Australian College of Veterinary Scientists

Fellowship Examination

June 2010

Veterinary Radiology

Paper 1

Perusal time: **Twenty (20)** minutes

Time allowed: **Three (3)** hours after perusal

Answer **four (4)** from the six questions **only.**

Choice is available in Parts B and C.

All questions are of equal value.

Subsections of questions are of equal value unless stated otherwise.

Paper 1: Veterinary Radiology

Part A:

Answer **all parts** of Question 1. Each part is worth equal marks. Recommended time allocation for Question 1 is 45 minutes.

1. With regard to magnetic resonance imaging (MRI), explain **each** of the following sequences. Discuss the indications/advantages of **each** when used to image the head of a dog, using clinical examples to illustrate your answer:

    a) T1 weighting

    b) T2 weighting

    c) fluid attenuated inversion recovery (FLAIR)

    d) short tau inversion recovery (STIR)

    e) gradient echo

    f) diffusion MRI.

Part B:

Answer **one (1)** of the following two questions. Recommended time allocation for either question is 45 minutes.

2. The past decade has seen the rapid uptake of digital radiography techniques (computed radiography and digital radiography) amongst veterinary practitioners worldwide, including Australia. Veterinary radiologists are often asked for advice about the transition to digital radiography.

    Answer **each** of the following parts of this question (Each part is worth equal marks):

    a) Compare and contrast the advantages and disadvantages of digital radiography with conventional film-screen radiography.

    b) Compare and contrast computed radiography (CR) with direct digital radiography (DR), addressing **both** small animal and large animal practice requirements.

    c) Besides the digital processor, what other factors does a veterinary practitioner need to consider when transitioning to digital radiography?

3. Describe in detail the components of a picture archive and communication system (PACS). Discuss how the scope or extent of PACS may differ between a large, multidisciplinary tertiary veterinary referral practice and a large veterinary general practice.

Part C:

Answer **one (1)** of the following two questions. Recommended time allocation for either question is 45 minutes.

4. Describe the methods for performing scintigraphy to identify a skeletal problem in the dog. Include indications for the study, details of the equipment, radionuclide/radiopharmaceutical, the protocol for obtaining and analysing the images, handling precautions and the subsequent care of the animal.

5. Dogs with 'cauda equina syndrome' can be imaged with at least three modalities: radiography, computed tomography (CT), and MRI. Discuss the advantages and disadvantages of **each** modality in reaching a diagnosis of the cause of the clinical signs. Based on this information, make an imaging recommendation to the owner of a middle-aged, large-breed dog with recent onset of hind limb weakness and pain related to the lumbosacral junction.

Part D on next page

Part D:

Answer all **nine (9)** of the following parts of this question. Recommended time allocation is 45 minutes (five minutes for each part). Each part of the question is worth equal marks. In a question with subsections, the subsections are of equal value.

6.

a) Define Hounsfield units. List the range of clinically useful Hounsfield units for different parts of mammalian anatomy.

b) Define the following radiographic terms:

   i. quantum mottle

   ii. focal spot blur

   iii. latitude.

c) Briefly describe how a photostimulable phosphor detector system works.

d) List **five (5)** factors that affect spatial resolution of CT. For **each** one, briefly describe how it affects spatial resolution.

e) Define 'magnetic moment'. Explain why hydrogen is the ideal element for producing an MR image.

f) Describe the following MR artifacts:

   i. chemical shift

   ii. susceptibility.

g) Define acoustic impedance. Briefly explain how this contributes to the creation of the ultrasound image.

h) Define lateral resolution of the ultrasound beam. Briefly explain how lateral resolution can be varied or altered in a linear transducer. Briefly discuss the relationship to axial resolution.

i) Briefly describe how harmonic ultrasound imaging is achieved. Explain the benefits of harmonic imaging.

End of Paper

Australian College of Veterinary Scientists

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July 2010

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Paper 2

Perusal time: **Twenty (20)** minutes

Time allowed: **Three (3)** hours after perusal

Answer **four (4)** from five questions only.

Choice is available in Part D.

All questions are of equal value.

Subsections of questions are of equal value unless stated otherwise.

Paper 2: Veterinary Radiology

PART A:
Answer the following question. Recommended time allocation is 45 minutes.

1. One of the most common abnormalities identified on radiographs of both weanlings and yearlings is osteochondrosis. Discuss this condition in horses, paying particular attention to **each** of the following:

   a) pathophysiology of the condition

   b) breed, age and sex predisposition

   c) common sites of occurrence, including relative prevalence and any individual site characteristics. Comment on the expected clinical significance for each of these sites.

PART B:
Answer the following question. Recommended time allocation is 45 minutes.

2. Chiari malformation and syringomyelia is now recognised commonly in small breed dogs.

   a) Describe the pathophysiology of this condition, including breed predilections and causes of the clinical signs.

   b) Describe diagnosis of this condition and include in your discussion references to recent veterinary research publications.

   c) Discuss the merits of a screening program for this disease, in light of what is known about its heritability.

Part C over page

PART C:

Answer **each** of the following short answer question parts. The recommended time allocation is 45 minutes (five minutes for each part). Each part of the question is worth equal marks. In a question with subsections, the subsections are of equal value.

3.

a) Chronic mitral valve regurgitation is a common cause of pulmonary hypertension in dogs. Briefly describe how chronic mitral valve disease can lead to pulmonary hypertension. List the non-invasive means of detecting pulmonary hypertension in dogs and describe what constitutes a positive finding.

b) Aortic stenosis is a common congenital cardiac anomaly in dogs with a heritable basis. List the commonly affected breeds. List the echocardiographic findings in a dog affected by this condition, and categorise your findings for dogs that are mildly, moderately and severely affected.

c) List the MRI findings that you may expect to see in the thoracolumbar spinal segment of a labrador retriever with acute, non-compressive nucleus pulposus extrusion (type III disc herniation) that presented for MRI scanning between 12-24 hours after the insult.

d) List the differences between per-rectal portal scintigraphy and trans-splenic portal scintigraphy in terms of preparation required, dose administered, dose absorbed and possible problems with shunt detection.

e) Extrahepatic biliary duct obstruction is a syndrome seen in the cat. List the sonographic features of extrahepatic biliary obstruction in cats. Briefly discuss causes of this disease.

f) An aged beagle presents to your practice with severe chronic progressive left forelimb lameness, with some atrophy of the associated upper limb musculature. List differential diagnoses from 'most likely' to 'least likely', in your opinion. Describe your approach to imaging this patient with justifications for each imaging test used.

g) Incomplete ossification of the humeral condyle is an orthopaedic condition that predisposes affected dogs to humeral condylar fractures. Describe the breed incidence and pathophysiology of this condition. Describe the imaging findings associated with this disease.

h) Neoplasia affecting the head of the horse can be divided into those affecting the sinonasal cavity, and those affecting the mandible. List the types of neoplasia that may be found in each region and provide a list of non-neoplastic differential diagnoses for each area.

i) List the potential ultrasonographic findings in each of the following conditions:

   i. an ectopic ureter

   ii. avulsion injury of the origin of the suspensory ligament

   iii. hyperadrenocorticism in a ferret

   iv. bicipital tendonitis in a dog.

Part D over page

Part D:
Answer **one (1)** of the following two questions. Recommended time allocation for either question is 45 minutes.

4. Pulmonary thromboembolism (PTE) in dogs can cause severe morbidity and mortality, however remains difficult to definitively diagnose. Discuss the predisposing causes of PTE in dogs. Compare and contrast diagnostic imaging modalities used in the diagnosis of PTE, namely radiography, nuclear medicine, computed tomography and ultrasonography.

5. Radiographically identifiable microhepatia in dogs is often associated with congenital portosystemic shunting (PSS).

    a) Explain the pathophysiology of the small liver size.

    b) List some other radiographic features of congenital PSS; include a brief explanation of the underlying pathophysiology.

    c) Discuss the different configurations of congenital PSS.

    d) Discuss diagnostic imaging modalities used in the diagnosis and delineation of PSS.

End of paper