iii. How do you explain the lameness?

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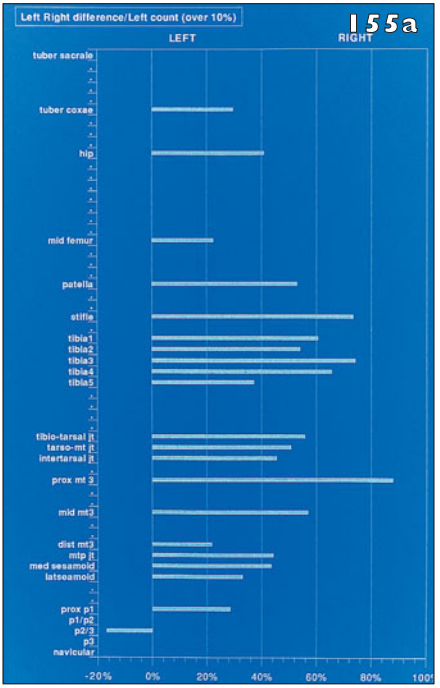
153 & 154: Answers

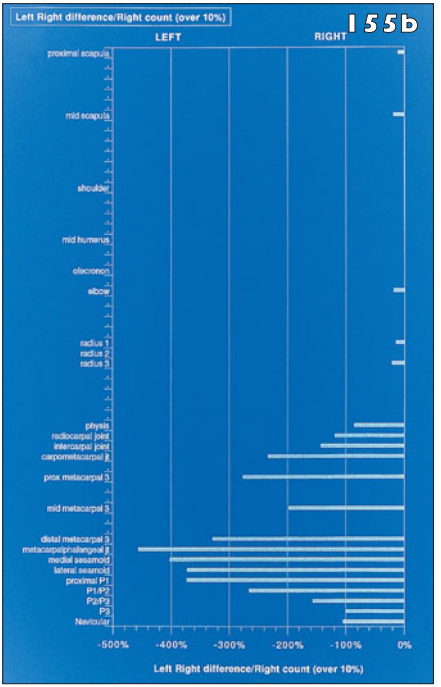


153 i. Penetration of any of the synovial cavities of the foot (navicular bursa, distal interphalangeal joint or digital sheath) leading to contamination and infection; fractures of the navicular bone or the pedal bone.
ii. Plain radiographs should be obtained in order to detect any foreign bodies, bone damage and gas shadows. Then a metal probe can be gently inserted into the tract (if necessary after abaxial sesamoid perineural analgesia) and another lateromedial radiograph obtained to determine the direction of the tract. If it approaches any of the synovial cavities and/or the horse is severely lame, the horse should be placed under general anaesthesia to allow further investigation. Each synovial cavity should be sampled and analysed for infection. A contrast agent can be introduced into a suspect synovial structure to determine any leakage into the discharging tract. This case shows penetration of the navicular bursa (**153b**).
iii. Any affected synovial cavity should be flushed and the animal maintained on high levels of systemic antibiotics. A 'street-nail' procedure should be employed to debride a tract to the navicular bursa. (More recently, arthroscopic debridement of the tract via the navicular bursa has shown encouraging results.) The defect in the hoof, after debridement, can be packed with gentamicin-impregnated beads to ensure high levels of antibiotics in the region.
iv. If there is damage to the deeper structures of the foot, the prognosis is very poor for a return to athletic function. Elimination of the infection is the primary problem. If infective osteitis of the navicular bone is evident on radiography of these cases, the prognosis should be considered hopeless.

154 i. Atrophy of, predominantly, the right infraspinatus muscle.
ii. Fracture of the first rib. No abnormality of the scapula or humerus is detectable.
iii. The first rib has a close relationship to the brachial plexus and impingement on nerves and nerve trauma *per se* may result in lameness.
The lameness improved but persisted long term, although instability of the shoulder resolved rapidly. Some periosteal reaction developed at the fractured ends of the bone, but 12 months after the injury there was no evidence of bony union of the rib fracture.

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155 Plots generated from point counts obtained from two different horses, following intravenous injection of 99^{m} technetium MDP, are illustrated (**155a, 155b**). The data are presented as the difference between equivalent points on the two forelimbs, expressed as a percentage of the count at that point in the non-lame limb.
i. Are these results helpful in arriving at a diagnosis?
ii. How would you explain the pattern of radioisotope uptake seen in each of these plots?

156 A three-month-old foal escaped into a field with a group of horses, and is thought to have spent a night galloping around with them. The following morning it could hardly move (**156a**).
i. What is your diagnosis?
ii. What anatomical structures must be abnormal?



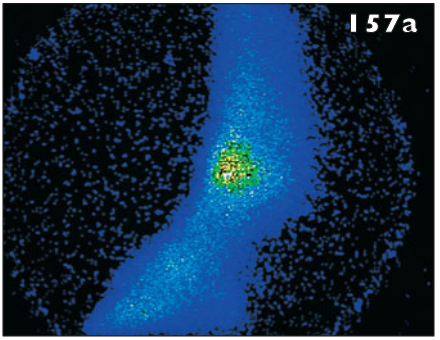
155 & 156: Answers

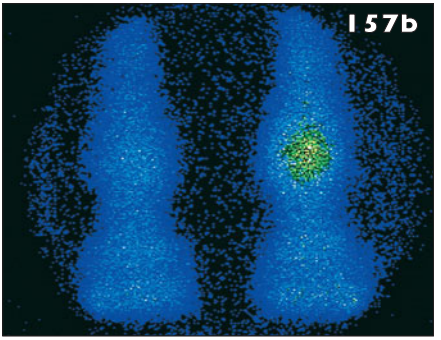
155 i. No.
ii. Both these cases show fairly commonly encountered artefacts in which one limb appears to have received far more injected isotope than the other. This can occur in the lame limb (**155a**) or in the sound limb (**155b**). The reasons for these phenomena have not been thoroughly investigated, but palpation of the limbs in such cases often reveals generalised heat on the same side as the apparent increase in uptake. In man, sympathetic reflex activity has been proposed as the explanation of diffuse increased uptake in the lame leg in, for instance, patients suffering from lesions of the hip joint. Therefore, similar scintigraphic findings in the horse have been described as vascular artefacts. It has also been suggested that where there is a generalised decrease in uptake, then blood flow to the lame limb is reduced due to lack of use, and blood flow in the sound limb possibly increases due to increased weight bearing.
The key to the recognition of such artefacts lies in the widespread nature of the apparent increased uptake, and the level of the increased uptake, which is well above that encountered in most fractures. Also, vascular artefacts tend to reach a peak at the fetlock joint. It is extremely unlikely that a genuine injury of the fetlock joint, resulting in a 200–300% increase in uptake, would be detectable at all sites from the carpus down to the foot. However, in some cases, inflammatory changes associated with fractures can produce a similar picture, leading to the mistaken conclusion that the pattern is related to a vascular artefact.

156 i. Bilateral subluxation of the proximal interphalangeal joints in the forelimbs (**156b**).
ii. The following structures must have been damaged: the straight (superficial) distal sesamoidean ligament, the insertion of the superficial digital flexor tendon on the second phalanx, and the palmar ligament/fibrous joint capsule of the proximal interphalangeal joint. The relatively normal angulation of the fetlock joint indicates that the other distal sesamoidean ligaments are intact.



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157 A three-year-old Thoroughbred colt pulled up lame on the left forelimb during a work-out at the gallops. The lameness was severe (grade 4/5) but improved with eight days box rest. Manipulation of the limb revealed pain on forced flexion of the fetlock. Standard radiographs of the fetlock failed to show any abnormalities. An abaxial sesamoid nerve block failed to improve the lameness, but both the low four-point nerve block and intra-articular analgesia of the fetlock joint gave positive results. In view of the lack of information obtained from the radiographs, gamma camera images of the left fore fetlock were obtained (**157a, 157b**) following the intravenous injection of 99^{m} technetium MDP.

i. What can you identify?
ii. How would you confirm your diagnosis?
iii. How would you manage the case, and what prognosis would you give the trainer?



158 A five-year-old Thoroughbred gelding sustained a fracture of its left accessory carpal bone. Conservative management, involving a prolonged period of rest, was advised. The horse was still lame one year later, when the radiograph illustrated was taken (**158**).

i. Describe the fracture on the basis of the current radiograph.
ii. Why has the fracture failed to heal?
iii. What is the likely explanation for the persistent lameness, and what other clinical signs might be detected?
iv. How can such cases be treated, and what is the prognosis?

157 & 158: Answers

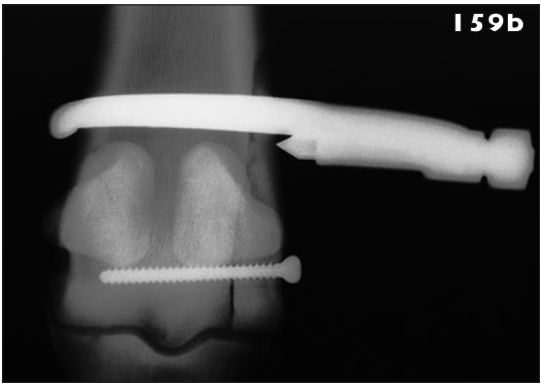
157 i. There is a focal area of increased radiopharmaceutical uptake associated with the distal metacarpus in the left forelimb. This appearance is characteristic of a fracture in the region.
ii. The radiological appearance of distal metacarpal fractures may vary from normal to a complete, displaced lateral condylar fracture. It is advisable to take a flexed dorsopalmar radiograph of the distal metacarpus in these patients, in order to recognise the presence of an incomplete short cortical fracture of the palmar aspect of the lateral condyle, as was found in this case (**157c**). Such fractures are not generally identified on standard dorsopalmar radiographs of the fetlock.
iii. Incomplete, non-displaced short fractures of this nature have a favourable prognosis for return to athletic activity. They can either be stabilised surgically, with lag screws, or treated conservatively with a Robert Jones bandage and 2–3 months of box rest.



158 i. Fibrocartilaginous non-union of a complete fracture in the frontal plane through the mid-body of the accessory carpal bone.
ii. Due to instability at the fracture site caused by the constant action of flexor carpi ulnaris on the palmar fracture fragment.
iii. Carpal canal syndrome – exuberant callus formation on the medial aspect of the accessory carpal bone encroaches upon the carpal canal, causing pressure on the flexor tendons, nerves and blood vessels. Other signs may include synovial effusion of the carpal canal and reduced arterial pulse in the distal limb.
iv. The treatment of choice is surgical transection of the palmar carpal retinaculum and careful curettage of protruding callus. The prognosis is guarded.

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159 A three-year-old Thoroughbred filly sustained an injury.
i. What is your diagnosis, and what is the optimal method for repair (**159a**)?
ii. 159b illustrates the initial stage of the repair. What comments would you make about the articular surface of the joint? What surgical instrument is being used?
iii. 159c illustrates the joint immediately after removal of the supportive cast, when the filly was sound at the walk. Are you satisfied with the result at this stage?
iv. 159d illustrates the joint several weeks later when the filly was found suddenly lame in its box. What is the prognosis now, and what would be the optimal method of treatment?

159: Answers

159 i. A displaced lateral condylar fracture of the third metacarpal bone. The standard treatment is repair by lag screw fixation after accurate articular realignment.
ii. There is a step at the joint surface with the fragment displaced slightly distally in relation to the parent bone or rotated in the sagittal plane. A radiolucent defect is also present medial to the sagittal ridge. The instrument is an AO/ASIF C-clamp drill guide.
iii. No. There is a step in the joint with the fragment apparently proximally displaced or rotated in the sagittal plane. The screws are bent. This suggests that the fracture fixation is unstable.
iv. The implants have fractured and the fragment has become severely displaced. As this is a filly, the fracture could be repaired for a second time to salvage the horse for breeding, but the prognosis for athletic soundness is hopeless. Therefore, in this case, the owner opted for euthanasia.

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160 An 11-year-old mare has been lame for three weeks, after escaping from her stable one night (**160a, 160b**). Recently, her condition has markedly deteriorated.
i. What is your diagnosis?
ii. Where is the horse likely to have spent the night of freedom?
iii. What treatment would you recommend?



161 A one-month-old Quarterhorse foal presented with angular limb deformities on both forelimbs, and a marked swelling on the dorsolateral aspect of the carpus of the right forelimb (**161a**).
i. What deformities are present?
ii. What is the most likely cause of the swelling on the right forelimb?
iii. What other clinical problems are frequently associated with this swelling?
iv. What gait problem will be present in the right forelimb?
v. If the forelimbs are splinted to correct the deformities, what functional complication may develop?



162 The distal forelimbs of an aged gelding (**162a**).
i. What is your diagnosis?
ii. What treatment is most likely to return this horse to athletic activity, and what is the prognosis without such treatment?
iii. What other joints affected by this condition would have a similar prognosis for return to athletic activity after treatment, and why?

160–162: Answers

160 i. Severe laminitis.
ii. The feed room. This type of case is often associated with grain overload while the animal is out of the stable.
iii. Discharge from the coronary band suggests that at least one hoof is starting to slough. The findings were similar in the other four feet, so the horse was destroyed.

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161 i. A valgus deformity of the left carpus and a varus deformity of the right carpus – 'windswept' foal.
ii. Rupture of the common digital extensor tendon.
iii. Carpal flexural deformity; incomplete ossification of the cuboidal bones of the carpus.
iv. The animal will not be able to extend its toe. It may knuckle over and stand placing weight on the dorsal aspect of the phalanges (**161b**).
v. Splinting and casting of the limbs of foals tends to result in tendon laxity. This problem is lessened if sleeve casts are used. Therefore, a foal may become 'back at the knee', low on its fetlocks and its toes may come off the ground. After the splints are removed, such a foal should be kept in a box, to limit its exercise, until the limbs have regained their normal conformation.

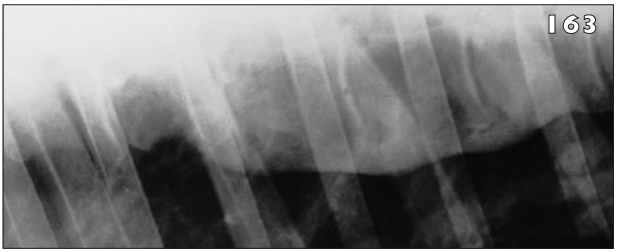

161b

162 i. Degenerative joint disease of the proximal interphalangeal joint (PIPJ) on the right forelimb – 'high ringbone' (**162b**).
ii. Surgical arthrodesis. The prognosis is poor without surgery as it is relatively uncommon for this joint to fuse naturally.
iii. The tarsometatarsal and distal intertarsal joints, like the PIPJ, are relatively low motion joints, so
surgical arthrodesis has an acceptable minor effect on the overall gait of the animal. In contrast, an animal with a fused high motion joint, such as the fetlock, will have an obvious stiff joint.


162b

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163 This is part of a lateral radiograph of the caudal thoracic region of a 15-year-old Welsh pony gelding (**163**).
i. What abnormality can you see?
ii. Is this radiograph most likely to have been taken because the pony had: • A chronic cough? • Back pain?



164 **i.** What is this problem (**164**)?
ii. How may it have developed?
iii. Is the horse likely to be lame?
iv. If considering treatment, what would you want to ascertain about the nature of the swelling first? How would you determine this?





165 A five-year old half-bred gelding presented with a severe lameness on the right forelimb. Eight hours previously a nail had been removed from the palmar aspect of the foot, but it was assumed that this puncture was well away from any vital structures. Initially, the horse was not lame, but with time it had steadily deteriorated.
i. Describe the investigation which has been undertaken to produce the picture illustrated in **165**.
ii. What is the likely explanation for the deterioration in the horse's condition?
iii. How could you confirm this?
iv. What treatment would you recommend?

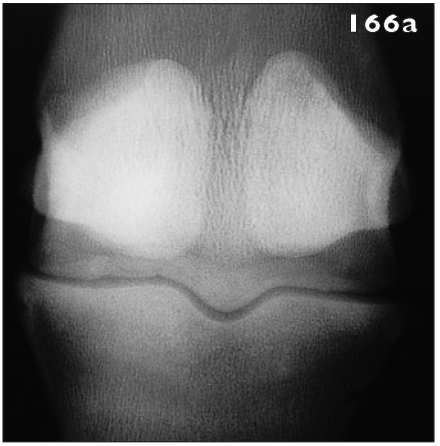
163–165: Answers

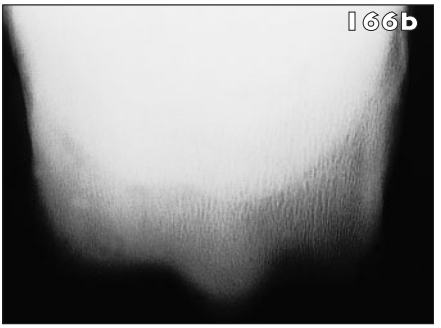
163 i. Ventral spondylosis bridging four adjacent thoracic vertebral bodies.
ii. Spondylosis is most commonly an incidental radiological finding of no clinical significance, and it is probably equally likely to be found on a radiograph of a coughing horse's chest as it is on a radiograph of the spine of a horse thought to have back pain. (This horse had a cough and no locomotor problems.)

164 i. An acquired bursa on the dorsal aspect of the carpus – capped knee, carpal hygroma.
ii. Repetitive trauma, such as banging a stable door every day at feed time.
iii. It may have restricted flexion of the carpus, but it is unlikely to have a weight-bearing lameness.
iv. You would want to ensure that the bursa does not communicate with any other synovial structure such as a tendon sheath or a carpal joint. This is most simply achieved by contrast radiography.

165 i. This is a contrast radiograph. A catheter, introduced into the puncture wound near the heel, has been advanced as far as possible, and a contrast agent injected. This has filled the digital sheath.
ii. The nail has penetrated and contaminated the digital sheath. The severe lameness was associated with an infective tenosynovitis.
iii. Synoviocentesis. The gross appearance might suggest infection. Failing that, and in addition, the sample should be submitted for a total nucleated cell count, measurement of total protein concentration and bacterial culture.
iv. Lavage of the digital sheath with several litres of sterile, balanced electrolyte solution. Systemic broad-spectrum antibiotic therapy, until this can be modified according to the antibacterial sensitivity of any organisms cultured. Non-steroidal anti-inflammatory drug therapy. Intrasynovial antibiosis might also be used. This case rapidly improved after flushing, and returned to soundness.

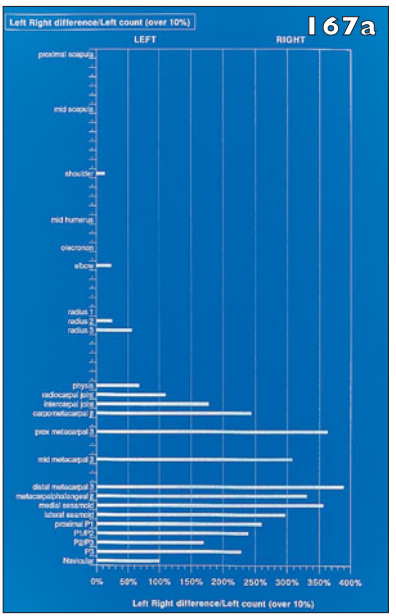
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166 Dorsopalmar and flexed dorsoproximal-dorsodistal views of the left fore metacarpophalangeal joint of a four-year-old Thoroughbred gelding(**166a, 166b**). There was effusion of the joint, and a grade 2/5 lameness which was abolished by intra-articular analgesia.
i. What lesion is present?
ii. What therapy should be employed?
iii. What is the prognosis for athletic soundness?

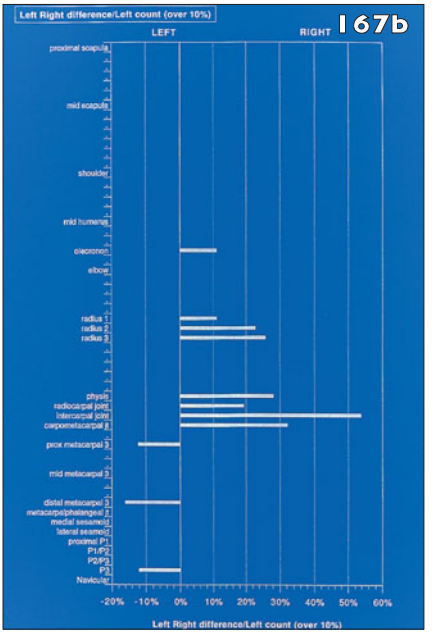
167 A horse had been lame on its right forelimb for 10 days prior to veterinary investigation. Regional nerve blocks up to and including the subcarpal level, and intra-articular analgesia of the ante-brachiocarpal and middle carpal joints, failed to improve the lameness. A bone scan was performed the following day. **167** illustrates the difference between the probe counts obtained from corresponding points in each forelimb, following intravenous injection of 99^{m} technetium MDP, expressed as a percentage of the counts obtained from the left (non-lame) forelimb.
i. Should you have performed a scan at this time?
ii. How would you interpret the plots?
iii. Should this horse have another bone scan and, if so, when?



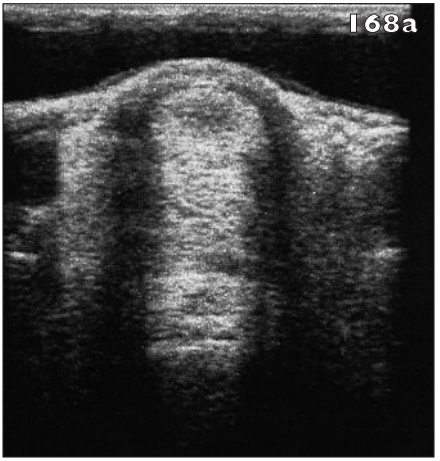
166 & 167: Answers

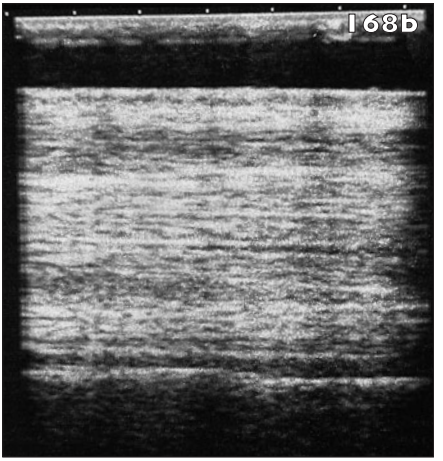
166 i. There is an articular defect involving the distal portion of the medial condyle of the third metacarpophalangeal joint. This could be an osteochondritic lesion or degenerative joint disease.
ii. This lesion would be difficult to treat by arthroscopy or arthrotomy. Intra-articular medication might be used.
iii. The prognosis for athletic soundness is poor.

167 i. No, the scan was performed too soon after the nerve blocks.
ii. Conflicting results have been reported on the effects of local analgesic agents on bone scans, but some horses show a diffuse increase in radioisotope uptake, presumably due to a profound and sustained increase in blood flow to the distal limb following the use of diagnostic nerve blocks. For this reason, it is advisable to allow at least five days between using regional nerve blocks and performing probe counting.
iii. Yes. This horse was scanned again five days later and the plot shown in **167b** was obtained. This revealed an increase in radioisotope uptake in the carpal region, which was obscured by the blood flow effect in the first examination. The lameness was abolished by median and ulnar nerve blocks. Radiography at a later date revealed periosteal new bone on the cranial aspect of the distal radius and cranial damage of the carpus. The horse was rested for one month. The lameness did not recur when the horse returned to work.



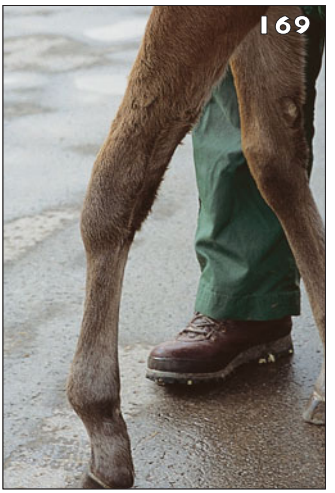
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168 An event horse pulled up lame after a cross-country event, and subsequently the left metacarpus became swollen. Over the course of four weeks the animal became sound at the walk, but still reacted to palpation over the soft tissues on the palmar aspect of the left forelimb. **168a** illustrates a transverse ultrasonographic scan from the proximal metacarpal region, and **168b** a longitudinal scan from the mid-metacarpal region.
i. Describe the ultrasonographic findings.
ii. Are the ultrasonographic changes consistent with the history?
iii. What other structures may be damaged concurrently with this type of injury?
iv. Based on these ultrasonographs, what treatment would you advise?

169 The illustration (**169**) shows a foal with two orthopaedic problems, one of which has produced a tubular distension on the dorsolateral aspect of the left carpus.
i. Identify the two abnormalities.
ii. Which came first, and what is the prognosis for recovery?



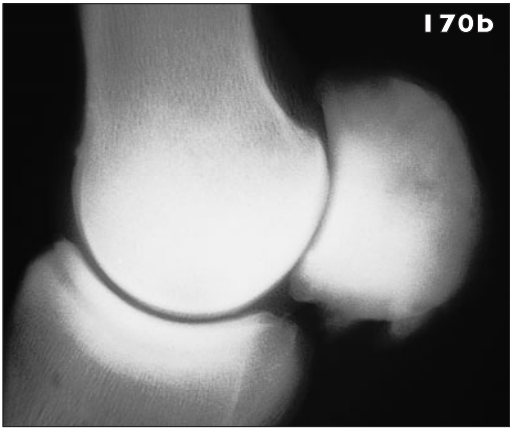
168 & 169: Answers

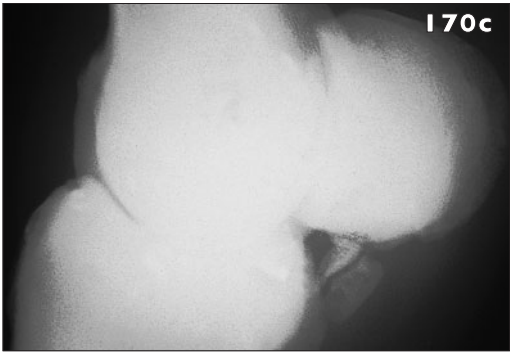
168 i. On the transverse scan, an indistinct, central hypoechoic lesion ('core lesion') can be identified in an enlarged superficial digital flexor tendon (SDFT). The lesion stretches the full length of the longitudinal scan. There is hypoechogenic oedema surrounding the SDFT which improves its definition. A hypoechoic central region is also visible in the suspensory ligament.
ii. Yes, the lesion within the SDFT is consistent with tendinitis of four weeks duration. There is still significant peritendinous oedema, but the core lesion is becoming indistinct. The 'lesion' within the suspensory ligament is most likely to be a normal variant and not a proximal suspensory ligament desmitis. Although a similar lesion could not be found on the contralateral limb, the hypoechoic core was unchanged when the limb was rescanned two months later and the horse was sound at the trot.
iii. The contralateral SDFT and the accessory ligament of the deep digital flexor tendon may be injured at the same time.
iv. The core lesion is showing evidence of healing, but the persistence of oedema indicates that there is still active inflammation. This is confirmed by the persistent pain response on palpation. Anti-inflammatory therapy should be continued and the horse box rested until the inflammation has disappeared. Once this has occurred (which can be detected by palpation), the horse could begin walking exercise.
Intra-tendinous injection with sodium hyaluronate or polysulphated glycosaminoglycan could be considered, although this treatment is best suited to early cases. Injection of such agents at this stage may disrupt newly-formed collagen fibrils. Superior check ligament desmotomy could also be considered. This surgery seems to be of benefit in the prevention of recurrence of tendinitis in Standardbreds and, to a lesser extent, in Thoroughbreds. It remains to be seen if it is of use in event horses.

169 i. Rupture of the common digital extensor tendon and flexural deformities of the carpus and fetlock.
ii. Debate exists as to whether the loss of extensor function causes the flexural deformity or whether the flexural deformity leads to mechanical failure of the tendon. Probably both can occur. Either way, the prognosis is good with conservative, supportive therapy, if treated early.

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170 Lateromedial projections of the proximal sesamoid region of three different horses are illustrated (**170a–170c**).
i. What is your diagnosis in each case?
ii. Which horse is least likely to be lame?

171 A six-month-old Thoroughbred colt was examined for an acute onset left hindlimb lameness. A grade 2/5 left hindlimb lameness was evident at the trot. There was an increase in the digital pulse and a pain response could be elicited with hoof testers. The lameness was still evident after three weeks box rest, so radiographs were obtained of the pastern and foot (**171**).
i. What lesion is present?
ii. What alternatives are available for treatment, and what is the prognosis?
iii. What changes would you expect in the radiographic appearance of this lesion if it were treated conservatively?



170 & 171: Answers

170 i. • Degenerative joint disease (**170a**). The new bone in this case is present as osteophytes at the proximal and distal limits of the articular surface of the sesamoid bone.
• Sesamoiditis (**170b**). The new bone is non-articular associated with the origins of the distal sesamoidean ligaments. Oblique projections showed the usual linear lucencies and opacities characteristic of this condition (**170d**).
• Ossification of the distal sesamoidean ligaments (**170c**).
ii. The horse with ossification of the distal sesamoidean ligaments. This was an incidental finding in both forelimbs of an old horse.



171 i. A bone cyst in the distal first phalanx.
ii. • Box rest.
• Arthrodesis of the proximal interphalangeal joint.
• Curettage of the cyst would be difficult.
The conservative approach is preferred with isolated cysts. In contrast to multiple cysts, which are associated with severe degenerative joint disease, single lesions do not usually damage the joint. As the foals grow, the lameness often disappears.
iii. The edges of the cyst might become more irregular and sclerotic, and the cyst may move away from the articular surface as the bone develops.

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172 A horse presented for slight lameness, associated with the right hind foot which had been slowly enlarging for some time (**172a, 172b**).
i. What is this condition?
ii. How would you treat it?

173 A yearling Warmblood filly presented with a swelling associated with the carpal region (**173a**). There was no obvious lameness.
i. What is the most likely diagnosis?
ii. What tests could be done to confirm your provisional diagnosis?
iii. What would be your approach to treatment?



172 & 173: Answers

172 i. 'Seedy toe' – separation of the wall from the deeper structures of the foot. **172b** shows that the enlargement of the toe is associated with the development of a large cavity between the wall and the pedal bone, particularly on the medial aspect.
ii. Removal of all the separated horn to allow the hoof wall to regrow in closer apposition to the pedal bone.

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173 i. Based on the appearance of two vertically aligned swellings, interrupted by what appears to be a constriction, the most likely diagnosis is tenosynovitis of the common digital extensor tendon sheath.
ii. The exact location of the fluid accumulation could be ascertained using a contrast radiograph (**173b**).
iii. When no lameness is apparent, a diagnosis of idiopathic tenosynovitis is made and the ideal treatment is to leave well alone. If the owner insists on treatment, the sheath can be injected with corticosteroids, but it is important that the fluid is completely drained prior to injection and that a sterile pressure bandage is applied postoperatively. It should be stressed to the owners that entering a tendon sheath with a needle may promote the occurrence of adhesions.

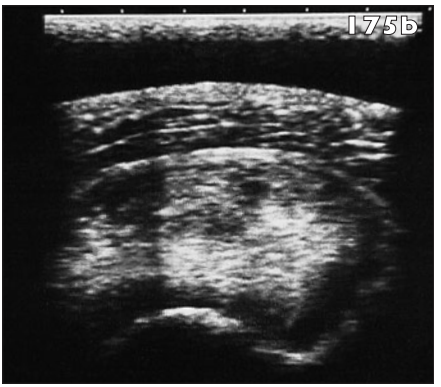


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174 An eight-year old part-bred Arab mare presented for severe lameness on the left hindlimb of two days duration. This had been preceded by three weeks' slight lameness of unknown origin. Stifle flexion was resented and there was a slight 'click' from the region each time the stifle was flexed. **174** illustrates a craniolateral-caudomedial oblique projection of the left stifle.
i. What is your diagnosis?
ii. Why did the pony suddenly deteriorate?
iii. What is the prognosis?





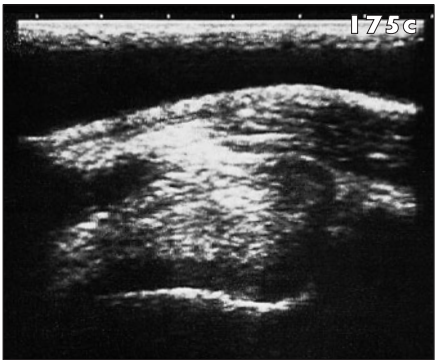


175 A nine-year-old Irish Draught-cross gelding presented for investigation of a right forelimb lameness (grade 3/5 at the trot) of four weeks duration. A course of phenylbutazone had markedly improved the lameness, but when the drug was withdrawn the animal was more severely lame than before. Physical examination revealed swelling of the cranial shoulder region and atrophy of the right shoulder musculature (**175a**). **175b** is an ultrasonograph of the right cranial shoulder region.
i. Describe your ultrasonographic findings?
ii. What is your diagnosis?
iii. What other structures might be affected in this region?
iv. What is the prognosis for this type of problem?

174 & 175: Answers

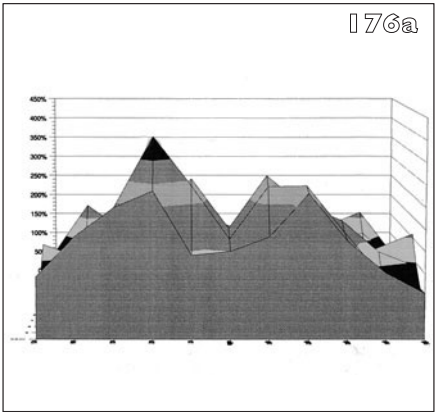
174 i. A large, well circumscribed lucency is present on the caudolateral aspect of the proximal tibia. This has a honeycomb or 'soap bubble' appearance, of the type associated with osteoclastomas (giant cell tumours) in other species. The diagnosis of an osteoclastoma was confirmed on histological examination of the mass.
ii. The subchondral bone of the tibial plateau and the caudolateral cortex of the tibia are fractured, with distal displacement of the caudal part of the neoplasm. This pathological fracture probably accounts for the sudden onset of a severe lameness.
iii. Hopeless. The pony was destroyed on humane grounds.

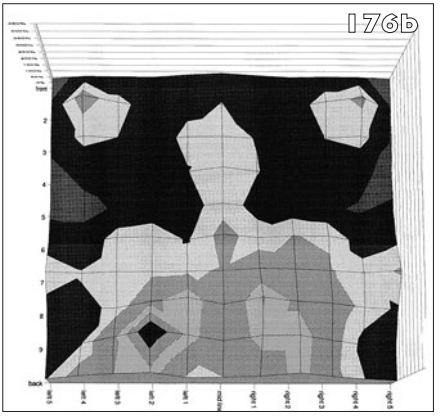
175 i. The transverse ultrasonograph shows the lateral portion of the bilobed bicipital tendon. The tendon is enlarged and contains areas of normal tendon structure mixed with areas of hypoechogenicity. The hypoechoic region surrounding the caudal and lateral margins of the tendon is the bicipital bursa, which is not unduly distended in comparison to the contralateral limb (**175c**).



ii. Bicipital tendinitis.
iii. The bicipital bursa, leading to a bicipital bursitis; bicipital tenosynovitis associated with humeral osteitis has also been described.
iv. Too few cases of primary bicipital tendinitis have been reported to give an accurate prognosis. The prognosis for bicipital bursitis is guarded because of the formation of adhesions within the bursa. Calcification of the bicipital tendon is also associated with a poor prognosis.
This case responded well to a prolonged period of box rest, and the horse has been in full work for two years.

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176 Graphs generated by a computer from data obtained by serially point-counting the pelvic region of a horse, following intravenous injection of 99^{m} technetium MDP are illustrated (**176a, 176b**). The horse had a history of chronic, intermittent, bilateral hindlimb lameness, exacerbated by exercise. The animal's stiff gait and shortened cranial phase of the stride were more noticeable at the walk than the trot.
i. How would you interpret these graphs?
ii. What steps could you take to confirm your suspicions?

177 A three-year-old, four weeks pregnant Thoroughbred brood mare developed sudden onset severe right fore-limb lameness. There was pain on deep palpation over the proximal humerus, so the region was radiographed (**177a**).
i. What radiological features can you identify?
ii. What else would you do?
iii. What features can be seen in the additional radiograph (**177b**)?
iv. How would you treat this case and what is the prognosis?





176 & 177: Answers

176 i. The plot shows a massive, bilateral increase in radioactivity caudally between the tubera sacrales and the ischia. This problem is encountered when performing scintigraphy on horses which have been affected with exertional rhabdomyolysis. Damaged skeletal muscle takes up 99^{m} technetium MDP by active absorption, in the same way as bone, and this can give rise to focal accumulations related to the muscles of the quarters.
ii. The isotope distribution is similar to that encountered in horses with a large amount of excreted isotope in the bladder. However, the two conditions can be differentiated by assaying muscle enzyme levels (CK and AST) or by delaying the pelvic scan until at least 20 hours after isotope injection.

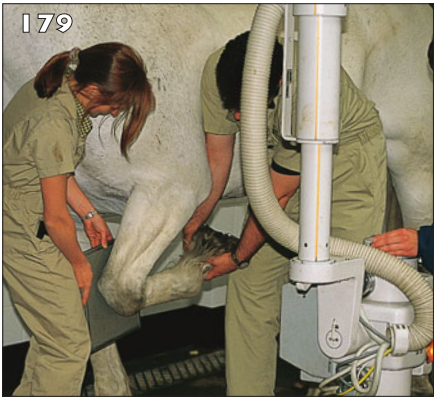
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177 i. This is a mediolateral view of the scapulohumeral joint including the proximal humerus. No significant abnormality can be seen.
ii. Obtain a craniomedial–caudolateral oblique radiographic view. Examine the area ultrasonographically. Consider synoviocentesis of the intertubercular bursa.
iii. A non-displaced, probably incomplete fracture of the deltoid tuberosity of the humerus.
iv. Since the mare is pregnant and the fracture is non-displaced, conservative treatment can be considered. It would be advisable to cross-tie the mare, and provided that the lameness does not deteriorate, re-radiograph her at six-week intervals. The mare made progressive improvement and was re-radiographed six weeks later. The fracture was healing satisfactorily but a large lucent area had developed (**177c**). The mare made a complete recovery.





178 A one-month-old foal presented because it was unable to place weight on its right hindlimb (**178**).
i. What is the likely diagnosis?
ii. How would you confirm this?



179 A number of basic errors are being made in radiographing this horse's carpus. List four of these.

180 During a purchase examination, a horse is noticed to have a small wound on the lateral aspect of the right hindlimb, just above the coronary band (**180**). When drawn to the owners' attention, they claim that this is a recent injury, the scab of which keeps on being knocked off by the horse.
i. What would be your main concern about this wound?
ii. Would you recommend the horse for purchase?



181 A nine-year-old part-Thoroughbred gelding fractured the olecranon on the left forelimb. **181** illustrates the appearance of the horse's right fore foot about eight weeks later.
i. How well is the fracture healing?
ii. What is the purpose behind the shoe which has been fitted?
iii. What other conditions might develop in horses and ponies under the circumstances which have contributed to this foot problem?



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178–181: Answers

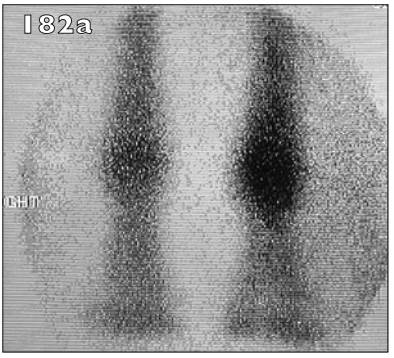
178 i. Rupture of the Achilles tendon or avulsion of the origin of the gastrocnemius muscle.
ii. Manipulation would confirm the loss of function, and palpation would help identify the site of the damage. Ultrasonography should be used to examine the Achilles tendon, and radiography might demonstrate an avulsion fracture if the gastrocnemius is affected at its origin.

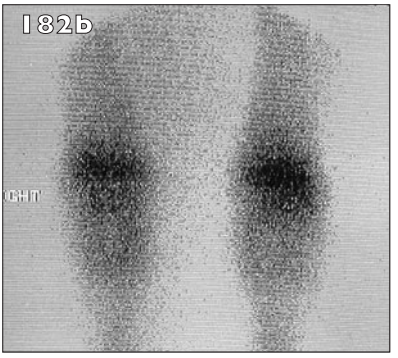
179 • No-one is wearing a gown.
• The person holding the cassette will be in the primary beam for a flexed lateromedial projection.
• A long-handled cassette holder should have been used.
• The person holding the leg is not wearing gloves.

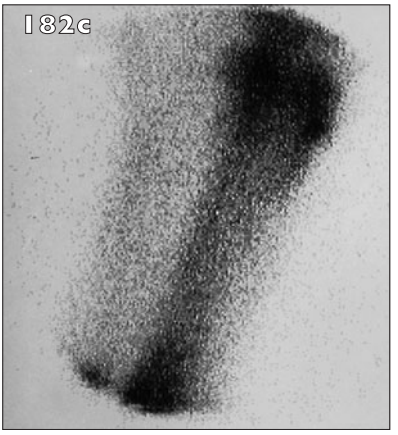
180 i. A discharging sinus just above the coronary band, associated with swelling over the collateral cartilage, is highly likely to be caused by infection of the cartilage – 'quittor'. It can be distinguished from infection of the hoof wall by the presence of a band of skin between the sinus and the skin-horn junction, and also the low level or absence of lameness in early cases.
ii. Quittor requires surgery to effect a cure, and the nature of the condition means that several operations may be needed before the infection is finally eliminated. This requires both time and money, so such an animal is best avoided.

181 i. The horse is overloading the right forelimb, indicating the presence of significant lameness on the left. This suggests poor healing as a result of displacement of a conservatively treated fracture, or breakdown in fixation of a surgically treated fracture.
ii. The heart bar shoe is supposed to increase the forces which support the pedal bone, counteracting the forces which are causing it to rotate or sink. At best it can tilt the balance in favour of stability; it can not prevent displacement of a pedal bone which has lost most of its support. In this case, continued rotation has led to penetration of the sole by the pedal bone.
iii. In addition to laminitis, overload of the collateral limb can lead to tendon strains, and angular deformities (usually varus) if the radial physis has not yet fused.

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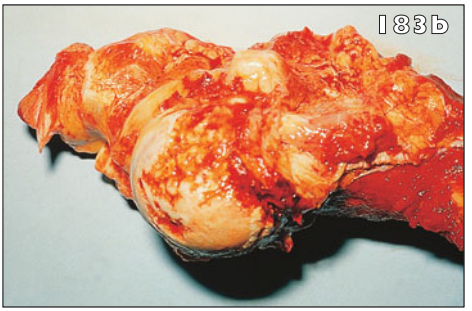
182 A three-year-old Thoroughbred colt presented for investigation of poor racing performance and multilimb lameness, which became noticeably worse after cantering. The horse's action improved considerably after rest and exercise restricted to walking and swimming, but deteriorated with fast work. Nerve block results were inconsistent, and variable between examinations. A bone scan was performed, following the intravenous injection of 99^{m} technetium MDP, and the images of the fore fetlocks (**181a**), the carpi (**181b**) and the right tibia (**181c**) are illustrated.
i. What observations would you make?
ii. What would you do next?
iii. How would you interpret this result?

183 A four-month-old Quarterhorse foal presented for correction of flexural deformities in both forelimbs (**183a**).
i. Why has this foal developed these flexural deformities?
ii. What would you do before performing surgery?
iii. How would you treat this foal?



182 & 183: Answers

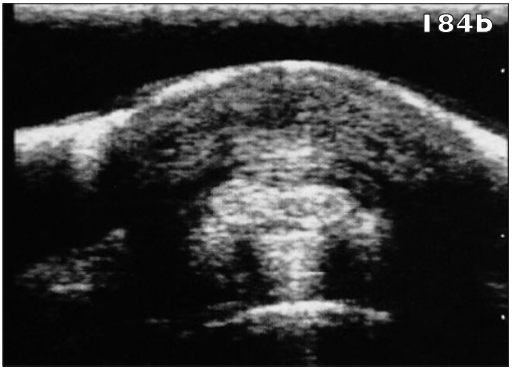
182 i. There is increased accumulation of radiopharmaceutical in the following regions: left fore fetlock, left distal radius and right tibial crest.
ii. Radiography of these regions failed to reveal any significant abnormalities.
iii. The syndrome of multiple skeletal sites of increased radioisotope uptake, indicating abnormal bone turnover, has been recognised in young racehorses, especially in Standardbreds. The most common sites are the characteristic stress fracture sites: first phalanx, distal, dorsolateral and proximal palmar/plantar cannon, third carpal bone, radius, humerus and tibia. Other locations include the navicular and pedal bones, the tibial crest and the patella. Because many of these sites are associated with racing-induced fractures, early scintigraphic recognition allows timely adjustment of the training regime.

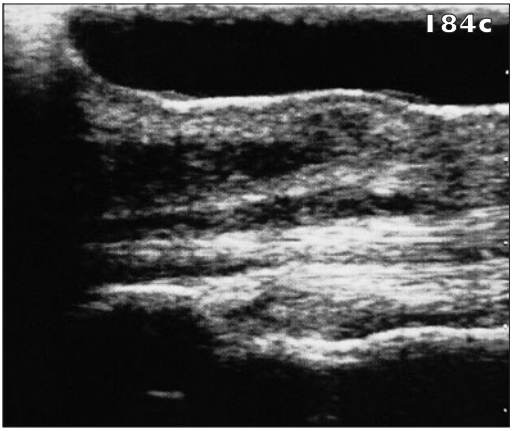


183 i. This foal does not look well. It had a stiff gait on its hindlimbs and the animal's growth seemed to be retarded. Therefore, it is likely that there is another severe orthopaedic problem, such as advanced osteochondritis, or chronic infective arthritis of a joint which is not easy to examine, such as a coxofemoral joint.
ii. A complete physical examination. Focusing on the forelimbs and the flexural deformities would be a mistake if a primary lesion were missed. If no other abnormality were found, then the flexural deformities could be treated as primary problems. However, in view of the hindlimb lameness, a radiographic examination of the coxofemoral joints would seem reasonable.
iii. Treat the flexural deformities, if the primary problem can also be treated. Otherwise consider euthanasia. The radiographic examination revealed degeneration of the right coxofemoral joint associated with chronic *Staphylococcus aureus* infection. Therefore, the animal was destroyed for humane reasons. The flexural deformities appeared to have developed as a result of continuous overload of the forelimbs due to the infective arthritis of the right coxofemoral joint, which had caused considerable damage to both the femoral head (**183b**) and the acetabulum.
This case illustrates the importance of always looking at the whole animal and not being blinded by the obvious.

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184 A pony was referred, with a suspected foot abscess, as the animal had shown repeated episodes of severe lameness with swelling of the pastern region (**184a**). The palmar aspect of the pastern was painful on palpation. **184b** illustrates a transverse ultrasonograph of the distal pastern region and **184c** the corresponding longitudinal view.
i. Describe the processes occurring in the pastern region soft tissues, as revealed by the ultrasonographs.
ii. What procedure should be carried out next?
iii. What options are available for treatment?



185 A six-year-old gelding became suddenly very lame on a hindlimb. The hock was unstable. The illustration shows a lateromedial projection of this region (**185**).
i. What is your diagnosis?
ii. How could this problem be treated?
iii. What is the prognosis for a return to pleasure riding?

184 & 185: Answers

184 i. The ultrasonographs show a hypoechoic region within the oedematous, grossly thickened subcutaneous tissues. The digital sheath wall is also oedematous, but there is relatively little fluid in the digital sheath itself. There is no sign of disruption to the digital sheath wall in these (or other) scans. There is, however, echogenic material within the sheath overlying the palmar surface of the deep digital flexor tendon. The deep digital flexor tendon is thinned in the distal pastern region in the longitudinal scans.
These findings are consistent with subcutaneous abscessation. The digital sheath wall is thickened and oedematous, either as a result of the inflammation associated with the sepsis in the subcutaneous tissues or as a consequence of the original injury. The deep digital flexor tendon has been damaged and the echogenic material within the sheath is suggestive of infective synovitis.
ii. The digital sheath should be sampled to establish whether or not it is infected. In this case the total nucleated cell count in the synovial fluid was only 0.8×10^9/l, indicating that all the infection was extrasynovial.
Further investigation could also include digital sheath analgesia. This produced about a 50% improvement in the lameness, suggesting that the pain was both intra- and extra-synovial in origin.
iii. In the absence of sheath sepsis a conservative approach could be followed, possibly with intrasynovial medication with sodium hyaluronate. However, the presence of subcutaneous abscessation, with an inflamed (and possibly damaged) digital sheath wall and damaged deep digital flexor tendon, suggests that surgical management (essential if the sheath were infected) would be preferable.
Surgery allowed removal of the subcutaneous abscess and revealed evidence of digital sheath penetration, distally, between the bulbs of the heel (not easily accessible to ultrasonographic assessment). A longitudinal defect in the deep digital flexor tendon, containing necrotic material, was debrided and the limb placed in a cast. A subsequent examination revealed adhesion formation over the site of the defect in the deep digital flexor tendon.

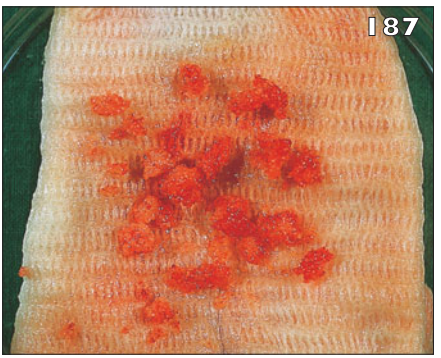
185 i. Subluxation of the distal intertarsal joint with fragmentation of the distal row of tarsal bones and the proximal aspect of one or more metatarsal bones.
ii. Reduction and stabilisation with a cast. This could be supplemented with a plate on the medial aspect of the hock, bridging from the central tarsal bone to the third metatarsal bone. Healing, with fusion of distal intertarsal and tarsometatarsal joints, should return the horse to soundness.
iii. Fair to good, provided the distal intertarsal and tarsometatarsal joints fuse and the tarsocrural joint has not been injured.

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186 A 12-year old Thoroughbred mare presented with chronic, intermittent low-grade lameness on the left forelimb. Both forefeet had a marked lateromedial imbalance, with a low, very vertical medial wall. A palmar digital nerve block abolished the lameness on the left forelimb, and uncovered a slight right forelimb lameness. The left fore foot was radiographed and a dorso 60° proximal-palmaro-distal oblique projection of the left fore third phalanx is illustrated in **185**.
i. What is your diagnosis?
ii. How could you investigate this problem further?
iii. How would you treat this case?



187 This Petri dish contains cancellous bone grafts.
i. In the horse, what are the three most useful sites for harvesting cancellous grafts?
ii. If you require the largest possible quantity of cancellous bone, which site would you choose?
iii. What are the four useful properties of a bone graft, and which two are most important in the case of a cancellous graft?



188 A seven-year-old Miniature pony presented following an injury of the left hindlimb (**188**).
i. Describe the radiological findings. What is your diagnosis?
ii. What other information about the injury would be relevant in your decision on whether or not to treat the pony?
iii. How could this injury be treated?



186–188: Answers

186 i. A cyst-like lesion of the medial aspect of the third phalanx.
ii. • Various oblique radiographic projections of the third phalanx. As in other cases, these suggested that the bone resorption was adjacent to the insertion of the medial collateral ligament of the distal interphalangeal joint.
• Intra-articular analgesia to investigate involvement of the distal interphalangeal joint itself. This was not performed as the lameness was virtually absent on the day set aside for the procedure!
• A bone scan, following intravenous injection of 99^{m} technetium MDP. This revealed a marked increase in uptake of radioisotope in the region of the cyst-like lesion, and a similar increase in uptake in the contralateral foot.
• A radiograph of the right fore third phalanx revealed a similar, if anything larger, lesion in that bone.
iii. Initially, the horse should be treated by correcting the lateromedial foot imbalance, followed by a gradual return to work. It is possible that abnormal strains in the medial collateral ligament have contributed to the development of these lesions.

187 i. Tuber coxae, sternebrae, proximal tibia.
ii. Tuber coxae.
iii. Osteoinduction, osteoconduction, osteogenic potency and support. A cancellous graft is very effective as regards osteoinduction and osteoconduction, less so regarding osteogenic potency. It provides virtually no support, which is the main property of a cortical graft.

188 i. A transverse diaphyseal fracture of the third metatarsal bone, with some comminution around the circumference of the fracture, although the bulk of the bony column has been maintained. The distal fragment is displaced caudally, as is the fracture apex. There is minimal overriding.
ii. There is little soft tissue cover in this region, and therefore many of these fractures are open at presentation. This is the single most important factor in any decision on treatment, as the prognosis for recovery from a closed fracture of this type, in a pony, is good. However, due to the likelihood of the development of osteomyelitis, the prognosis in an open fracture is poor.
iii. • Full limb cast, but reduction and alignment is difficult. Also prolonged immobilisation may damage the fetlock joint in particular.
• External fixation, possibly using a walking cast.
• Internal fixation, usually involving two plates placed dorsally and either laterally or medially, although in this case one was deemed sufficient. This allows the best reduction and alignment, but in an open fracture there is a considerable risk of infection of the implants which may spread to the fracture itself. However, provided the infection stays localised to the implants and the fracture is stable, it can heal in the face of the infection. Any draining tracts will heal when the plate is subsequently removed.
This pony had a small wound to the level of the bone, but the decision was made to plate the fracture. The plate was removed seven months postoperatively, after the fracture had healed, due to a persistent discharging sinus, and the pony returned to ridden work as a much-loved children's pony.

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189 A radiograph of the carpus of a horse (**189**).
i. What radiographic projection is this?
ii. What is the most likely use to which this horse is put?
iii. Can it continue in this activity?



190 **i.** What radiographic projection of the hock is illustrated (**190**)?
ii. What surgical procedure is likely to have been performed?
iii. What is the prognosis for soundness following this procedure?



191 The illustration (**191**) is a lateral radiograph of the thoracolumbar dorsal spinous processes of a six-year-old Thoroughbred gelding, with a history of a hunched posture when ridden, reluctance to extend the thoracolumbar spine and poor jumping performance.
i. What radiological abnormality is present?
ii. Give two other techniques that might be helpful in assessing the possible relevance of the radiological changes to the history.

189–191: Answers

189 i. A dorsomedial-palmarolateral oblique projection.
ii. Jumping of some sort – probably show jumping or hunting. New bone is present on the cranial aspect of the distal radius. In the absence of sepsis, the usual aetiology is traumatic periostitis caused when a flexed carpus hits an obstacle just after take-off.
iii. Yes. The prognosis for this injury is good provided:
• The animal does not keep re-injuring the region.
• The extensor tendons and their sheaths do not become involved in the inflammatory process.
Knee boots might be protective.

190 i. A dorsolateral plantaromedial-oblique projection.
ii. The proximal intertarsal, distal intertarsal and tarsometatarsal joints are all completely fused. This is unlikely to have happened spontaneously. The joints were surgically arthrodesed, by drilling, 18 months before this radiograph was taken. Chemical arthrodesis does not produce such complete obliteration of the joints, and it could not have been used to fuse the proximal intertarsal joint as this communicates with the tarsocrural joint.
iii. When all three joints are involved, the prognosis for soundness is 50%. This seems to relate to a failure of the proximal intertarsal joint to fuse, in contrast to this case which is a surgical success.

191 i. Impingement of the dorsal spinous processes, with associated sclerotic and lytic changes on the edges of adjacent spines.
ii. • Assessment of the clinical response to deposition of a local analgesic agent around and, if possible, between the impinging margins of the dorsal spinous processes.
• Nuclear scintigraphy to assess if there is a high rate of active bone remodelling at the radiologically affected sites.

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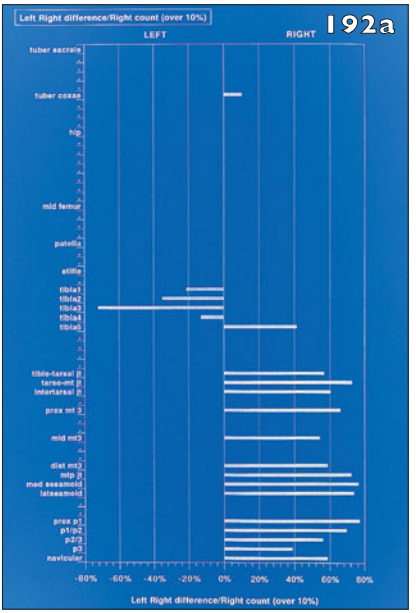
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192 A two-year-old Thoroughbred racehorse went acutely lame on the left hindlimb, after exercise, seven days previously. **192a** illustrates the difference in probe counts between various points on each hindlimb, following intravenous injection of 99^{m} technetium MDP, expressed as a percentage of the counts from the right (non-lame) hindlimb.

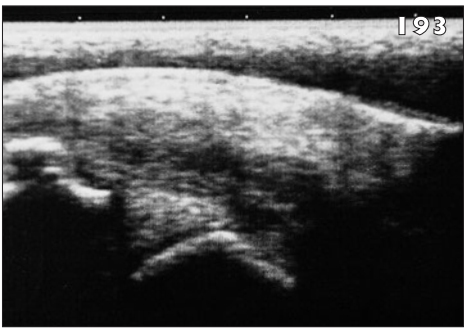
i. Where is the site of pain?

ii. Why are the counts revealing this pattern of radioisotope uptake?

iii. How lame is the horse likely to be?



193 A nine-month-old Arab colt was found acutely lame on the left hindlimb, in the field, six weeks before presentation. The animal was non-weight bearing at the onset of the lameness, but had improved slightly with rest. Close examination revealed distension of the left femoropatellar joint and a firm enlargement over the left medial femorotibial joint space. Flexion was resented, and there was severe atrophy of the quadriceps on the left hindlimb. Radiographs revealed bony fragments on the caudoproximal and the medioproximal aspects of the tibia. A longitudinal ultrasonograph obtained from the medial aspect of the stifle is illustrated (**193**).



i. Describe your ultrasonographic findings.

ii. How can these findings be interpreted in the light of the radiographs?

iii. Are there any areas in the stifle that are not easily visualised ultrasonographically?

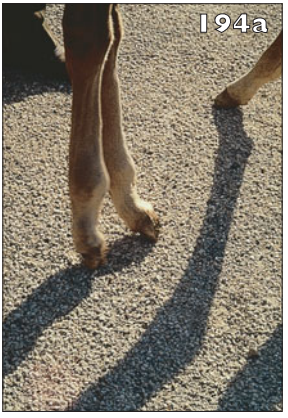
192 & 193: Answers



192 i. The lameness is associated with a problem in the proximal tibial region. Given the history and the horse's work, this is probably a proximal tibial stress fracture. This was subsequently confirmed radiographically, with the appearance of abundant endosteal callus in the mid-diaphysis (**192b**).
ii. The plot is typical of a sudden onset, severe lameness. The lameness seems to result in a reduced uptake of radioisotope in the lame leg, either due to reduced blood flow or a genuine reduction in bone turnover as a result of reduced bone loading. However, as in this case, if the cause of lameness is a bone injury, a focal area of increased uptake should be observed in the middle of this generalised reduction.
The same phenomenon occurs using the gamma camera, but is often easier to deal with because of the visual nature of the image. A 'hot spot' is judged against adjacent parts of the same bone, rather than against the equivalent point on the opposite bone.
iii. After seven days, the lameness in a horse with a stress fracture is likely to be much improved. In this case the animal was sound at the walk. Therefore, it is important that the serious nature of the injury is appreciated, or the animal may return to work with catastrophic consequences.

193 i. The ultrasonograph from the medial aspect of the limb shows the triangularly-shaped medial meniscus in its normal position. Immediately distal to the meniscus, a bony fragment can be seen displaced superficially with respect to the medial surface of the tibia. Associated with this fragment is a hypoechoic region extending proximally in the position where the medial collateral ligament should be identified.
ii. This horse has a combination of soft tissue and bony abnormalities in the left stifle. There are medial collateral (medial fragment) and caudal cruciate (caudal fragment – not shown) ligament avulsions, with damage to the medial collateral ligament.
iii. At present, ultrasonographic imaging of the cruciate ligaments is very difficult, requiring high quality equipment and considerable expertise. In this case the avulsed fragment associated with the caudal cruciate ligament was visible using a five MHz linear transducer, but imaging of the caudal cruciate ligament itself was impossible with this probe. In addition, not all areas of the menisci are detectable ultrasonographically, and also the weight-bearing parts of the articular cartilage and the articular cartilage on the caudal surface of the patella are not accessible to ultrasonographic evaluation. This horse had cartilage erosion on the femoral condyles, associated with prolonged stifle instability, which was only detected at post-mortem examination.

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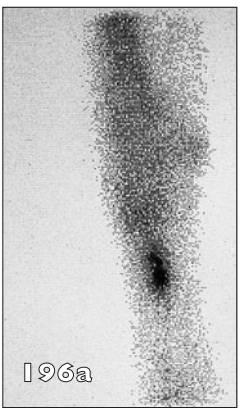




194 A foal was unable to stand at birth. When it tried to use its forelimbs it always knuckled forward. On manipulation, it was difficult to extend the phalanges beyond the vertical axis (**194a**).
i. What is the most likely diagnosis?
ii. List the various options available for treatment of this condition.

195 An 18-year-old mare presented for a slight lameness, on the right forelimb, of several months duration. Nerve blocks indicated pain in the fetlock region.
i. What lesion is present?
ii. What is the likely cause?
iii. What is this radiographic projection (**195**)?

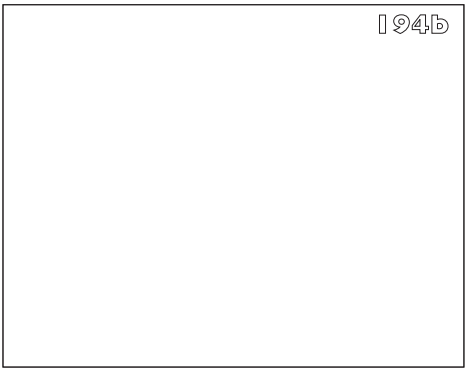
196 A six-year-old Thoroughbred was found to be lame on the left forelimb, the day after a hurdle race. Following a few days rest, it resumed training but was considered a 'poor performer'. Two months later, clinical examination revealed that the horse had a grade 2/5 lameness on the left forelimb. This lameness was exacerbated by a flexion test to 3/5. Palmar digital, abaxial sesamoid and low four-point nerve blocks failed to improve the lameness. A high four-point nerve block rendered the horse virtually sound (**196a, 196b**).





i. What is your diagnosis?
ii. How would you treat this case?
iii. What is the prognosis for this case?

194–196: Answers


194b

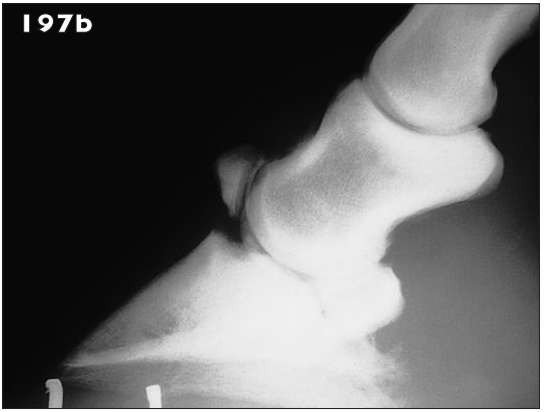
194 i. Congenital flexural deformity of the metacarpophalangeal and/or distal interphalangeal joints in both forelimbs.
ii. • Intravenous administration of 1 g tetracycline in 500 ml Ringer's solution to chelate calcium ions and facilitate relaxation of the tense flexor muscles.
• Application of splints for about two weeks to allow relaxation of the flexor muscles and facilitate correction of the problem.
• Application of toe extensions to the feet to extend the weight-bearing surface further dorsally. In this case the foal was immediately able to bear weight on its limbs (**194b**). Exercise then helps to stretch the shortened flexor tendons. This can obviously be combined with intravenous administration of tetracyclines. However, in some foals, the application of toe extensions will make the flexural deformities in the metacarpophalangeal joints worse. In such cases, the deformities of the metacarpophalangeal joints should be corrected, with splints, and the distal interphalangeal joints corrected at a later date.

195 i. A circular lucency in the base of one of the proximal sesamoid bones, with an apparent 'neck' exiting through the most distal aspect of that bone.
ii. This appearance can be associated with trauma or infection. The clinical signs suggest trauma is more likely. In this case the resorption appears to be associated with the attachments of the distal sesamoidean ligaments, but in other cases similar resorption is seen associated with the attachments of the intersesamoidean ligament.
iii. Either a proximolateral-distomedial or a proximomedial-distolateral oblique projection. In this case, the lateral proximal sesamoid bone was involved so it is a proximolateral-distomedial view.

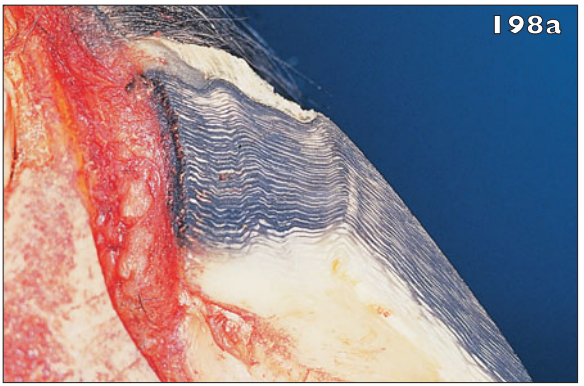
196 i. The gamma scan indicates a high, focal increase of radiopharmaceutical uptake in the proximal palmar metacarpal region. Radiography shows a radiolucent line surrounded by an area of sclerosis in the proximal palmar cortex of the metacarpus, starting approximately 2 cm distal to the carpometacarpal joint and running distally for 5 cm. These findings are compatible with the diagnosis of a proximal palmar metacarpal stress fracture.
ii. The treatment of choice is 2–3 months box rest, with controlled exercise.
iii. The prognosis for return to athletic function in this case is favourable, if there is no significant suspensory desmitis.

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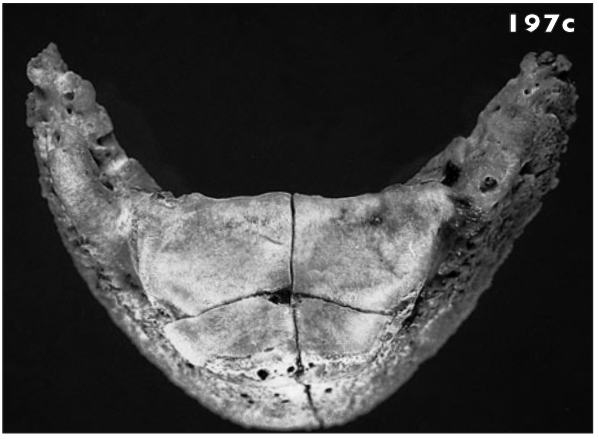
197 An eight-year-old hunter mare went suddenly severely lame on a hindlimb. The foot appeared to be painful, but there was no evidence of any infection. The lameness improved only a little with box rest, so six weeks later the foot was radiographed (**197a, 197b**).
i. Describe the radiological findings.
ii. What treatment would you suggest?





198 Sagittal sections of the dorsal parts of two hooves are illustrated (**198a, 198b**). About eight weeks previously, each of these feet was affected by the same condition.
i. Had the horses from which these feet were taken survived, which would have had the best prognosis for future soundness, and why?
ii. One foot would have required drastic surgery in an attempt to correct the problem. What surgery would you suggest?

197 & 198: Answers



197 i. A sagittal (Type III) fracture combined with an extensor process (Type IV) fracture of the pedal bone. This is an uncommon but not unique case which shows the cruciate nature of the fracture, with the two fracture planes intersecting in the distal interphalangeal joint (**197c**).
ii. At six weeks, there is little point in attempting reconstruction of this joint. Even if the injury were acute, it would be difficult to reduce and stabilise the split extensor process, making the prognosis guarded for future soundness on that limb.

198 i. The horse with the foot illustrated in **198b**. Both these horses suffered from laminitis, but in the case of the foot illustrated in **198a** the marked rotation has resulted in realignment of the coronary papillae in a horizontal orientation. In the case of the foot illustrated in **198b** the slight rotation or sinking which occurred during the acute stage of the disease resulted in a temporary disturbance of growth, but the alignment of the papillae and hence the hoof wall has been maintained parallel to the dorsal surface of the pedal bone.
ii. No amount of farriery will correct the abnormal direction of hoof wall growth illustrated in **198a**. The logical but drastic treatment which could correct the problem would be a dorsal wall resection to the level of the coronary band, which stripped the hoof wall from the coronary papillae and allowed them to fall back into a normal alignment with the pedal bone.

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199 A new-born foal presented with both forelimb and hindlimb orthopaedic problems (**199**).
i. What are these problems?
ii. What is the aetiology of the forelimb problem, and how are motor neurons in the spinal cord involved?
iii. What is the appropriate treatment for this foal?



200 A two-week-old filly foal presented with lameness and swelling of the left hock region. A lateromedial radiograph of the hock is illustrated in **200**.
i. Describe the radiographic signs.
ii. What is your diagnosis?
iii. Why has this problem occurred in this foal?



201 An 18-month-old Quarterhorse acquired an increasingly upright stance and then started to knuckle forward on its fetlocks (**201**).
i. What is your diagnosis?
ii. Why does this problem develop?
iii. How would you treat this problem surgically?
iv. What additional therapy is indicated?



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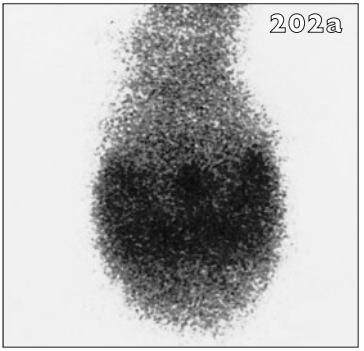
199–201: Answers

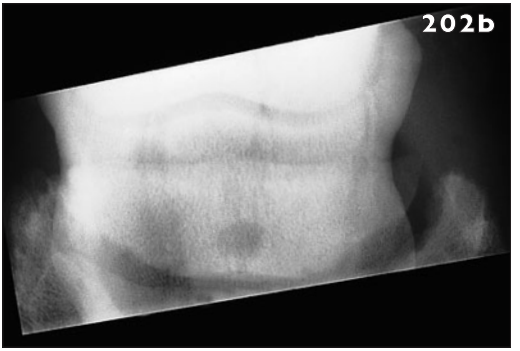
199 i. • Forelimb – congenital malformation of the shoulder and elbow joints, and flexural deformity of the carpus. The elbow is particularly noteworthy as it is fixed in an abnormally extended position. This condition is known as arthrogryposis and, in addition to the contracture, it is associated with fibrosis of the joint capsules, atrophy of the related musculature, and often the absence of those motor neurons in the spinal cord that normally innervate the affected muscles.
• Hindlimb – overextension of the distal interphalangeal joints, often known as tendon laxity. The angulation of the calcaneus in relation to the third metatarsal bone on the left hindlimb also suggests a degree of tarsal collapse. Both these conditions are related to prematurity or dysmaturity, which may be the result of an illness of the mare or foal during pregnancy which also precipitated the arthrogryposis.
ii. The aetiology is controversial. However, there is some evidence from other species that arthrogryposis is related to the destruction of motor neurons to the affected limb during the second or third trimester of pregnancy.
iii. Euthanasia.

200 i. There is marked soft tissue swelling of the plantar hock region, particularly over the proximal calcaneus. An irregular zone of bone lysis runs parallel to, and just distal to, the calcaneal physis, from its cranial border almost to the plantar aspect of the calcaneus.
ii. Infective osteomyelitis of the calcaneus adjacent to the physis.
iii. The foal is likely to have suffered a bacteraemia as a result of an infective focus elsewhere in the body (umbilical abscess or pneumonia). Sluggish blood flow in the bony metaphyses adjacent to the physes is supposed to account for increased seeding of bacteria in these areas, resulting in metaphyseal osteomyelitis and infective physitis.

201 i. Flexural deformity of the metacarpophalangeal joints.
ii. Heritable factors, including selection for rapid growth and early activity, combined with high energy diets.
iii. Desmotomy of the accessory ligaments of the SDFT and/or the deep digital flexor tendon (DDFT). Careful clinical assessment is necessary to elucidate the primary problem. Treatment is based on what structure is the most taut.
iv. The animal should be fed a balanced diet, possibly with an overall reduction in energy intake. Exercise is important to stretch the tendons, if necessary encouraged with phenylbutazone therapy. If the fetlocks continue to knuckle, braces can be fitted with dorsiflexion straps, but if this is necessary, the prognosis is guarded for recovery.

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202 A 12-year-old hunter gelding has shown evidence of low grade forelimb lameness for three years. The owner has hunted him on phenylbutazone medication as necessary, but recently the lameness has become much more pronounced on the right forelimb and analgesics are no longer effective. The right forelimb lameness is abolished by a palmar digital nerve block. Because radiographs of the feet failed to reveal any abnormalities during an examination two years previously, scintigraphy of both front feet is performed. The gamma scan (**202a**), and the dorso 60° proximal-palmarodistal oblique (**202b**) and palmaroproximal-palmarodistal oblique (**202c**) radiographs of the right fore foot are illustrated.

i. What is your diagnosis?
ii. How do you explain the focal nature of the radionuclide uptake?
iii. What may have occurred to exacerbate this horse's lameness?
iv. Can this condition be treated?



203 A horse presented with a swelling in the region of the left hock and a slight lameness on that limb. A lateromedial radiograph is illustrated (**203a**).

i. What structure is enlarged?
ii. Given the structure affected, which single additional radiographic projection is likely to contribute more information to the case?
iii. What is the prognosis?

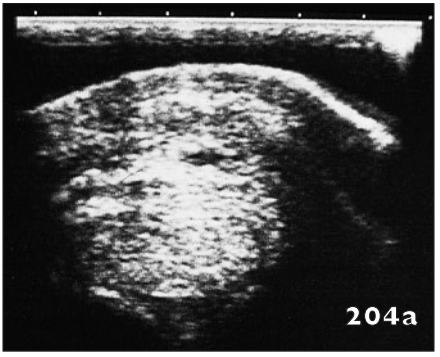
202 & 203: Answers

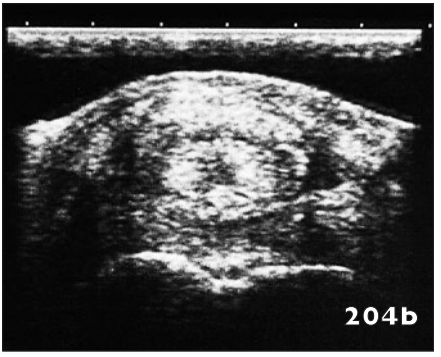
202 i. The right navicular bone shows signs of 'classical navicular disease'. This consists of a full thickness flexor cortex erosion, producing the appearance of a navicular bone cyst on the dorso 60° proximal-palmarodistal oblique projection of the bone.
ii. The focal nature of radionuclide uptake is associated with the focal character of bone destruction in this case.
iii. It is possible that the horse's lameness was controlled with analgesics prior to the development of the flexor cortex erosion, and has become more painful since.
iv. Given that the condition has deteriorated and that it is no longer controlled with analgesics, it is likely that a palmar digital neurectomy will be the only way of making this horse pain free.

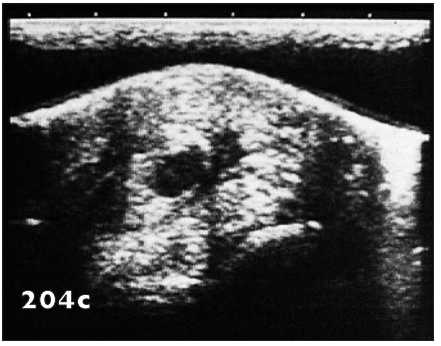
203 i. The swelling is centred on the angle between the distal tibia and the calcaneus, and therefore indicates distension of the tarsal sheath of the deep digital flexor tendon (DDFT). It is too far proximal to be the tarsocrural joint.
ii. The lameness could be associated with damage to the DDFT and its sheath as a result of new bone formation on the sustentaculum tali. This would distinguish this case from those which are not lame, in which the sheath distension is merely a blemish. The new bone is best demonstrated in a plantarolateral-dorsomedial oblique projection (**203b**) or, alternatively, a dorsoplantar (flexed) projection of the fibular tarsal bone.
iii. Horses with lameness as a result of new bone formation on the sustentaculum tali have a guarded prognosis for future soundness, whether treated conservatively or surgically.



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204 An eight-year-old gelding presented with chronic left hindlimb lameness (grade 2/5 at the trot) of two months duration. Physical examination revealed swelling of the plantar aspect of the distal metatarsus and phalanges. On radiography, there was evidence of enthesophytosis and remodelling of the plantar borders of the proximal sesamoid bones and the plantar aspect of the first phalanx. The results of diagnostic local analgesia were as follows:

- Digital sheath analgesia – negative.
- Pastern ring block – negative.
- Regional analgesia of the plantar nerves proximal to the digital sheath – 50% improvement.
- Regional analgesia of the plantar and plantar metatarsal nerves proximal to the digital sheath – 70% improvement.

Transverse ultrasonographs of the plantar aspect of the distal limb are illustrated (**204a** at the level of the metatarsophalangeal joint; **204b** of the distal pastern region), together with an oblique view of the plantarolateral aspect of the distal pastern (**204c**).

i. Describe your ultrasonographic findings. What structures have been damaged?

ii. Why did intrasynovial analgesia not have any effect on the lameness?

iii. What treatment would you advocate?

iv. What prognosis would you give?

204: Answers

204 i. There is a marked increase in the amount of soft tissue between the skin and plantar surface of the superficial digital flexor tendon (SDFT), as a result of thickening of the annular ligament, together with subcutaneous fibrosis. The digital annular ligaments are also enlarged. The deep digital flexor tendon (DDFT) contains a central hypoechoic region distally. The SDFT branches can only be assessed using oblique images. These revealed an anechoic lesion in the lateral branch (the medial branch was normal). The digital sheath wall is thickened.
In summary, this horse has both SDFT and DDFT tendinitis at the level of the pastern, with digital sheath thickening, thickening of the plantar and digital annular ligaments, and considerable subcutaneous fibrosis.
ii. The presence of tendon sheath adhesions and constricted annular ligaments (plantar and digital) may result in poor spread of the local analgesic agent and a failure to remove sensation from the painful areas within the sheath. Alternatively, the pain may be coming from areas outside the sheath, such as the centres of the DDFT and SDFT, or the annular ligaments, or the lameness may be mechanical. The latter was thought to be at least partly the case, as not all the lameness was abolished by plantar and plantar metatarsal nerve blocks. Such mechanical lameness can arise from restriction of movement of the tendons by adhesions or the constricted plantar annular ligament.
iii. Surgical transection of the plantar annular ligament may provide some relief. However, the ultimate state of the horse will depend on healing of the flexor tendons and the ability of the animal to cope with adhesions.
iv. The prognosis, even with surgery, is poor, as a result of the extensive involvement of the plantar soft tissues.

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205 The pastern region of a four-year-old Arab mare with a very lame limb (**205**).
i. What are your radiological findings?
ii. What is the primary lesion?
iii. What type of shoe would form an appropriate part of the treatment of this case?



206 An eight-year-old Thoroughbred mare went suddenly severely lame on the left hindlimb. There was a wound on the lateral aspect of the fetlock joint and this joint was also unstable, so a dorsoplantar radiograph was obtained (**206**).
i. What is your diagnosis?
ii. What is the prognosis for conservative management of an uncomplicated injury of this type?
iii. Why would the prognosis in this case be more guarded?



207 A nine-year-old Thoroughbred gelding presented for a lameness of seven months duration on the right forelimb. The lameness developed following a fall. The shoulder seemed painful on manipulation, so it was radiographed (**207**).
i. What is your diagnosis?
ii. Why has it taken so long for this case to be investigated?
iii. What is the prognosis for a return to racing?

205–207: Answers

205 i. There is subluxation of the distal interphalangeal (DIP) joint, with the distal aspect of the second phalanx moving in a palmar/plantar direction in relation to the third phalanx. There is also evidence of soft tissue swelling on the palmar/plantar aspect of the limb at the level of the proximal interphalangeal joint.
ii. Loss of palmar/plantar support to the DIP joint as a result of rupture or severance of the deep digital flexor tendon (DDFT).
In this horse the DDFT had been severed as a consequence of the wound in the mid-pastern region.
iii. Once this horse starts to bear weight on the limb, after the initial lameness has improved, the DIP joint will hyperextend and the toe will tend to come off the ground. A shoe fitted with extended heels ('trailers') will keep the foot flat on the ground.

206 i. Subluxation of the fetlock joint as a result of loss of support from the lateral collateral ligament. A small fracture fragment lies laterally, just proximal to the joint, and a larger fragment lies medially, apparently originating from the medial articular surface of the first phalanx.
ii. The prognosis for salvage and even light work is surprisingly good following treatment with a cast for about eight weeks.
iii. The presence of the wound suggests that this may be an open luxation, but even these do well following flushing of the joint, debridement and casting. Of more concern is the intra-articular fracture of the medial aspect of the first phalanx. This will contribute to the development of degenerative joint disease, and a more severe residual lameness than would have been anticipated from an uncomplicated luxation.

207 i. A comminuted supraglenoid fracture. This is the common configuration which mimics the separate ossification centres seen in the development of the scapula.
ii. Although these cases start with a severe lameness, they rapidly improve to being virtually sound at the walk and only slightly lame at the trot. Therefore, it is sometimes erroneously concluded that the animal has suffered a 'soft tissue' injury of the proximal forelimb, rather than a fracture and further rest is prescribed. This leads to such cases presenting late for radiography, and definitive diagnosis.
iii. The prognosis is very poor. The horse will always be lame.

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208 A four-year-old Arab mare severely lacerated the plantar aspect of the right hind metatarsus. The mare had considerable value for breeding. **208a** illustrates the distal part of the right hindlimb on the day of the injury, and **208b** the limb five months later.
i. What structures have been damaged?
ii. How has the problem been treated?

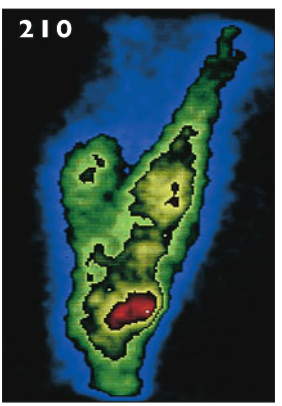




209 A well-grown, four-month-old foal, normal at birth, has developed a postural abnormality over the last three weeks (**209a**).
i. What is your diagnosis?
ii. What is the probable cause of this problem?
iii. How would you treat this problem?
iv. What is the prognosis for an athletic future?



210 A nine-year-old show jumper presented for investigation of a back problem. The horse was reluctant to jump and disliked having his hindlimbs lifted by the farrier, who noticed excessive wear of the toes and the lateral branches of both hind shoes. No lameness was present, but flexion tests were mildly positive in both hindlimbs. Gamma scans of the left and right tarsal regions, following the intravenous injection of 99^{m} technetium MDP, showed similar changes. The scan of the right hock (**210**) is illustrated.
i. What abnormality is revealed on the bone scan?
ii. What is your diagnosis, and how would you confirm it?



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208–210: Answers

208 i. The superficial and deep digital flexor tendons and the suspensory ligament have all been severed. The lifting of the toe indicates loss of function of the deep digital flexor tendon (DDFT), and the very low fetlock indicates loss of both the superficial digital flexor tendon and the suspensory ligament. The extent of the laceration required to cause this amount of damage means that it is also likely that there has been damage to nerves and blood vessels, and possibly one or other splint bone.
ii. It is difficult to treat horses with splints and casts when all support to the fetlock has been lost. Therefore, this horse was treated for the loss of fetlock support by fetlock arthrodesis and the loss of DDFT function was treated with a shoe with extended heels. At five months the mare was walking well on the limb, and she has since had two foals.

209 i. Acquired flexural deformity of the distal interphalangeal (DIP) joint (club foot) in both forelimbs.
ii. Too much supplementary food at weaning and an inability of the deep digital flexor tendon to lengthen passively at the same rate as the third metacarpal bone. The accessory ligament of the deep digital flexor tendon combines with the deep digital flexor tendon to have a 'bowstring' effect on the palmar aspect of the limb, resulting in flexion of the DIP joint.
iii. Desmotomy of the accessory ligament of the deep digital flexor tendon (**209b**), reduction of the heels and, if necessary, application of a toe extension. Weight bearing may need to be encouraged with a short course of phenylbutazone therapy.
The animal should be fed a balanced diet, possibly with a reduction in its energy level.
iv. Good.


209b

210 i. There is increased radiopharmaceutical uptake, associated with the small tarsal joints.
ii. Radiography confirmed the diagnosis of osteoarthritis of the tarsometatarsal and distal intertarsal joints, or 'bone spavin'.

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Abbreviations

ALDDFT	Accessory ligament of the deep digital flexor tendon
ALS	Annular ligament syndrome
CDE	Common digital extensor
DCP	Dynamic compression plate
DCSP	Dynamic condylar screw plate
DDFT	Deep digital flexor tendon
DIP	Distal interphalangeal
EHV-1	Equine herpesvirus 1
FEP	Fractional excretion of phosphorus
HA	Hyaluronic acid
MPICL	Medial palmar intercarpal ligament
PAL	Palmar annular ligament
PIP	Proximal interphalangeal
SDFT	Superficial digital flexor tendon
SLE	Systemic lupus erythematosus

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Numbers refer to questions and answers, not pages.

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