ABSTRACTS OF PAPERS PRESENTED AT THE 16TH CONGRESS OF THE INTERNATIONAL VETERINARY RADIOLOGY ASSOCIATION AND THE ANNUAL MEETING OF THE EUROPEAN ASSOCIATION AND COLLEGE OF VETERINARY DIAGNOSTIC IMAGING, BURSA, TURKEY

26 AUGUST–1 SEPTEMBER 2012

Veterinary Radiology & Ultrasound, Vol. 54, No. 4, 2013, pp 408–449.

MRI AND MRA CHARACTERIZATION AND PREOPERATIVE EVALUATION OF THYMOMAS IN DOGS

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Introduction:
CT and MRI are the standard modalities for characterization and preoperative surgical planning of mediastinal masses including thymoma in people.[1,2] Tumors are assessed based on published evaluation schemes to predict neoplasm behavior, invasiveness, and resectability.[3] To date, there are two published reports describing CT evaluation of mediastinal masses in case series of dogs and cats[4,5], but no comparable report utilizing MRI.
Aim:
The purpose of this study was to evaluate MR and MRA image characteristics of canine thymoma and to attempt to predict tumor resectability.
Materials and Methods:
Dogs undergoing MRI thoracic evaluation followed by thoracotomy or necropsy were included. Imaging sequences using a 1.0T scanner consisted of precontrast T1, T2, STIR, T1-W gradient echo, True FISP, pre- and postcontrast T1-W VIBE, dynamic contrast enhanced 3D gradient echo and post contrast T1. Precontrast images were evaluated for tumor size, contour, lobulation, shape, homogeneity, presence of capsule and septa, presence of high and low signal foci, presence of regional lymphadenopathy, and pleural effusion. Post contrast images were evaluated for tumor vascular supply, deviation/invasion of great vessels, and patterns of contrast enhancement. Angiographic 3D images were reconstructed using maximum intensity projection and digital subtraction.
Results:
Five dogs were included. The most characteristic imaging pattern of thymoma consisted of tissue hyperintense to muscle on T1 and T2-W sequences. Masses contained variable numbers of T2/STIR hyperintense foci that were isointense to hypointense to adjacent mass parenchyma on T1-W images. Post contrast images showed diffuse nonuniform tumor enhancement with small nonenhancing foci variably corresponding to areas of T2/STIR hyperintensity. Two of five tumors contained large noncontrast enhancing areas of T1 isointensity and T2 hyperintensity. Tumor blood supply was predominantly from the internal thoracic artery. Great vessels of the cranial mediastinum were deviated without evidence of tumor invasion. Resectability was negatively correlated with tumor lobular extension into the mediastinum.
Conclusion:
MRI/MRA was useful in characterizing morphology of thymoma and predicting tumor resectability.
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PARASPINAL INFILTRATIVE INTRAMUSCULAR LIPOMA CAUSING SPINAL CORD COMPRESSION IN A DOG

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Introduction:
Infiltrative lipomas (IL) are uncommon in dogs and rare in cats. Lipomas and IL are found more frequently on the head and neck. Lipoma-like masses infiltrating the vertebral canal and causing neurologic deficits, as the case described here, have been reported only in three cases.[1–3]
Aim:
The objective of this report is to describe a case of IL causing a femoral nerve dysfunction in a dog.
Materials and Methods:
A 12-year-old, intact male Fox Terrier dog was evaluated with a history of abnormal gait of the left pelvic limb of 1 month of duration, without a previous history of trauma. Physical and neurological examinations were performed. Hematological and biochemical analysis was carried out. Imaging study of the lumbar spine was performed.
Results:
The physical examination revealed a soft, painful mass of 12 cm of diameter on the left side of the caudal lumbar area. The patient could not bear weight on the left limb and maintained the stifle in a flexed position. Neurological abnormalities included loss of patellar reflex, decreased proprioception of the affected limb, and atrophy of the quadriceps muscle that was indicative of a dysfunction of the femoral nerve. The ultrasonographic appearance of the mass was consistent with a lipoma that was confirmed by cytological study. Computed tomography (CT) images obtained before and after the IV administration of iodinated contrast medium, showed an expansive well-defined mass within the left epaxial muscles from L3 to pelvic canal. The mass invaded the vertebral canal at the level of L5–L6, causing spinal cord compression. The lesion appeared as a homogeneous hypoattenuated mass (−119 UH), similar to subcutaneous adipose structures (−118 UH). Contrast enhancement was not evident. The lesion was diagnosed as an infiltrative intramuscular lipoma that compressed the spinal cord at the level of the L5–L6. A hemilaminectomy was performed and the dog recovered neurologic function within 2 weeks.
Conclusion:
In this case, CT imaging determined the location and extension of a mass causing spinal cord compression, and also provided evidence that the mass was fatty origin.
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COMPLICATED THORACIC HYDRATID CYST IN A CRAB-EATING MACAQUE

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Introduction:
Hydatid cyst is the outcome of infection with the Taenia echinococcus granulosus tapeworm.[1] The canidae family are the definitive hosts of the worm while other animals, including human being and other primates are the intermediate hosts.[2,3]
Case History:
An adult crab-eating macaque, arrived at the Israeli Primate Sanctuary from a research facility. Like many other "experimental" monkeys who came to the sanctuary for rehabilitation it was introduced to other monkeys and acclimatized very well. It had a long history of eye problem that was improved by a long term of low dose of Docycycline without a definite diagnosis. During relocation of monkey groups to larger enclosures a full physical examination, ultrasound examinations, and blood workup were done under anesthesia with ketamine. A large cyst-like structure was imaged in the right side of the thorax by ultrasound after detecting dyspnea. No other abnormalities were found during the ultrasound examination. A volume of 350 ml of clear fluid (like water) was aspirated from the cyst. Mild dyspnea was observed while the patient was hospitalized so the next day it was referred for CT examination to the Veterinary teaching Hospital of the Koret School of Veterinary Medicine, Hebrew University. CT showed that the cystic lesion was air-filled with no sign of

fluids. A connection to the right middle lung lobe bronchi was found. A metal ring was found in the orbit of the diseased eye. A week later the patient underwent exploratory thoracotomy but it was impossible to excise the cyst and the patient died. Diagnosis of hydatid cyst was confirmed by histology and parasitology.
Conclusion:
This is a unique case of communication of a hydatid cyst to bronchi. No clinical signs were observed before the cyst aspiration. In this case ultrasound, radiography and CT examinations are compared to a case of a hydatid cyst in a monkey. Diagnosis was based on ultrasound, CT, and radiography, confirmed by surgery, necropsy, parasitology, and histology.[3]
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CONTRAST RADIOGRAPHIC, ULTRASONOGRAPHIC, AND COMPUTED TOMOGRAPHIC IMAGING STUDIES ON THE ABDOMINAL ORGANS OF THE ZARAIBI GOAT

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Introduction:
Contrast radiography has previously been shown to be helpful in the study of the normal structure and function of the gastrointestinal tract and as a means of diagnosing gastrointestinal disease in the goat.[1] Hepatic, gall bladder, and splenic ultrasonography have also been widely used.[1] The superior contrast resolution of computed tomography (CT) is a potential advantage over conventional radiography.[2]
Aim:
The present study was performed to observe the radiographic structure and function of the abdominal organs using contrast radiography, ultrasonography, and CT.
Materials and Methods:
The morphology of the stomach, intestine, liver, spleen, caudal vena cava, portal vein, and gall bladder were examined by contrast radiography, ultrasonography, and CT in 11 zaraibi goats aged 1–1.5 years and weighing 25–30 kg.
Results and Discussion:
Contrast radiography demonstrated the various parts of the gastrointestinal tract depending on the distribution of the contrast material (barium sulphate).[1] Ultrasonography was used to evaluate the liver, biliary system, stomach, and small intestine.[2] CT provided unique information about areas in which radiography and ultrasonography were unrewarding without the need for contrast administration.[3] The diameter of the caudal vena cava, portal vein, and gall bladder decreased from the 9th to the 12th intercostal spaces with ultrasonographic measurement.
Conclusions:
This study shows that contrast radiography, ultrasonography, and CT are safe, practical, and easily performed in the goat. Radiographic and ultrasonographic procedures were complimentary in the evaluation of the gastrointestinal tract, spleen, and liver. CT provided superior soft tissue differentiation over conventional radiographic techniques.
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ULTRASOUND IMAGING OF THE BRACHIAL PLEXUS FOR REGIONAL ANAESTHESIA IN THE CAT

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Introduction:
The recent development of high-resolution electronic broadband transducers has enable ultrasonography (US) to be an optimal image technique to assess normal anatomy and abnormalities of the peripheral nerves (PN). US-guided techniques are gaining popularity to be employed to locate and block PN in humans and dogs. To the author's knowledge, there is only information regarding the appearance and ultrasonographic approaches of the sciatic nerve in the cat.
Aim:
To describe the anatomical basis, the US appearance and approaches to the feline brachial plexus (BP) to facilitate its blockade.
Materials and Methods:
(i) Anatomical study: Ten feline forelimbs were used to establish the anatomical landmarks to approach the BP by US. Anatomical dissection of the BP was carried out in five forelimbs. Cross-sectional images were obtained in another five forelimbs by introducing red-latex through the thoracic aorta. |(ii) Ultranosographic study "in vitro": the BP was evaluated by US in five fresh feline cadavers using a 4–13 MHz linear array transducer. The accuracy of the approaches and nerve location was demonstrated by the injection of ink around the target nerves. (iii) Ultranosographic nerve study "in vivo": five healthy adult experimental cats were employed to perform an US examination of the BP as described in the "in vitro" study. (iv) US-guided block: the BP of five cats was blocked by an axillary approach. Cats were positioned in dorsal recumbency with the forelimb to be blocked abducted 90° and the other forelimb extended caudally. The needle was positioned in plane and lidocaine 2% was injected around of the nerve roots of the BP. The efficacy of the block was assessed by neurological examination every 10 min for 1 h.
Results:
The anatomical landmarks employed to locate the BP by US were the scapulo-humeral joint and the first rib. The axillary approach allowed the identification of all the BP roots. The musculocutaneous, radial, median, and ulnar nerves were individually identified by the humeral approach and appeared as homogeneous hypoechoic rounded structures surrounded by a hyperechoic rim. The BP US-guided block was successful in four of five cats.
Conclusions:
US is an optimal technique to assess the BP and to guide the technique of BP block in cat.
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SURGICAL VERSUS MEDICAL TREATMENT IN DOGS WITH GALL BLADDER MUCOCELES

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Introduction:
Gall bladder mucoceles in dogs are increasingly diagnosed with ultrasound (US). This condition is generally considered a surgical emergency. Few cases in the iteratüre indicate that dogs with gall bladder mucoceles may be treated medically.
Aim:
The purpose of this retrospective study was to define parameters, such as US, that determine appropriate treatment (medical vs. surgical) and prognostic indicators indicative of long-term outcome.
Materials and Methods:
Forty-four dogs presented to Kansas State University-Veterinary Medical Teaching Hospital (2000–2010) with an US diagnosis of gall bladder mucocele were included. Medical records were reviewed for signalment, history, clinical signs, laboratory, and US findings, concurrent disease, medical, and surgical treatment, histopathology, and minimum 6-month of follow-up.
Results:
Shelties and Cocker Spaniels were over-represented. Twenty-eight dogs were treated surgically, 16 medically. Vomiting was the most common clinical sign. Of the 28 dogs treated surgically, 13 were diagnosed with rupture on US, eight had confirmed rupture at the time of surgery. The most common ultrasound findings consistent with rupture were hyperechoic mesentery, free abdominal effusion, and abnormal gall bladder. Concurrent disease was seen in 11/16 medically treated dogs and 7/28 in the surgical group. The most common concurrent diseases were hyperadrenocorticism, diabetes mellitus, renal disease, and pancreatitis. Five surgical cases died or were euthanized due to complications related to the mucocele within 2 weeks of surgery. All 16 medically treated dogs survived the initial 14 day time period. Subsequently, 1 dog was euthanized due to complications related to the mucocele.
Discussion/Conclusions:
Ultrasound overestimated the incidence of gall bladder rupture compared to surgical findings, but the US findings were specific for rupture (Sen 0.54, Sp 0.93, PPV 0.86, NPV 0.70). Breed predisposition and clinical signs were similar between groups and similar to the iteratüre. Concurrent diseases were identified in both groups of dogs, with a higher incidence in the medical treatment group. The mortality rate for dogs undergoing surgery was 17%, which is less than previously reported. If dogs survived the initial 14-day period after surgery or initiation of medical therapy they were unlikely to die due to complications related to the mucocele.
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POLYOSTOTIC HYPEROSTOSIS IN BIRDS: A RADIOGRAPHIC STUDY OF 34 CASES

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Introduction:
During the preovulatory stage of the egg-laying cycle, female birds normally produce large amounts of medullary bone.[1,2] Polyostotic hyperostosis (PH) is estrogen-dependent and associated with follicular development,[2,3] but has also been reported in association with ovarian cysts or tumors, oviductal tumors, and also in cases of sertolinomas in male birds.[1–4] PH is most frequently seen in budgerigars (*Melopsittacus undulatus*).[2,5]
Aim:
The goal of this study was to describe the radiographic findings in 34 birds with polyostotic hyperostosis.

Materials and Methods:
A retrospective radiographic evaluation of 34 birds, from different orders, with polyostotic hyperostosis was performed. Radiographs were obtained from the archives of Radiology Service of the Veterinary Teaching Hospital, School Veterinary Medicine of University of São Paulo, São Paulo, SP, Brazil, during the 60-month period. The radiographic changes of the skeletal system and coelomic cavity were recorded.
Results:
Psittacines performed the highest percentage (18/34, 52.94%), followed by passerines (11/34, 32.35%). Of these 34 birds, nine were budgerigars (*Melopsittacus undulatus*) (9/34, 26.47%) and nine were canaries (*Serinus canarius*) (9/34, 26.47%). Various degrees of medular sclerosis were observed. The most affected bones were those of the appendicular skeleton: femur (31/34, 91.18%), tibiotarsus (31/34, 91.18%), ulna (26/34, 76.47%), and radius (24/34, 70.59%). Associated enlargement of the coelomic cavity was found in 26 birds (26/34, 76.47%). Of these 26, mineralized eggs were found in seven birds (7/26, 26.92%). A total of eight birds with PH (8/34, 23.53%) had no abnormalities in the coelomic cavity.
Discussion/Conclusion:
Polyostotic hyperostosis is characterized by increased medullary bone opacity in some or all bones, which can be seen on radiographs. It is often an incidental finding. This condition and associated enlargement of the coelomic cavity not related to egg laying may suggest the presence of an estrogen-secreting tumor.
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SURVEY RADIOGRAPHIC IMAGING OF AVIAN DISORDERS

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Introduction:
Radiology has been recognized as a valuable tool in routine diagnostic procedures of avian patients. Its use in the evaluation of numerous avian diseases is well established, including abnormalities of the skeletal system, digestive system, genital system, and respiratory system.[1–3] Abnormalities of the skeletal system, however, are recognized as the most commom in pet avian species.[1]
Aim:
The goal of this study was to describe the findings in birds presented for radiographic examination from April 2006 to December 2011.
Materials and Methods:
This retrospective study reviews the plain radiographic findings in 295 birds of different species and ages. The radiographic examinations were analyzed and the distribution of findings for each system, as well as their respective species and ages, were studied. The data were obtained from the Radiology Service of Provet Veterinary Diagnostic Laboratory, São Paulo, SP, Brazil, from April 2006 to December 2011. The findings of the skeletal system and coelomic cavity were recorded.
Results:
Of all birds evaluated, the predominant species were blue-fronted Amazon parrot (Amazona aestiva) (117/295, 39.66%) and cockatiel (Nymphicus hollandicus) (72/295, 24.40%). Disorders of the skeletal system were the most commom (163/295, 55.25%). Of these 163, 61 birds had fractures (61/163, 37.42%). Disorders of the digestive system occupied the second position (91/295, 30.85%). Of these 91, 28 birds were diagnosed with hepatomegaly (28/91, 30.77%).
Discussion/Conclusion:
The results of the present study support the opinion expressed in the literature that disorders of the skeletal system are very common in birds. Radiographic examination is a valuable diagnostic tool in the assessment of several avian disorders, either skeletal system or coelomic cavity; however, specific knowledge of normal avian radiographic anatomy is desirable for proper radiographic evaluation. In addition to radiology, findings of other ancillary tests may be required to aid in the diagnosis of various diseases involving the avian patient.[4]
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DENTAL PULP NECROSIS IN INCISORS IN OLD HORSES

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Introduction:
Modern horse management has changed considerably in recent years, with horses increasingly being kept as companion animals. Furthermore, geriatric equine management is more common and gives horse practitioners special challenges especially with regard to dental care.
Aim:
The purpose of this study was to examine 20 horses > 15 years of age (average 23.5 years), without a history of eating or dental problems, as assessed by their owners, in order to determine the incidence of subclinical dental problems.
Material and Methods:
The 20 horses were examined clinically and after euthanasia radiographed and CT scanned. They were euthanized for reasons other than clinical dental or digestion abnormalities. One 35-year-old horse was followed for 3 years by means of annual dental radiography. Histology was performed in some cases.
Results:
Six horses had 33 open, black-stained pulp visible in the incisors. CT images showed various internal resorption related to the pulp. The open pulp could very often be observed on plain radiographs. However, internal resorption of the affected teeth develops with time. Some horses had hypercementosis independent of the presence of pulp necrosis. CT scanning is the gold standard showing all changes in the pulp cavity, even if the hypercementosis is severe. The diagnosis was confirming by histology.
Discussion:
Trauma and/or inflammation, septic or aseptic that compromise the blood supply to the periodontal membrane can result in external root resorption and around the root apex, can cause pulp necrosis.[1] Later in life as the necrotic pulp will be seen as an open pulp on the occlusal surface, when the teeth are worn down, without secondary inflammatory changes.[2] The same theory is also discussed in dogs.[3]
Conclusion:
Open pulp can be seen in incisors in old horses without clinical abnormal findings. Specific treatment for this condition is very difficult and may not be required until affected teeth eventually break as a result of internal resorption and loss of material within the teeth.
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COMPUTED TOMOGRAPHIC QUANTIFICATION OF CANINE ADRENAL GLAND VOLUME BEFORE AND AFTER ADMINISTRATION OF TETRACOSACTIDE

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Introduction:
The normal volume of the adrenal glands in dogs was previously established by computer tomography (CT);[1] however, the ability of this method for adrenal gland enlargement, which is the most probable change in the gland diseases, has not been examined yet.
Aim:
We conducted a study in presumed normal dogs before and after administration of Tetracosactide to determine the adrenal gland volume and the ability of CT in detecting its enlargement.
Materials and Methods:
Two-detector CT analysis of the gland was carried out in 10 adult dogs without evidence of adrenal gland disease before and after 8 days 800 gm/kg BW administration of Tetracosactide.
Results:
The mean baseline CT volume $+/-$ standard error for left and right adrenal gland was 0.175 cm^3 $+/-$ 0.077 and 0.213 cm^3 $+/-$ 0.015 and after administration of tetracosactide was 0.255 cm^3 $+/-$ 0.026 and 0.317 cm^3 $+/-$ 0.025, respectively. There was no statistically significant difference between the size of the left and right adrenal glands either before and after administration of tetracosactide but the volume of the adrenals was increased significantly ($P < 0.05$), which was detectable by CT imaging.
Discussion:
Based on our study, CT is an effective and accurate method for assessing adrenal enlargement in dogs.
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COMPARISON OF ULTRASONOGRAPHIC OPPOSITE CONTRAST TECHNIQUE WITH LOW-FIELD MRI OF SOUND AND INJURED EQUINE PROXIMAL THIRD INTEROSSEOUS MUSCLE

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Aim:
Minimal correlation between routine ultrasonographic (US) images and MR ones for sound equine proximal third interosseous muscle (PTIOM) has been reported.[1,2] A dedicated US approach performed on the flexed limb by tilting the probe to obtain opposite contrast (OC) images has been developed[3] to overcome these limitations. The aim of this study was to evaluate the correlation and diagnostic interest of OC US images compared to MR ones in sound and injured PTIOM.

Materials and Methods:
Sound PTIOM: routine and OC US examination was conducted in six forelimbs and six hindlimbs. The same PTIOM was evaluated on a low-field MR system under general anesthesia. Correlation between transverse MR and OC US images was evaluated and quantified by measuring the overall cross sectional area (CSA) of the PTIOM. Statistical analysis was performed using Pearson correlation and paired Student *t*-tests ($P < 0.05$). Injured PTIOM: diagnostic interest of OC US images compared to routine ones and standing low-field MRI was assessed using 10 clinical cases.
Results:
Sound proximal TIOM: the overall PTIOM was visualized on transverse OC US images. These images correlated morphologically well with the MR aspect of the PTIOM by increasing tissue contrast and differentiating the dense, fibrous, and connective parts of the PTIOM lobes. Pearson correlation on tilted US and MR CSA was statistically significant and high ($r = 0.93$). No statistical difference was found between OC US and MR CSA values. Injured PTIOM: OC US images have allowed the diagnosis of mild PTIOM injuries hardly or not visible on routine US images such as enlargements of the dorsal dense fibrous part of the medial lobe of the fore PTIOM with a concurrent reduced size of its connective island. Such alterations were well correlated with MR findings but MR images have demonstrated a higher contrast resolution by identifying different types of tissues in the injured lobes.
Discussion/Conclusion:
Dedicated OC examination improves the performance of US in the routine diagnosis PTIOM injuries. MRI represents an excellent complementary imaging technique due to its higher contrast resolution and ability to document abnormalities in the bony part of the PTIOM enthesis.[4]
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RADIOGRAPHIC EVALUATION OF FEMORAL TORSION AND CORRELATION WITH COMPUTED TOMOGRAPHIC TECHNIQUES IN LABRADOR RETRIEVERS WITH AND WITHOUT CRANIAL CRUCIATE LIGAMENT DISEASE

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Introduction:
Proximal femoral torsion plays an important role in the development of coxarthrosis in dogs.[1,2] Distal femoral torsion has recently been proposed as a predisposing factor for canine cranial cruciate ligament deficiency (CCLD).[3] Biplanar radiography and computed tomography (CT) have previously been used to evaluate femoral torsion via measuring the anteversion angle (AA).[2,4]
Aim:
Develop a technique to determine the anteversion angle of the femur on a single radiograph. Determine the correlation between this technique and other published radiographic and CT methods. Determine the location of femoral torsion in dogs with CCLD.
Materials and Methods:
Thirty mature Labrador Retrievers were enrolled. Pelvic limbs ($n = 28$) of 14 dogs without CCLD were classified as control, whereas limbs of 16 dogs (18 limbs) with CCLD were considered as diseased. Femoral torsion was evaluated using radiography and CT and variables were compared among limb groups using a mixed-model ANOVA, with $P < 0.05$ considered significant.
Results:
There was a significant association between biplanar and lateral plane AAs but neither correlated with CT assessment of femoral torsion. On CT, a significant correlation was identified between overall AA and each of the distal, proximal, and femoral head trochanteric angles. Biplanar and lateral plane AAs did not differ between normal and CCL-deficient limbs. Overall and distal AAs were increased in CCL-deficient limbs compared to control.
Discussion:
The lack of standardized positioning, the use of different radiographic landmarks, and the complicated mathematical formulas are the most common disadvantages in using biplanar radiographic technique.[5] CT imaging is considered the reference method for measuring the anteversion angle as it eliminates artifacts related to positioning and allows 3D reconstruction of images, thereby improving the accuracy of measurements.[3,4] The limitations of CT compared to radiography include cost and reduced availability to veterinarians.
Conclusion:
Biplanar determination of femoral torsion can be estimated based on a single lateral radiograph but the results may be inaccurate as only CT identified and localized the site of femoral torsion. Femoral condylar torsion may be associated with CCLD in Labrador Retrievers.
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TOMOGRAPHIC DIAGNOSIS AND MONITORING OF PULMONARY CONTUSION AND PNEUMOTHORAX IN A GUINEA PIG

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Introduction:
Thoracic trauma is a common cause of injuries usually diagnosed with great accuracy by CT.[1]
Aim:
To describe the CT diagnosis and monitoring of pulmonary contusion and pneumothorax in a guinea pig.
Case Report:
A guinea pig presented with dyspnea and a history of trauma on the day before it underwent thoracic CT. In the images, a moderate gas collection was observed in the middle and caudal right portions of the pleural space. The left lung lobes had a diffuse and slightly heterogeneous opacification, indicating pulmonary contusion. The right lung lobes had a marked heterogeneous opacity, and were also reduced in size due to atelectasis secondary to pneumothorax. In a follow-up CT scan performed 72 h after trauma, the pneumothorax had regressed and the opacity of lung lobes had decreased and the right lobes' size increased, secondary to the improvement of pneumothorax.
Discussion:
CT scan has a great accuracy in the identification of pulmonary contusion.[2] It was observed in 38% of the patients by radiographic examination and in 100% of the individuals by CT.[2] Pulmonary contusion, which usually takes an average of 6 h to be identified, resolves after about 3–10 days.[3] In the animal reported, the pulmonary opacity was observed in the initial thoracic assessment, performed after 24 h of injury, and the pulmonary lesions had regressed on the 3rd day. The pulmonary consolidation identified in this type of injury is often observed as a diffuse or focal irregular opacity[3] without air bronchograms due to hemorrhage within the airways.[1] In the patient reported a diffuse and slightly heterogeneous opacity was observed in the left lung lobes lungs, whereas in the other, a marked nonuniform opacity was identified, presumably due to atelectasis secondary to the pneumothorax in association with the pulmonary contusion.
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RADIOGRAPHIC MEASUREMENT OF HEART SIZE BY VERTEBRAL SCALE SYSTEM IN OVINES

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Introduction:
The radiographic evaluation of the heart includes subjective and objective analysis. However, the values of the quantitative method in which the heart size is measured by vertebral scale system,[1] are not known for animals of several species, including ovines.
Aim:
In this study, we describe the values of the measurements of heart size by vertebral scale system in thoracic radiographs of ovines.
Materials and Methods:
Twelve healthy 8-month-old Bergamácia ovines were included in this study. The thoracic radiographs were made in the right lateral recumbence. The measurements of heart size were performed using the vertebral scale system method described by Buchanan and Bücheler (1995).[2] The long axis of the heart was measured from the ventral border of the left main stem bronchus to the most distant ventral contour of the cardiac apex, whereas to the maximal short axis measurement of the heart, the calipers were placed in the central region of the third heart, perpendicular to the long axis. The measures were repositioned over the thoracic vertebrae beginning with the cranial edge of the fourth thoracic vertebrae (T4). The sum of both measures was considered the value for vertebral heart size.
Results:
The animals presented a weigh between 39 and 42.5 kg (mean: 41.04 kg) and a thoracic diameter between 75 and 88 cm (mean: 82.04 cm). The lower and upper limits and the

average of the measurement of the vertebral heart size (VHS) were 8.2, 9.4, and 8.6, respectively.

Discussion:

VHS may be very useful for cardiac evaluation since it can increase the accuracy of the diagnosis of heart disease by radiographic examination and it is not dependent on the professional experience.[3] Comparing the VHS in ovines with those in canines, it is found that this value is higher in the most canine breeds. The VHS average found in this study (8.6) resembles the lower limit set for German Shepherd dogs (8.7).[4] One fact that may contribute to this similarity is the deep chests found in both animals.

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CERVICAL AND THORACIC TOMOGRAPHIC FINDINGS IN A DOG WITH TRACHEAL RUPTURE

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Introduction:

Tracheal rupture, often diagnosed late or even not identified since the clinical signs presented by patients affected by this rare affection are often nonspecific,[3] can be diagnosed by CT1.[1]

Aim:

In this case report, we describe the cervical and thoracic CT findings of a canine diagnosed with tracheal rupture.

Case Report:

A 2-year-old male shih tzu with a history of trauma underwent a cervical and thoracic CT scan because of the suspicion of tracheal rupture since the radiographic examination showed cervical emphysema, pneumomediastinum, and pneumothorax. On CT were seen a focal deformity of the wall of the trachea associated with a decrease of its lumen at the level of the middle portion of the third cervical vertebra. In this examination, pulmonary atelectasis and air-filled cavities with ill-defined limits in cranial lung lobes were also noted, compatible with pneumatoceles. The animal was submitted for a surgical procedure and the presence of the tracheal rupture at the level of the third cervical vertebra was confirmed.

Discussion:

In a study in which the CT findings of 14 humans with tracheal rupture and 41 patients with pneumomediastinum but without tracheal injury were compared, the most common CT findings noted in patients with this type of tracheal injury were deep cervical emphysema and pneumomediastinum,[1] also identified in the animal of this case report. These patients were also identified with pneumothorax that may have originated from a rupture of the mediastinal pleura[3] or a pneumatocele, which can be formed secondarily to a parenchymal tear due to trauma.[2] In humans, pneumothorax is not a frequent finding in cases of tracheal rupture. In one study,[1] tracheal injury was identified by CT in 71% of human patients, either as a defect or discontinuity of the wall of the tracheal (57%) or as a tracheal ring fracture or a focal deformity of the wall (14%), as seen in this patient reported.

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CONTRIBUTION OF THE ULTRASONOGRAPHIC METHOD IN THE DIAGNOSIS OF PYONEPHROSIS IN A CANINE

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Introduction:

Pyonephrosis, a rare disease in animals,[1] is represented by an accumulation of purulent content in the renal pelvis. The diagnosis of this disease is based on clinical and ultrasonographic findings,[2] which is recommended to be performed as early as possible, since the rapid intervention and treatment are extremely important in order to avoid complications.[3]

Aim:

To describe the ultrasonographic contribution to the diagnosis of pyonephrosis in a dog.

Case Report:

The ultrasonography of the animal diagnosed with pyonephrosis, a 3-year-old mixed breed male canine, revealed a mild fluid collection in abdominal cavity and a well-defined structure with thin wall (0.31 cm thick) and tissue extensions to its interior. The structure occupied almost the entire abdominal cavity, and showed highly echogenic content. No signs of vascularization in color Doppler were visualized, suggesting the presence of a fluid collection. High viscosity content was indicated since no movement change of echogenic debris was observed.

Discussion:

The imaging method most commonly used to aid in the diagnosis of pyonephrosis is ultrasound.[2] It enables the identification of the dilatation degree of renal pelvis, which in severe cases, as in the animal reported, only a thin tissue in the periphery of the organ and some extensions to the interior of the structure are observed.[4] This exam also enables the evaluation of the content echogenicity present in the renal pelvis. In the animal reported, an echogenic content that filled completely the renal pelvis was visualized, indicating the existence of a pyonephrosis or a hemonephrosys.[3] An ultrasound guided fine needle aspiration can be done in some cases in order to differentiate these two diseases; however, in the animal reported it was not done since the peripheral renal tissue was thin and the content, that possibly could be a septic content, could leak into abdominal cavity. The ultrasound can also be used for the evaluation of secondary changes such as peritoneal and retroperitoneal inflammation and fluid.[1] In the animal reported, a mild collection of fluid was observed in the abdominal cavity, however, it could not be aspirated by a fine needle since it was deeply located in abdominal cavity. It is believed that the fluid was originated from a lymphatic compressive process due to the extensive renal dimension since peritoneal and retroperitoneal inflammation, such as the presence of fibrinous material in organs surfaces and edematous and hemorrhagic omentum had not been observed during the surgical procedure.

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ULTRASONOGRAPHIC FINDINGS OF EMPHYSEMATOUS HEPATITIS IN A DOG

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Introduction:

Intraparenchymal and mural gas collection may be due to several malignant and benign processes and can affect several organs such as gallbladder, liver, renal parenchyma and pelvis, stomach, pancreas, and urinary bladder.[1]

Aim:

In this report, we describe the ultrasonographic findings of emphysematous hepatitis in a dog.

Case Report:

A 16-years-old mixed breed female canine presenting ataxia, circling, head tilt, vocalization, mental depression, and ventromedial strabismus in the left eye as clinical signs underwent to an ultrasonography due to the suspicion of hepatic encephalopathy. In the examination of the patient who also presented elevated liver enzymes, was observed a markedly heterogeneous echotexture in the liver due to the presence of hyperechoic focal areas with posterior reverberation and without twinkle artifact scattered throughout the liver parenchyma, more evident in the left lobe, indicating the presence of emphysematous hepatitis.

Discussion:

Emphysematous hepatitis is a disease in which there is a gas accumulation in liver parenchyma, which is rare due to the highly vasculature and reticuloendotelial efficiency of this organ, in portal vasculature and in biliary system.[3] This disorder is usually caused by gas-forming infection, which may be originated from distant or nearby sites by hematological or local dissemination, respectively.[4] The ultrasonographic findings of emphysema has been described in other organs such as gall bladder, kidney, and urinary bladder, however, there were no differences compared to the findings observed in the animal reported. In emphysema, highly reflective hyperechoic images with reverberation artifact can be observed.[2] A differentiation between intraparenchymal gas collection and mineralization should be done in these cases since a posterior reverberation artifact can occasionally be identified in this latter alteration.[5] The twinkle artifact that appears as a turbulent flow in Doppler ultrasound in cases of mineralization[1] may aid in the differentiation of both findings, especially in cases in which radiography and tomography were not made, as occurred in the animal reported. Computed tomography is considered the imaging modality most specific and sensitive to the evaluation of emphysematous disorders.[1] However, ultrasonography can be useful in the identification of those disturbs in some cases.

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ULTRASONOGRAPHIC ASPECTS OF DYSPLASTIC KIDNEYS OF THREE DOGS

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Introduction:
Renal dysplasia is a disorder resulted from an abnormality in nephrogenesis, which evolves into a chronic kidney disease in young animals.[1] Ultrasound, since it allows evaluation of the kidney, may suggest the existence of the nephropathy as well as the prognosis of the animal.
Aim:
In this report, we describe the ultrasonographic aspects of kidneys affected by dysplasia in three dogs.
Case Reports:
Renal dysplasia was diagnosed in: (i) a 2-year-old male doberman pinscher, (ii) a 1-year-old male lhasa apso and (–) a 9-months-old female lhasa apso. Ultrasound examination of these animals revealed kidneys with reduced size and irregular margins. Absence of normal architecture and increased renal echogenicity were seen in their ultrasound examination. In all patients, focal mineralizations were visualized in the renal cortex. In animals 2 and 3, bilateral renal cysts were identified. In patient 2, a mild collection of anechogenic fluid was observed in bilateral perinephric region.
Discussion:
The sonographic aspects of renal dysplasia include a variety of features depending on the renal involvement by secondary inflammation and fibrosis. The sonographic aspects of the kidney affected only by dysplasia include loss of corticomedullary definition and a cortical hyperechogenicity associated with a generalized increase in echogenicity of the renal medulla or the presence of some multifocal hyperechoic areas in it.[1] In more advanced cases, when there is already the development of fibrosis, the sonographic findings include changes that were observed in the animals reported here, such as irregular margins and hyperechogenicity of the renal parenchyma with marked loss of corticomedullary definition[2] and a decrease in their dimensions,[3] indicating an unfavorable prognosis. Renal mineralizations that are usually present in senile animals were observed in all animals reported, despite being young.[4] The perinephric fluid identified in one animal possibly represents a transudate since it was anechogenic. However, this finding is not specific and may be observed associated to several kidney diseases.[4] Renal cysts were also seen in two animals, although not characteristic, they are often associated with renal dysplasia in humans too.[5]
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CERVICAL ULTRASONOGRAPHY IN A DOG WITH BILATERAL ACUTE SUPPURATIVE SIALADENITIS OF THE MANDIBULAR GLANDS

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Introduction:
Sialadenitis is a rare disease in small animals, which has a number of potential causes. Infectious agents may be involved in cases with suppurative disease.[1]
Aim:
In this report, we describe the cervical ultrasonographic findings in a dog diagnosed with bilateral acute suppurative sialadenitis of the mandibular glands.
Case Report:
A 7 year-old male mixed-breed dog presented with bilateral swelling of the submandibular region. Cervical ultrasonography was performed which showed an increase in the size of mandibular lymph nodes and a decrease in echogenicity. The mandibular salivary glands had a slightly heterogeneous echotexture and decreased echogenicity. The medial aspect of the right mandibular salivary gland contained an anechoic, poorly defined area, measuring approximately 0.65 cm in diameter. A hypoechoic linear structure measuring 0.14 cm diameter was identified extending from the ventral aspect of each mandibular salivary gland to the mandibular bone, which was consistent with salivary duct. Ultrasound-guided fine needle aspiration of the mandibular salivary glands was performed. Cytological examination was consistent with suppurative sialadenitis.
Discussion:
In cases of acute sialadenitis, the salivary glands may show decreased echogenicity and a heterogeneous echotexture on ultrasonographic examination, which is likely to be the result of edema. The salivary ducts may also be identified if they are distended with suppurative material. Variably well-defined anechoic areas are suggestive of the presence of abscesses.[2] In sialadenitis cases, the lymph nodes may also be enlarged, rounded, and have reduced echogenicity due to a secondary lymphadenopathy.[3] In this patient, ultrasonography contributed to the diagnosis of suppurative sialadenitis. Based on its accessibility, reliability, and cost,[4] ultrasonography should always be considered in the suspected cases.
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INTRAPARENCHYMAL AND INTRAVENTRICULAR CEREBRAL HEMORRHAGE IN COMPUTED TOMOGRAPHY OF A DEER (OZOTOCEROS BEZOARTICUS)

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Introduction:
Intracranial hemorrhage, verified most commonly in the intraparenchymal form,[3] can be easily diagnosed by computed tomography (CT).[1]
Aim:
In this case report, we describe the CT findings of a deer diagnosed with intraparenchymal and intraventricular hemorrhage.
Case Report:
An adult male deer (Ozotoceros bezoarticus) underwent a brain CT due to a head injury suspect. In the CT, images were observed with a hyperdense area (60 HU) showing a well-defined and irregular limits and a mild peripheral contrast enhancement in cortical and subcortical left parietal lobe, indicating a cerebral intraparenchymal hemorrhage. In the CT image was also identified an intraventricular hemorrhage since a hyperdense content was observed therein. In its surroundings, there was a hypodense area with ill-defined and irregular limits, indicating a perilesional edema. A mass effect, represented by the deviation of the cerebri falx and ventricles, was also identified on CT images. The animal was later euthanized and submitted to a necropsy, which confirmed the diagnosis.
Discussion:
The intracranial hemorrhage in the acute phase is easily recognizable due to the great ability of radiation attenuation by globin and fibrin.[2] In this stage, the hemorrhagic area appears as a hyperdense image[2] with an attenuation value, in Hounsfield units (HU), between 55 and 95 by Tidwell et al.[4] and 60 to 80.[2] In the subacute phase there is a reduction of the density of the hematoma that usually presents the attenuation value ranging from 40 to 60 HU.[4] The attenuation values of the intraparenchymal and intraventricular hematomas areas found in deer are within the parameters for the acute and subacute phases.[4] However, the contrast enhancement in the parenchymal lesion suggests it was in the subacute phase since the contrast capitation is not seen during the acute phase due to the reduced blood perfusion.[3,4] Secondarily to injury of blood capillaries or ischemic necrosis, there is edema formation, seen as a hypodense area, which associated with the hematoma, result in a mass effect, represented by the displacement of brain structures.[4]
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THORACIC RADIOGRAPHIC AND TOMOGRAPHIC IMAGING OF A FELINE DIAGNOSED WITH LYMPHOCYTIC INTERSTITIAL PNEUMONIA

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Introduction:
A diffuse proliferation of lymphocytes and plasm cells in the pulmonary parenchymal interstitium characterizes a lymphocytic interstitial pneumonia,[4] a disease that affects individuals with autoimmune diseases.[1]
Aim:
In this case report, we describe the radiographic and computed tomographic (CT) findings of a feline diagnosed with lymphocytic interstitial pneumonia.
Materials and Methods:
A 14-year-old mixed breed male cat with dyspnea and appetite loss underwent thoracic radiography. In order to allow a more detailed assessment of this region, a CT scan was later performed.
Results:
The thoracic radiographs revealed a reticular interstitial lung pattern. Several cystic air spaces, which had their dimensions markedly increased in an 11-months period, were verified in the ventral portion of lung lobes. In the CT images, ground-glass opacities, centrilobular, and subpleural nodules, cystic air spaces and thickening of bronchovascular bundles and interlobular septa were identified.
Discussion:
Lymphocytic interstitial pneumonia is an uncommon nonneoplastic inflammatory reaction. Humans affected by this disorder often have immunosuppressive diseases such as Sjögren's or acquired immunodeficiency (AIDS) syndromes.[1] In the animal reported, an infection by feline immunodeficiency virus, the causative agent of feline AIDS, was not confirmed, however it was suspected. Patients affected by this disease usually demonstrate a nonspecific

pulmonary opacification represented by a reticular or nodular interstitial pattern in the radiographic examination,[2] as identified in the animal of this case report. The most common CT findings in humans diagnosed with lymphocytic interstitial pneumonia are ground-glass opacities, centrilobular, and subpleural nodules, thickening of bronchovascular bundles and interlobular septa, and cystic airspaces[3] (formed from a partial obstruction of airways due to a cellular peribronchiolar infiltration)[3], all of them identified in this case report. A lymph node enlargement, commonly verified in the patients affected, and other alterations that occasionally can be visualized, such as consolidation, emphysema, honeycombing, and pleural thickening, were not observed in the animal reported.[4]

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STANDARD AND GRAY-SCALE REVERSED ALGORITHMS IN THE DIAGNOSIS OF NODULAR INTERSTITIAL PATTERN

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Introduction:
Despite recent advances in cross-sectional imaging of the thorax, thoracic radiographs remain one of the most common exams performed in small animal practice.[1] Further studies with digital radiography in veterinary medicine are necessary to show the benefits of the different algorithms.[1–4]

Aim:
Evaluate the effectiveness of the gray-scale reversed filter (GSRF) for nodular interstitial pattern detection in dogs.

Materials and Methods:
A retrospective evaluation of 23 randomized sets of computed radiographs was performed by two veterinary radiologists and two small animal residents individually. A consensus by two experienced veterinary radiologists was reached in order to select the template for normal and nodular interstitial patterns. Pulmonary nodules were detected in radiographs of 5 of 23 dogs. Two reviewers evaluated each set of three-view thoracic radiographs first in a standard display mode (SD) and then in GSRF. The two others evaluated first in GSRF and after in SD. The observers evaluated all set of images in both display modes consecutively (SD + GSRF) and scored these filters as sc0 = unsatisfactory/sc1 = satisfactory/sc2 = great. The average of sensitivity (Sn), specificity (Sp), and the agreement (determined via a κ statistic) of all observers for each display mode and their association were calculated.

Results and Discussion:
The highest average of sensitivity and specificity was found in the association of SD + GSRF (Sn = 100, Sp = 90%), followed by GSRF (Sn = 90%, Sp = 87,5%) and SD (Sn = 85% e Sp = 86%), suggesting that the combination of filters may reduce the false positives and increase of true negatives results. SD showed an average of moderate agreement (k = 0.6), GSRF and SD + GSRF, substantial agreement (k = 0.7 and k = 0.8, respectively). The means of the score percentage for the filters SD and GSRF were 77% sc2, 23% sc1, and 56% sc2, 40% sc1, 3% sc0, respectively. These results may reflect the experience and ability of the radiologist in analyze images in SD and a lack of familiarity with new algorithms although; GSRF was classified as great in 56% and satisfactory in 40% of images.

Conclusions:
The use of both filters consecutively to detect the nodular interstitial pattern showed better results increasing the radiologist performance.

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SEVERE SUBAORTIC STENOSIS IN A PINSCHER PUPPY: ECHOCARDIOGRAPHIC AND RADIOGRAPHIC FINDINGS

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Introduction:
Subaortic stenosis is the most common congenital heart defect of large-breed dogs, particularly in Newfoundland,[1] and is characterized by a fibrous (nodule, band, or annulus) narrowing of the left ventricular outflow tract.[2] Is suggested to be an acquired disease based on a congenital or genetic predisposition and has unclear, but probably multifactorial, aetiology.[3] The present authors have not found any case reports describing a severe form in puppies during the first three months of life.[4]

Aim:
This case report aims to describe echocardiographic and radiographic images in a very young small breed puppy as well as underscoring the importance of imaging diagnosis in the detection of the disease.

Case Report:
A 3-month-old male pinscher was referred to Veterinary Hospital of this institution presented with respiratory distress, cough and a grade four of five murmur of mitral and tricuspid valves. At thoracic radiography, a global enlarged cardiac silhouette could be seen. Echocardiographic examination was carried out and right parasternal long-axis view revealed a narrowing of the left ventricle outflow tract with poststenotic aortic dilation. Fibrous tissue also was seen on short axis view. Color flow Doppler of the same transducer orientation and at apical five-chamber left paraesternal position demonstrated a region of flow acceleration proximal to the obstructive level and turbulent flow with increased velocity distally. Other findings as concentric hypertrophy of the left ventricle, increase in subendocardial echogenicity (probably from myocardial ischemia and fibrosis) and mitral valve flutter (probably from volume overload on left ventricle) with enlarged left atrium were visualized and suggested severe obstruction.

Conclusion:
Usually, electrocardiography and radiography are unrevealing in this disorder. Doppler echocardiography may be the best diagnostic tool to detect even mild cases of aortic stenosis[1] allowing an accurate prognosis and, where possible, surgical correction.[5] Although the clinical findings of this disease occurs more commonly in mature large-breed dogs, it should be considered as a differential diagnosis even in suspicion of congenital heart disease in small-breeds during the first 3 months of age.

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OSTEOMYELITIS IN A LABRADOR RETRIEVER DOG WITH ASPERGILLOSIS: RADIOGRAPHIC AND TOMOGRAPHIC FINDINGS

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Introduction:
Canine aspergillosis is mostly restricted to upper respiratory tract, particularly the nasal cavity, and most commonly caued by Aspergillus fumigatus.[3] Systemic aspergillosis is a rare condition.[1] A hereditary immune defect might cooperate to pathogenesis.[2] Most dogs with disseminated aspergillosis had bone lesions as much in axial appendicular as in skeleton.[3]

Aim:
Tomographic findings of aspergillus osteomyelitis in appendicular skeleton is rarely described.

Case Report:
A female, 7-year-old Labrador Retriever was referred to Veterinary Hospital with a clinical history of relapsing lameness, cachexia, intermittent pyrexia, and muscular atrophy of the limbs. On bilateral humerus and femur radiographs and CT, all limbs were affected, with lesions in proximal metaphysis of the left humerus: aggressive proliferative periosteal reaction with subperiosteal elevation (Codman triangle) and medullary and cortical destruction in caudal face associated with osteolytic areas. Left and right femurs had slightly lucent areas, with mild periosteal reaction in left femur. Definitive diagnosis was made by cytology of bone content: biopsy material contained birefringent structures with septations consistent with fungus (*Aspergillus* spp.). At PAS, special staining structures consistent with fungus became apparent.

Conclusion:
The characteristic radiographic and tomographic features of canine appendicular skeleton were consistent with fungal osteomyelitis and neoplasia. The disseminated distribution of lesions in skeletal system suggested the first diagnosis, which was confirmed by cytology. Despite the importance of radiographs to visualize bone destruction and proliferation, CT is superior due to its ability to produce multiple tomographic slices that avoid superimposing structures and to define the extension of lesions into adjacent structures.

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CT FEATURES OF METACARPO (TARSO) PHALANGEAL JOINT PATHOLOGY IN LAME HORSES (31 CASES: 2010–2011)

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Introduction:
Metacarpo(tarso)phalangeal join (MC(T)PJ) pathology can have a significant effect on the use and athletic competitiveness of a horse. Several ex vivo studies compared findings (including contrast arthrography) with different image modalities (radiography, computed tomography (CT) and magnetic resonance imaging (MRI) in racehorses. Although CT is routinely used worldwide to assess MC(T)PJ pathology in sporthorses, published data is lacking. This study describes MC(T)PJ pathology findings with CT and CT-arthrography in a referral hospital population of lame sporthorses.
Material and Methods:
Thirty-one warmblood sporthorses with MCPJ ($n = 24$) and MTPJ ($n = 7$) lameness (based on clinical examination, diagnostic anesthesia, radiographs and ultrasound) were evaluated. Overlapping 2.5 mm images were made while the horses were positioned in lateral recumbancy in a 4 slice helical CT scanner. An arthrogram, with nonionic, iodinated contrast medium, was performed in 19 horses (MCPJ $n = 15$; MTPJ $n = 4$).
Results:
Subchondral bone pathology (SCBP) (lysis and/or sclerosis) was identified in 26 joints. In 19 joints, the subchondral pathology was present in the third metacarpal –metatarsal condyles. Seveteen joints had osseous abnormalities of the proximal phalanges and one had lysis of the proxmal sesamoid bones. Other lesions included periarticular osteophytes (29), central osteophytes (4), supracondylar lysis (7), osseous fragments (7), proximal phalangeal fissures (8), and a condylar fissure (1). Arthrography identified cartilage lesions in 10 cases.
Discussion/Conclusion:
Fetlock joint disease is an important diagnosis in equine lameness practice. Sport horses, although less well described than thoroughbreds, demonstrate a wide range of metacarpo (-tarso) phalangeal joint pathology that can be detected with CT and CT arthrography. In addition to periarticular changes associated with joint disease (osteophytes, supracondylar lysis), subchondral bone pathology was a common and very important finding. Arthrography further enhanced the diagnostic technique by identifying cartilage lesions within the joint. This study documents the use of CT and CT arthrography for evaluation of fetlock lameness in sport horses.
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INTRACAROTID CONTRAST-ENHANCED COMPUTED TOMOGRAPHY OF THE EQUINE HEAD

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Introduction:
Contrast media is widely accepted and used in computed tomography (CT) imaging of the brain and skull. Intra-arterial delivery to the equine foot during scanning aids characterization of soft tissue lesions. Although CT is useful for skull disorders, it has low sensitivity for identifying inflammatory and parenchymal brain lesions. A technique for timely delivery of contrast media could be useful to better characterize lesions of the equine head.
Aim:
This study describes a technique for the delivery of contrast medium to the equine head via the carotid arteries.
Material and Methods:
Seven horses with disease of the skull or brain were evaluated in dorsal recumbency under general anesthesia. Ultrasound guided (7.5–10 mHz linear probe) catheterization (14 gauge $\times$ 80 mm catheter) of both ($n = 6$) or one carotid artery ($n = 1$) was performed in the mid to caudal neck after aseptic preparation. The catheters were attached via prefilled extension sets to two pressure injectors holding 180 ml non-ionic iodinated contrast media (350 mg I/ml, corresponding to a dose of 230 mgI/kg). A precontrast study obtaining 1.3 mm contiguous images was made prior to injection and repeated during an infusion of 2 ml/se of contrast media. The scan extended from the second cervical vertebra to the nose. The catheters were removed and a pressure bandage was sutured over the injection sites. Assisted recovery was performed for all horses. The horses were monitored for 24 h for any complications and the bandages were removed after this period.
Results:
Carotid catheterization was successful in all horses. Mild unilateral haematoma formation occured in two horses and was managed medically. No other complications were noted. Contrast images were high quality and aided in the characterization of regional lesions.
Discussion/Conclusion:
Intracarotid contrast administration resulted in diagnostic high quality studies without major complications. This technique provides an additional means of evaluating the brain and soft tissues of the equine head. Further investigation to validate this technique is necessary.
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DESMOPATHY OF THE PROXIMAL SUSPENSORY LIGAMENT IN DIFFERENT IMAGE MODALITIES AND POST MORTEM FINDINGS – A CASE REPORT

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Introduction:
Proximal palmar metacarpal pain occurs frequently in horses. For detailed characterization of underlying conditions use of radiography, ultrasonography, nuclear scintigraphy, magnetic resonance imaging (MRI), and computed tomography (CT) has been described.[1–3]
Aim:
To describe a case of a histological confirmed desmopathy of the proximal suspensory ligament (PSL) with metacarpal bone involvement by using different image modalities.
Materials and Methods:
A 16-year-old Hanoverian gelding with a left forelimb lameness of 2 months duration was subjected to scintigraphy. Radiographs were taken. Postmortem CT, MRI, ultrasonography, and histological examinations were performed.
Results and Discussion:
Scintigraphy located the cause of lameness in the proximal metacarpal region. A radiolucent area with a thin sclerotic rim was found in this region on radiographs. Ultrasonography revealed asymmetric enlargement of the PSL with loss of longitudinal fibre pattern and hypo-to-anechoic areas and an irregularity of the palmar metacarpus. On MRI, the medial branch of the PSL showed decreased signal intensity also involving the embedded muscle-fat-bundle and enlargement with absence of connective tissue between the PSL and the palmar metacarpus. CT soft tissue window revealed the same findings, but also a small cortical fracture of the medial part of the proximal metacarpus in bone window. Postmortem histological examinations confirmed the diagnosis of a chronic desmopathy with granulation tissue formation of the PSL and the cortical fracture.
Conclusion:
When desmopathies are combined with avulsion fractures, CT-examinations are able to precisely reveal both lesions, extend of soft tissue damage, and possible underlying bone injury.
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COMPUTED TOMOGRAPHY OF INCIDENTAL AND NONINCIDENTAL THYROID LESIONS IN DOGS

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Introduction:
Thyroid cancer accounts for 1 to 4% of all neoplasms diagnosed in dogs. Clinical detectable carcinomas have a high rate of metastasis at the time of diagnosis. Small benign or malignant thyroid masses in dogs remain unnoticed on physical examination and are incidentally discovered during imaging procedures.[1–3]
Aim:
To determine the CT characteristics of incidental and nonincidental thyroid lesions in dogs and to assess the accuracy of computed tomography (CT) in the differentiation of benign from malignant thyroid lesions as compared with pathology.
Materials and Methods:
In a prospective study, the thyroid region of dogs underwent 16-multidetector CT examination between August 2008 and March 2011 was routinely investigated. Dogs with thyroid masses on CT subsequently underwent diagnostic fine needle aspiration or biopsy. Thyroid mass location, shape, appearance, volume, mineralization, enhancement, vascularity were always recorded, as well as the presence of ectopic thyroid tissue, vascular invasion, involvement of surrounding structures, lymph nodes enlargement, and distant metastases. Mann–Whitney and the χ^2 tests were used to analyze the data (P-value set at <0.05).
Results:
A total of 1409 dogs were included in the study. Forty-four dogs had mono/bilateral thyroid lesions with a prevalence of 3.12% (44/1409) (95% confidence interval [CI], 2.21–4.03). The prevalence of thyroid incidentalomas was 1.63% (23/1409) (95% confidence interval [CI], 0.97–2.29). Of the 48 masses analyzed, 42 were malignant and 6 were benign lesions. Among the CT characteristics, an ovoid or irregular shape, large size, inhomogenous enhancement, and vascularity of the mass resulted significantly related to the malignancy ($P < 0.05$). Although not statistical significant, mineralizations, invasion of adjacent structures of the neck, lymphnodes enlargement, and distant metastasis, were typical of malignant

lesions. Based on the findings of this preliminary study, more than 50% of the thyroid masses are incidentally discovered. Most of thyroid masses in dogs are malignant.
Conclusion:
CT is a useful tool for distinguishing between benign and malignant thyroid lesions in dogs and is essential to assess the local invasiveness of the tumor, ectopic thyroid tissue, lymphnodes, and distant metastasis.
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COMPUTED TOMOGRAPHY, LOW-FIELD MAGNETIC RESONANCE IMAGING AND CROSS-SECTIONAL ANATOMY OF HEALTHY BEARDED DRAGON (POGONA VITTICEPS)

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Introduction:
In literature there are many studies about reptiles anatomy[1–3] and computed tomography,[4] but no anatomical studies on individual species with a significant number of subjects.
Aim:
To provide a detailed anatomical description of the Bearded Dragon by using computed tomography (CT), cone beam CT (CBCT), and low-field magnetic resonance imaging (MRI), and to compare it with a compilation of corresponding gross anatomical sections.
Materials and Methods:
Ten adult clinically normal Bearded Dragons, anesthetized for reasons not connected to our study, were examined with single slice CT scanner (PQ2000S Philips MD S.p.A., Monza, Italy), Cone Beam CT (NewTom 5G, NewTom QR S.R.L., Verona, Italy), and low-field MRI (0,18 T, Vet-MR Esaote S.p.A., Genova, Italy). Each subject was positioned in ventral recumbency with its head and neck extended; CT and CBCT studies were executed during the same anesthesia session. In CT study, 3 mm-thick slices were acquired in transversal plane, with hard and soft convolution filter. For CBTC study, volumetric data was acquired and reprocessed to obtain transverse, sagittal, and dorsal 0.75 mm-thick images. For MRI study, the same Bearded Dragons were positioned inside a volumetric coil; transverse, sagittal, and dorsal 3-mm-thick T1, T2, and Gradient Echo T1-weighted images were acquired. Three dead Bearded Dragons, euthanatized for reasons not connected to our study, were positioned and frozen in an ice block at -14°C until solid, and then sectioned at 6-mm-thick intervals with an electric band saw, using the same section planes applied in the imaging studies. Slab sections were then immediately cleaned and photographed. For each cutting plane we gained a good overlap between sections obtained at the same level with the different techniques. The bone window CT images and the CBCT images provided good anatomic detail of hard structures, as did Gradient Echo T1-weighted acquisition. Soft tissue structures were well evaluated with T1- and T2-weighted images, providing detailed information regarding parenchymal organs and central nervous system.
Conclusion:
Results of this study can be used as an anatomical guide for evaluating Bearded Dragon with CT, CBCT, and MRI in practice.
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COMPUTED TOMOGRAPHY AND HISTOPATHOLOGY OF PRIMARY LUNG TUMORS IN DOGS: A RETROSPECTIVE STUDY

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Introduction:
Primary lung tumors (LT) are rare in dogs, but the reported incidence has recently increased. Most canine primary LT are malignant and are most often adeno- or bronchioalveolar carcinomas. Surgical excision is the treatment of choice, so precise preoperative tumor staging is important. Mean survival for operable solitary, well-differentiated, primary LT without node involvement is 15–26 mo. Regional lymph node metastasis or the presence of regional pulmonary metastasis at initial diagnosis significantly reduces survival time. Computed tomography (CT) has been shown to be the best diagnostic modality to detect primary lung tumors and to assess regional lung and lymph node metastasis.
Aim:
To characterize thoracic CT features of dogs with primary LT and correlate those with histological or cytological diagnosis.
Material and Methods:
Clinical signalment and CT images of 80 dogs with confirmed primary LT were retrospectively evaluated. Primary tumor size, morphology, and location were defined as was presence of regional pulmonary or lymph node metastasis. CT findings were correlated with histological or cytological findings.
Results:
LT were classified as papillary carcinoma (21), bronchioloalveolar carcinoma (18), adenocarcinoma (16), histiocytic carcinoma (5), adenosquamous carcinoma (4), basaloid carcinoma (1), and B-cell lymphoma (1). Regional pulmonary metastasis was present in 22 dogs and lymph node enlargement was detected in nine dogs. CT enabled a precise description of the tumor, pulmonary metastasis, and lymph node enlargement but CT features were not specific enough to accurately determine histological diagnosis.
Discussion/Conclusion:
CT enables excellent preoperative tumor staging of primary LT but not for histological diagnosis.
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DILATATION OF THE PANCREATIC DUCT AS AN ULTRASONOGRAPHIC SIGN OF FELINE PANCREATITIS

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Introduction:
The feline pancreatic duct is identified ultrasonographically as an anechoic 0.5–2.5 mm tube within the pancreas. The diameter of the pancreatic duct increases with age but no correlation has been previously found between increased diameter and pancreatic disease diagnosed by feline trypsin-like immunoreactivity (fTLI). Serum feline pancreatic lipase immunoreactivity (fPLI) determination has proved to be the most sensitive and specific indicator for pancreatitis in cats and is currently the most useful test for the diagnosis of this disease.
Aim:
The aim of this study was to retrospectively evaluate whether cats with an ultrasonographic dilatation $\geq$ 2.5 mm of the pancreatic duct had elevated serum fPLI levels.
Materials and Methods:
Nine cats with an ultrasonographically pancreatic duct $\geq$ 2.5 mm with an fPLI determination were included. Other ultrasonographic abnormalities were also recorded. Clinical history, physical examination, hematological and biochemical results, treatment, and outcome were reviewed.
Results:
Seven of the nine cats included in the study had a low (5.7 μg/l) to severe (49 μg/l) increase of fPLI (laboratory reference range $>$ 5.3 μg/l compatible with pancreatitis). In two of them pancreatitis was confirmed histopathologically. Two cats had normal fPLI levels ($<$3.6 μg/l). Pancreatic duct diameter ranged between 2.5 and 5.2 mm. In eight patients ultrasonography revealed hepatobiliary, gastrointestinal, and/or renal changes besides pancreatic findings.
Discussion:
In humans pancreatic duct diameter increases with age and in cases of pancreatitis. Recent studies have shown that pancreatitis has a high incidence in cats and has been underdiagnosed due to the low clinical suspicion. Our results may indicate that pancreatic duct dilatation may appear as an ultrasonographic sign of feline pancreatitis and that it may be advisable to determine fPLI levels when detected. Evidence of other ultrasonographic findings that might explain the clinical signs should not warrant the suspicion of pancreatitis, as concurrent disease is common.
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CONTRIBUTION OF THE CT VITUAL ENDOSCOPY ON DETECTION OF INTERVERTEBRAL DISK DISEASE

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Introduction:
Intervertebral disk disease is a common neurological problem of dogs.[2] Disk disease can result in extrusion (Hansen's type I lesion, commonly in nonchondrodystrophoid breeds of dog) or protrusion (Hansen's type II lesion, typically in small-breed, particularly chondrodystrophic dogs) of disk material into the spinal canal resulting in cord compression.[1] Most dogs with intervertebral disk disease presents with pain and paralysis.[3] Diagnosis is made by radiography, computed tomography (CT), or MRI. A recent technique, CT virtual endoscopy allows the radiologist to position the point of view inside any structure that has been imaged with CT, and then travel down the structure.
Aim:
To describe the adaptation of CT virtual endoscopy for diagnosis of protrusion and extrusion of disks.

Methods:
CT was performed on 12 dogs with clinical signs of intervertebral disk disease, followed by CT virtual endoscopy and the findings compared.
Results:
In all animals, both conventional CT and CT virtual endoscopy were conclusive. However, CT virtual endoscopy indicated more precisely the extension of the lesion.
Discussion and Conclusion:
One of the biggest advantages of CT virtual endoscopy is that this exam can predict the extension of the lesion better than CT, because the image is analyzed as a three-dimensional image. The surgeons can better plan the procedure and so, have better indicators for predicting the prognosis of the patient.
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ULTRASONOGRAPHIC ELASTOGRAPHY IMPROVES EARLY DETECTION OF HEPATOCELLULAR CARCINOMA IN AN EXPERIMENTAL MODEL OF NONALCOHOLIC STEATOHEPATITIS

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Introduction:
Early detection of focal hepatic lesions is a challenge for ultrasound scanning and becomes even greater in the presence of a diffuse parenchymal disease. Elastography has emerged as a new method to evaluate stiffness of focal lesions and promises to differentiate their malignancy.
Aims:
This study aimed to evaluate the diagnostic performance of ultrasonographic elastography for early detection of malignant hepatic nodules in an experimental rat model of nonalcoholic steatohepatitis (NASH).
Material and Methods:
B-mode and Doppler ultrasonography was performed weekly in 40 experimental rats, divided in nonalcoholic steatohepatitis ($n = 30$) and rats without liver disease (controls; $n = 10$). Animals with NASH developed focal liver lesions with suggestive malignancy. These animals underwent elastography, euthanized, and liver nodules were assessment by histopathology. Tissue stiffness of the nodules on elastography was classified in negative (elastic strain) or positive (hard and no strain) comparing with surrounding liver parenchyma.
Results and Discussion:
Elastograms of positive lesions showed area of high stiffness, which were indicative of malignancy confirmed on histology evaluation, with sensitivity of 90% and specificity of 60%. Pathological changes are generally correlated with changes in tissue stiffness as well. The echogenicity and the mechanical attributes of tissue are generally uncorrelated. In many cases, in spite of the difference in stiffness or mobility, the small size of a pathological lesion and/or its location deep in the body difficult its detection. Moreover, lesions may or may not possess echogenic attributes that make them detectable. Elastography presented high sensitivity and specificity in this research.
Conclusions:
Elastography allows making right diagnosis with high accuracy of well to moderately differentiated hepatocellular carcinomas in an experimental rat model of NASH. Elastography provided promising perspectives for the assessment of malignancy of focal hepatic lesions.
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DOPPLER ASSESSMENT OF HEPATIC VEINS IN OBESE DOGS WITH FATTY LIVER DISEASE AND COMPARISON WITH A RODENT MODEL

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Introduction:
Some conditions can alter waveform of hepatic veins (HV) in dogs and cats.[1,2] Obesity is increasingly encountered in pets.[3] No prior studies have focused on the effect of fatty liver infiltration on the HV Doppler waveform in a model of nonalcoholic fatty liver disease (NAFLD) or obese dogs.
Aim:
To study the progressive effects of fatty liver infiltration on HV Doppler waveform in rodents and compare with clinical cases of obese dogs with diffuse NAFLD.
Material and Methods:
NAFLD was induced in 100 adult isogenic rats by a choline-deficient high-fat diet and examined weekly by ultrasonography during 10 weeks (experimental group). At each 4 weeks, in order to follow the development of the NAFLD, a rat was euthanatized and the liver was assessed at histology. In a clinical group, 15 obese dogs were selected by ultrasonography for liver steatosis and underwent hepatic biopsies. Control group consisted by 10 healthy dogs. Endocrinopathies, cardiac diseases and chronic hepatic diseases were excluded by clinical and biochemical findings in all dogs. B-mode fatty infiltration was classified: (0) normal liver, (1) discrete, (2) moderate and (3) severe fatty infiltration of the liver, corresponding to increasing degrees of hepatic echogenicity with poorer visualization of HV and diaphragm. Also quantitative assessment of liver echogenicity by histogram was performed. The Doppler sonography spectrum of HV was classified into three groups: normal or triphasic waveform,[4] biphasic waveform, and monophasic or flat waveform.
Results and Discussion:
There was a statistically significant difference in the waveform of HV flow between clinical and control groups. The Doppler flow pattern in the right hepatic vein was triphasic in 6/15 (40%), biphasic in 5/15 (34%), and monophasic in 4/15 (26%) obese dogs with steatosis. Control group of dogs presented triphasic in 70% and biphasic in 30% dogs. Both clinical group and experimental group presented an inverse correlation between the sonographic grade of liver fatty infiltration and the phasicity of hepatic venous flow.
Conclusion:
Obese dogs with fatty infiltration of liver presented abnormal right HV Doppler waveform and proportional to hepatic steatosis severity.
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QUANTIFICATION OF EXPERIMENTAL LIVER FIBROSIS WITH A NOVEL ALGORITHM METHOD BASED ON STATISTICAL ANALYSIS OF SIGNALS

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Introduction:
Evaluation of liver fibrosis is important in the diagnosis, management and prognosis of patients with chronic hepatic diseases. Conventional ultrasound imaging is sensitive to detect changes in the acoustic properties of tissues that affect their texture. However, it is difficult to detect mild diffuse liver disease and follow-up patients with chronic liver diseases. It is known that diffuse liver diseases have variable subjective sonographic results. Pathologic results on fibrosis liver samples do not always accurately represent the fibrosis grade of the entire organ.
Aim:
To evaluate the development of liver fibrosis in an experimental model by use of a novel method to quantify the homogeneity of the tissue texture on B-mode images.
Materials and Methods:
A prospective study was performed in 20 adult isogenic rats divided into two groups, control and experimental. A model of progressive injury as seen in severe forms of chronic liver diseases was induced in the experimental group with 13–15 mg/day diethylnitrosamine in the drinking water. In both groups, scans were performed weekly at the same regions of interest (ROI) for 6 weeks. A commercially available acoustic structure quantification software (ASQ) was used to calculate the value of each ROI of all animals. Degree of fibrosis development was classified according to the literature from histological samples.
Results:
The average of the values at ROI 1 was 150.30 (SD $\pm$ 37.21) for normal animals, and was 60.40 (SD $\pm$ 28.97) for rats with fibrosis grade F3, and 44.72 (SD $\pm$ 33.23) for those with fibrosis grade F4 at 6th week. A significant increase ($P < 0.0001$) in the median peak C^2m histogram value was observed according to stage of the progress of fibrosis grade.
Discussion:
A significant increase in the median peak C^2m histogram value was observed, in concordance with the progress of fibrosis.
Conclusions:
Results with this B-mode based algorithm correlate well with fibrosis grade in this experimental model of hepatic fibrosis.
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SONOGRAPHIC ASSESSMENT OF DEEP VASCULAR THROMBOSIS IN DOGS

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Introduction:
Deep venous thrombosis (DVT) is a relatively common disease in humans, but rare in animals. This could be explained because of the form of the platelets, vascular anatomy, and blood flow in quadruped posture.[1,2] Vascular Doppler ultrasonography (US) allows a noninvasive assessment of the vessels, providing information about its anatomy, characteristics of flow and vascular calibers.[3] Currently Doppler US is considered the first choice test in human patients suspected to have TVP, because it is more cost effective than others.[4]
Aim
Evaluate the vascular Doppler US parameters for diagnosis of DVT in dogs.
Material and Methods:
A high-resolution transducer was used to perform US examinations (B-mode, color, and pulsed Doppler) between January 2010 and December 2011 in five selected patients (one female and four male dogs, of several breeds, with ages between 01 and 11 years), with clinical signs of DVT disease. The criteria evaluated through B-mode were ?(i) lumen deformity when compared with contra lateral vessel; (ii) echogenicity of the lumen suggesting thrombosis; (iii) unchanged of vessel diameter characterized by dynamic maneuvers, obtained with transducer in the suspected area (transversal section) and doing a light pressure with the transducer over the region. The criteria evaluated through color and pulsed Doppler were (i) presence of aliasing; (ii) presence of collateral vessels; (iii) significant difference of velocity of blood flow when comparing normal and affected vessels.
Results and Discussion:
All dogs had peripheral DVT (four in pelvic members and one in the thoracic). In order to define the best parameters, we evaluated sensitivity and specificity for each criterion. We found that changes of vessel caliber and/or deformity of the lumen were the best criteria in B-mode. All parameters together with Doppler information improved sensitivity and specificity values obtained. We also found others useful parameters: the presence of collateral vessels (tortuous and anomalous) adjacent to the point of venous occlusion (revascularization) and loss of valve's wall movement distal to the point.
Conclusions:
A combination of parameters could be used to provide the best sensitivity and specificity values to produce conclusive diagnosis of DVT.
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EVALUATION OF RADIOGRAPHIC FINDINGS IN NORMAL COWS AND COWS WITH LAMINITIS

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Introduction:
It is suggested that most claw diseases causing lameness in cows are related to laminitis.[2] Although there are some visible changes in claws with subclinical or clinic laminitis, determination of the real prevalence of laminitis is difficult.[1,2] Radiography provides valuable information confirming diagnosis, determining prognosis and to follow up dynamic changes of laminitis.[1–3]
Aim:
The aim of this study was to evaluate radiographical findings in normal and laminitic bovine claws and to find out if any differences are significant.
Materials and Methods:
Claws of 60 animals ($n = 480$) provided from the slaughterhouse (experimental study), and claws of 20 dairy cows (field study) suspicious of laminitis ($n = 160$) were enrolled for the study. Claws were examined clinically, radiographically (all groups) and histopathologically (Groups 1–3). According to histopathological diagnosis claws were classified with respect to laminitis as "affected claws" – group 1," "unaffected claws" of cows with laminitis in other claws—group 2" and "completely sound"—group 3. Animals in the field study with visible signs of subclinical laminitis comprised group 4. The distribution of radiographic findings in healthy and laminitic claws was evaluated and the accuracy of radiographic examination in diagnosing laminitis was determined. Findings were evaluated as "related to laminitis" and "not related to laminitis".
Results:
Most radiographic changes occurred in group 3 with sound cows. Most encountered radiographic finding known as not related to laminitis in group 1, 2, and 3 ($n = 39$, $n = 79$, $n = 115$, respectively) were osteophytes on the axial site of the pedal bone (P3). The most encountered radiographic finding related to laminitis in group 1, 2, and 3 ($n = 22$, $n = 56$, $n = 71$, respectively) was inactive solar osteitis of P3. Inactive solar osteitis ($n = 51$) and "ski jump" sign ($n = 14$) were the most common findings in group 4. "Ski jump" did not occur in any other group.
Discussion/Conclusion:
The radiographic findings related to laminitis are not always compatible with histopathologic diagnosis. Sound cows might have suffered laminitis before and recovered afterwards or histopathological criteria mentioned in the literature maybe inaccurate to diagnose laminitis in cows.
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TRANSCRANIAL ULTRASONOGRAPHY IN HEALTHY DOGS: TECHNIQUE STANDARDIZATION AND ANATOMIC DESCRIPTION

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Introduction:
Transcranial ultrasonography (TCUS) has the advantage of being a noninvasive and low-cost method when compared to Magnetic Resonance Imaging.[1,2] The temporal bone has been used as an acoustic window in TCUS in humans.[3,4]
Aim:
To correlate transcranial ultrasonographic images obtained through the temporal and occipital windows with healthy dog's encephalic anatomy, identifying the brain structures in the image and standardizing the technique.
Materials and Methods:
A total of 37 adult mongrel dogs weighting up to 10 kg: 30 animals in vivo and 7 cadavers. TCUS was performed using a microconvex transducer (4–7 MHz) initially positioned perpendicularly to the temporal bone to obtain a median dorsal plan, then rotated clockwise to obtain caudal dorsal-oblique planes and finally rotated counter-clockwise to obtain cranial dorsal-oblique planes. For the occipital window, longitudinal, dorsal, and dorsal-oblique planes were done. The cadaver's heads were sectioned according to the insonation angle and the sonographic images were correlated to the corresponding anatomical plane for identification and quantification of the brain structures visualized in the TCUS. Data analysis was accomplished by the nonparametric Wilcoxon test.
Results and Discussion:
The number of brain structures visualized in the TCUS in vivo, when compared to that observed in the anatomical planes of cadavers, had statistically significant ($P < 0.05$) differences between dorsal and caudal dorsal-oblique planes through the temporal window. Otherwise, it did not have significant differences ($P > 0.05$) for cranial dorsal-oblique planes through the temporal window and also for the planes visualized through the occipital window. In the dorsal and caudal dorsal-oblique planes the number of identified structures in the ultrasonographic images were lower ($P < 0.05$) than observed in the anatomical planes, due to significant attenuation of the ultrasound beam through the bone surface in the skull. However, it was possible to visualize some anatomic landmarks with good statistical agreement.
Conclusions:
TCUS was able to obtain detailed images with good definition to evaluating brains of dogs weighting up to 10 kg, without the need to anesthetize the patient.
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CRITICAL POINTS IN ULTRASONOGRAPHIC APPROACH TO THE DYSURIC DOG

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Introduction:
In dysuric dogs, ultrasound (US) allows evaluation of the urinary bladder and adjacent organs in order to determine the cause.
Aims:
To establish the relevant signs of the US examination in dogs with dysuria.
Methods:
US investigations were performed on 37 dogs with dysuria, of different age, sex: 26 males (70%) and 11 female (30%), breed: 18 from small breeds (49%), and 19 from large/giant breeds (51%). The causes were confirmed using classic ultrasound technique (and additional X-ray exams).
Results and Discussion:
The US examination confirmed the diagnosis of the cause of the dysuria, the main featured changes being related to the bladder`s topography and content, and adjacent structures. Eleven cases had US changes indicating paralysis: paralytic/hypotonic features correlated with the distension degree, content changes (corpuscular elements in suspension/sediment, stones, clots), wall thickness and uniformity and ratio of parietal layers.[1] Twenty-nine presented primary or secondary bladder changes (retention, hypotonia and inflammation), in 19 cases due to prostate diseases (of which were cysts in five cases, abscesses in three,

tumors in two, hypertrophy in nine), in eight cases due to bladder neoplasia (local in five and invasive in three cases), and in two cases urethral stones with urethral and bladder distension.[2] In the other eight cases the causes of dysuria were caused by neurological or spine lesions (X-ray diagnosed).

Conclusions:

US is a valuable method in revealing the bladder changes,[3] accuracy of their components, and visualization of adjacent organs, in confirming the diagnosis the cause of dysuria in dogs.

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PERITONEOPERICARDIAL HERNIA IN TWO DOGS

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Introduction:

Peritoneopericardial hernia is usually accompanied by abdominal organs herniation through a congenital hiatus inside the pericardial sac.[1,2] Hernia may be present at birth or it may be gained. Raised abdominal pressure may determine abdominal organs herniation through a congenital hiatus into the pericardial sac.[4] This affection may show respiratory clinical signs. Also it may be discovered later on at some other investigations. Ultrasound examinations or radiographs for some other affection may reveal peritoneopericarcial hernia.[3] The aim of this study is to present the radiological findings and relate them to the literature as peritoneopericardial hernia is a congenital defect.

Material and Methods:

Two dogs were brought at the radiological laboratory, both belonging to the Caniche breed, aged 4 months, males and siblings. One of them had respiratory clinical signs (dry cough, dyspnea worsen at effort). Surgery on both dogs confirmed the radiologic diagnose of peritonepericardial hernia. The dog with clinical signs was treated 7 days for a pulmonary infection without any signs of improvement. The dogs have been radiological investigated, both native and with contrast, before and after the surgical procedure, in lateral and ventrodorsal recumbency.

Results and Discussion:

When the first dog was X-rayed (without barium contrast) the small intestines were identified into the pericardial sac as a confluent silhouette. The stomach and the liver were behind the diaphragm into the abdominal cavity. This led to presumption of peritoneopercardial hernia. When barium contrast radiographs were performed they revealed that the whole small intestinal tract herniated into the pericardial sac while the stomach remained at its place (behind the diaphragm), so the diagnose was confirmed. The second dog was investigated after its sibling was diagnosed with this affection. Both X-rays, native and with barium contrast, revealed that the right hepatic lobe herniated into the pericardial sac. The stomach and the intestinal tract were identified behind the diaphragm. Surgical procedures were performed onto both dogs and confirmed the radiologic diagnose of peritonepericardial hernia. It must be mentioned that the offspring of these dogs did not have this disease.

Conclusions:

Native and contrast X-rays are good methods for diagnosing peritoneopericardial hernia. The young age and the same family origin, in these two cases is a subjective support for the hereditary character of the peritoneopericardial hernia.

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THORACIC CT FINDINGS IN CATS EXPERIMENTALLY INFECTED WITH AELUROSTRONGYLUS ABSTRUSUS

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Introduction:

Aelurostrongylus abstrusus is the most common feline pulmonary parasite.[1] The radiographic findings in affected cats have been described, however, there is only one article of thoracic CT features in naturally occurring aelurostrongylosis.[2]

Aim:

To characterize the pulmonary changes over time in cats with experimentally induced *A. abstrusus*, using Computed tomography (CT) and computed radiography (CR). The imaging results are compared to histopathology.

Materials and Methods:

Six healthy young cats were inoculated with low and high dose of *A. abstrusus.* CT was performed before inoculation, and both CT and CR at day 48 and 81 after inoculation. CT pre- and postcontrast, as well as CT angiography, was included. Radiographic criteria included presence, degree, and distribution of bronchial and pulmonary changes, presence of pleural disease, cardiovascular changes, and signs of lymphadenomegaly. From the CT images, the lungs were described according to a classification system previously reported.[3] Quantitative assessment of the bronchial dimensions and pulmonary artery caliber was performed on CT. Vessel tortuosity, luminal filling defects together with size, shape, and attenuation of the intrathoracic lymph nodes were noted. Histopathology of the accesory lung lobe and one tracheobronchial lymph node was done and compared with the imaging findings.

Results:

At day 0 no abnormalities were detected in the CT studies. At day 48 all radiographs but one showed generalized nodular interstitial patterns with bronchial component and high suspicion of tracheobronchial lymphadenomegaly. CT revealed mild subpleural thickening, nodules and unstructured interstitial changes, ground glass opacification and moderate bronchial thickening. CT confirmed the presence of lymphadenomegaly and no evidence of cardiovascular disease. In both modalities the changes were dose dependent. At day 81 the location of the nodules and unstructured interstitial changes varied mildly in comparison to the study at day 48.

The enlargement of the tracheobronchial lymph nodes was still statistically significant in comparision to day 48, but not as pronounced.

Discussion:

Experimental infection of cats with *A. abstrusus* causes infectious dose-dependent pulmonary nodular and unstructured changes, occasionally confluent to alveolar regions and regional lymphadenomegaly.[1,2]

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CT ASSESSMENT OF LUMBOSACRAL REGION IN DOGS AFFECTED BY CAUDA EQUINA SYNDROME

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Introduction:

Cauda equina syndrome (CES) is a neuropathy secondary to compression and reduced blood supply of the nerve roots at level of the lumbosacral junction (LSJ).[1] Computed tomography (CT) is one of the most commonly used methods for imaging of LSJ.

Aim:

Retrospective evaluation of CT images for the presence of bone and soft tissue changes in dogs with CES.

Materials and Methods:

Between 2006 and 2012, 72 dogs of different breeds, clinically diagnosed with CES underwent to CT exam. There were 50 males and 22 females, mean age 7.5 years and mean weight 31.2 kg. The exams were performed using two CT scanners on dogs under general anesthesia and in dorsal recumbency with LSJ in neutral, flexed, and extended position.[2,3] The evaluation of the CT studies was performed on transverse slices and on multiplanar reconstructions (MPR) using both bone and soft tissue windows.

Results:

The most frequent revealed lesions were spondylosis (72.2%), foraminal stenosis (55.6%), Hansen type II herniation or dorsal longitudinal ligament hypertrophy (52.8%), and articular process bone spurs or thickened articular processes (47.2%). Degenerative disc disease (i.e, vacuum phenomenon), Hansen type I herniation, spondylolisthesis, vertebral malformations, Schmorl's nodes, etc., had a prevalence lower than 40%. In stress position, compression/stenosis showed no changes in 39.3% of cases, it increased in 55.4% in the extended series, and in 5.3% in the flexed series.

Discussion/Conclusions:

Spondylosis, stenosis of the vertebral canal and foramina, Hansen type II herniation or dorsal longitudinal ligament hypertrophy are the most frequent lesions associated with CES. Stress position series are recommended since they significantly increase the sensitivity of CT exam.

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RADIOGRAPHIC AND TOMOGRAPHIC ASPECTS OF OSTEOARTICULAR LESIONS IN A DOG WITH VISCERAL LEISHMANIASIS

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Introduction:
Visceral leishmaniasis (VL) is a cause of inflammatory polyarthritis in dogs,[1] and about 30–45% of them have orthopedic disorders.[2,3] These lesions can be detected on radiographic examination, although are not pathognomonic.[2,3]
Aim:
This study is aimed to describe, by means of radiographic (XR) analyzes, computed tomography (CT) and synovial fluid (SF), the detection of abnormalities of the joints of a dog with VL.
Case Report:
A Cocker Spaniel, aged 7, with difficulty chewing and cachexia, was examined at College of Veterinary Medicine of Araçatuba, São Paulo State University. Clinical findings were generalized lymphadenopathy, weight loss, and periarticular swelling. Given these signs and the origin of the animal, examinations were performed for the detection of leishmaniasis, and evaluation of the elbow, carpus, stifle and tarsus, by cytology SF, XR, and CT.
Results:
In the cytological examination of lymph nodes were observed amastigotes of *Leishmania* spp. within macrophages. The cytological examination of the LS revealed polyarthritis with the presence of *Leishmania* spp. macrophages, neutrophils. The color of the cloudy SF was straw yellow to reddish, with cell counts between 10 and 90% for mononuclear cells and >10 to 100% of polymorphonuclear cells. XR examination showed discrete osteolytic areas, with bilateral trabecular bone, subchondral sclerosis, and joint collapse, more evidence in the distal joints. CT revealed areas of osteolysis, with adjacent sclerosis, periosteal new bone formation, and heterogeneous bone density.
Discussion:
Although the patient had no claudication, osteoarticular lesions observed on XR and CT were suggestive of polyarthritis, distal joints being the most affected as published.[2,3] The analysis confirmed the synovitis and amastigotes of *Leishmania* spp., as described in the literature.[1–3]
Conclusion:
The presence of osteoarticular lesions in a dog with VL drew attention to this condition. LV should be included in the differential diagnosis list osteoartropathies in dogs, considering the spread of endemic areas.
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EXPERIENCES WITH THORACIC MRI IN SMALL ANIMALS

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Introduction:
CT is generally considered to be the imaging modality of choice for thoracic lesions in small animals due to its excellent resolution and relative lack of motion artifact. MR images are degraded by movement, due to noise and ghosting artefact in the phase-encoding direction that may render the images nondiagnostic.[1,2] Although cardiac and respiratory gating techniques can be used in man[3], they may be less successful in dogs and cats. MRI is therefore not generally considered for thoracic investigations in small animals.
Aim:
The aim of this retrospective study was to review the use and value of thoracic MRI in a clinical small animal population.
Materials and Methods:
MRI records were searched for cases of thoracic MRI during the period when a high-field (1.5 T) MR scanner has been present on site. Cases were categorized according to the area imaged and the diagnosis. The MR images were assessed for their diagnostic value and compared with that produced by radiography. Techniques that were used to reduce the effect of motion artifact were noted.
Results:
During a 12-year period (April 2000-April 2012) 67 patients (55 dogs, 12 cats) were recorded as showing significant thoracic pathology on MR images. Approximately 80% were elective thoracic scans but in 20% cases unexpected thoracic pathology was diagnosed during MRI performed for other reasons. The anatomical areas affected were the chest wall (25), mediastinum (17), lung (16), thoracic inlet and sternum (4), pleura or pleural space (4), oesophagus (4) and diaphragm (1); three patients showed lesions in more than one area of the thorax. Thoracic radiographs were obtained in 65/67 cases. The MR studies were all considered to be diagnostic; they always yielded more information than radiography alone although the techniques were complementary. Motion artifact was minimized by careful RF coil selection, patient positioning, choice of RF pulse sequences, and phase-encoding direction, and by the use of saturation bands.
Discussion:
MRI may be a useful tool for thoracic imaging, although studies are required comparing MRI and CT in order to provide guidance regarding modality choice when both techniques are readily available.
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RESISTIVE INDEX AND PULSATILITY INDEX IN DOGS AND CATS AT DIFFERENT STAGE OF CHRONIC KIDNEY DISEASE

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Introduction:
Resistive index (RI) and pulsatility index (PI) provide information of blood flow resistance within an artery. In humans, RI and the PI are related to the severity and progression of chronic renal failure.[1,2] In veterinary medicine correlations have been found between the indices and parameters of renal function.[3] The International Renal Interest Society developed the IRIS staging system for the diagnosis and assessment of progression of chronic kidney disease (CKD) in small animals.
Aim:
To asses if RI and PI correlate with the IRIS scale and therefore if they could be used to assess the severity of the disease.
Materials and Methods:
Ultrasound reports of dogs and cats at different stages of CKD presented between 2006 and 2011 were review. RI and PI, clinical signs, complete blood work and urianalysis, including urine protein/creatinine ratio, systolic blood pressure, and ultrasonographic findings were recorded. Staging using the IRIS system was performed. A General Lineal Model procedure (PROC GLM) was used to evaluate significant differences ($P < 0.05$) among stages, whereas the LSMEANS procedure was used to list the mean differences.
Results:
Thirty dogs and 10 cats were included. IRIS stage 1 and 2 were grouped together due to the small number of animals in stage 1. Results are expressed as mean ± SD. Twelve dogs belonged to IRIS 4 (RI: 0.77 ± 0.02, PI: 1.92 ± 0.11), 13 to IRIS 3 (RI: 0.71 ± 0.02, PI: 1.55 ± 0.11), and 6 to IRIS 1–2 (RI: 0.70 ± 0.03, PI: 1.40 ± 0.15). Three cats belonged to IRIS 4 (0.81 ± 0.04, PI: 2.06 ± 0.27), five to IRIS 3 (RI: 0.78 ± 0.03, PI: 1.68 ± 0.21), and two to IRIS 1–2 (0.74 ± 0.05, PI: 1.49 ± 0.33). A tendency for increasing vascular indices with the IRIS staging was detected. However, the difference was only significant between PI of stages 1–2 and 4 in dogs.
Discussion:
Some relationships have been demonstrated in previous veterinary studies between the indices and renal function. A tendency for increasing RI and PI with increasing IRIS stage was observed in our patients. However, this was only significant for PI between stage 1–2 and stage 4 in dogs. More studies should be performed including a larger number of patients to confirm these findings.
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CONE BEAM COMPUTED TOMOGRAPHY (CBCT): CLINICAL APPLICATIONS IN DOGS AND CATS EXTRACRANIAL DISEASES

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Introduction:
Cone Beam CT (CBCT) has been recently introduced in veterinary medicine for dentomaxillofacial imaging studies.[1,2] The hard tissues relatively high isotropic spatial resolution increases diagnostic quality, providing a three-dimensional representation of maxillofacial skeleton, with minimal distortion and short scanning times.[3]
Aim:
The aim of this study was to assess clinical applications of CBCT for dentomaxillofacial and extracranial studies in dogs and cats.
Materials and Methods:
A new generation of CBCT (NewTom G5, NewTom QR S.R.L., Verona, Italy) has been employed. It features seven flexible FOVs, which comply with the diagnostic imaging requirements of multiple orthodontic and extracranial diseases of small animals. The machine is provided of a pass-through gantry.
Results:
Forty-five patients, 27 dogs and 18 cats, have been positioned in sternal recumbency under general anesthesia or deep sedation. The overall scan time was 18 s. Slice thickness ranged from 150 to 300 μm. Seven animals (15.6%) did not show abnormalities. The most frequent lesions was otitis, observed in 15 animals (33.3%): four external otitis, eight middle ear diseases, two middle and external otitis, and only one presented involvement of inner and middle ear. Eight animals (17.8%) revealed rhinitis: five neoplastic rhinitis and three non-neoplastic rhinitis. Six animals (13.3%) showed traumatic fractures. Five animals (11.1%) presented orthodontic diseases. Four animals (8.9%) showed neoplastic diseases on

craniofacial structures. Four subjects showed more concurrent diseases. All images obtained were of excellent quality for hard tissues and software facilities were the very highlights of the machine. The animal's positioning has been faster and easier by comparison with previously reported.[1,2] The scanning time was very short allowing volumetric acquisitions in deep sedation. In seven animals a diagnosis was not delivered. It is possible that the disease could be inside the soft tissues. CBCT has a high spatial resolution of hard tissues with low dose radiation, but because of its characteristic is unable to provide a good soft-tissue contrast resolution.[3]

Conclusion:
Further prospective studies are mandatory to demonstrate CBCT advantages compared with conventional CT.

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EFFECTS OF INTRAVENOUS ALPHAXALONE OR ETOMIDATE ADMINISTRATION ON UMBILICAL ARTERY DOPPLER INDICES IN PREGNANT EWES

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Introduction:
The pregnant sheep is widely used as an animal model for the study of human pregnancy. Some of the experimental procedures in the pregnant ewe require the administration of anaesthetic agents, which could have cardiovascular and respiratory depressant effects on both mother and fetus.[1,2] Alphaxalone and etomidate are proved to produce minimal cardiorespiratory negative effects in sheep, but their effects on the foetal sheep have not been thoroughly studied.

Aims:
To determine the effects of alphaxalone and etomidate on vascular indices on the umbilical artery (UA) of the fetal sheep.

Material and Methods:
Twenty-one pregnant Ripollese sheep were included in the study ([A] alphaxalone (n = 10); [B] etomidate (n = 11); mean gestational age: 101.6 ± 5.3 days and 98.4 ± 4.5 days, respectively). Noninvasive color and pulsed Doppler evaluation of UA was performed in each sheep before (baseline) and 1, 2, 5, 10, 15, 20, 30, 40, 50, and 60 min after administration of a single IV dose of 2 mg/kg alphaxalone or 1 mg/kg etomidate. Recorded data included velocities (peak systolic velocity-PSV, end diastolic velocity-EDV, and time-average maximum velocity-TAMX), and vascular indices (pulsatility index-PI, and resistive index-RI). Results are expressed as mean ± SD.

Results:
At baseline time, PSVA was 66.84 ± 30.84 cm/s and PSVB 45.27 ± 12.87 cm/s; EDVA was 18.87 ± 12.30 cm/s and EDVB 14.05 ± 7.40 cm/s; TAMXA was 39.23 ± 24.17 cm/s and TAMXB 27.89 ± 9.00 cm/s; PIA was: 1.23 ± 0.17 and PIB was: 1.16 ± 0.19; RIA was: 0.72 ± 0.06 and RIB was: 0.7 ± 0.07. Alphaxalone or etomidate administration induced no statistically significant changes on the vascular indices.

Discussion/Conclusion:
The UA waveform analysis has been reported to be an essential noninvasive technique for the evaluation of foetoplacental blood flow.[3,4] According to our results, alphaxalone and etomidate did not cause any detrimental hemodynamic effects on foetoplacental circulation by Doppler ultrasound evaluation. Although further studies should be performed to widely assess the effects of anaesthetic agents in the foetomaternal unit, both anaesthetic agents are apparently safe drugs to use during pregnancy.

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RADIOGRAPHIC ASSESSMENT OF RENAL SIZE IN HEALTHY FERRETS (MUSTELA PUTORIUS FURO)

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Introduction:
Abdominal radiography is a noninvasive imaging technique that allows the evaluation of renal size, shape, and contour, and is frequently used in the diagnosis of ferret renal disease.[1] Normal radiographic renal size compared with the length of the second lumbar vertebra (L2l) has been reported in dogs and cats.[2,3] However, information about normal radiographic renal size in ferrets is not available.

Aim:
To provide normal reference radiographic values for kidney size related to L2l in adult ferrets.

Materials and Methods:
Abdominal radiographs of adult ferrets were retrospectively reviewed. Patients with no renal disease, based on clinical history, physical examination, and blood work were included. Ventrodorsal abdominal radiographs were acquired in conscious ferrets or under mild sedation. Renal length (Rl) (longest renal dimension along the longitudinal axis of each kidney), and L2l (distance from the cranial to the caudal vertebral endplate in a mid-sagittal plane) were measured. The ratio between renal length and L2l was calculated. Results are expressed as mean ± SD.

Results:
One hundred and seven radiographic studies from 59 healthy adult ferrets were evaluated (23 entire males, 13 castrated males, 16 entire females, 7 neutered females). Female body weight (BW) ranged between 345–1180 g (759.25 ± 261.25 g) and male BW ranged between 600–1660 g (1153.08 ± 266.56 g). Left kidney length was 2.88 ± 0.38 cm and right kidney length was 2.92 ± 0.4 cm. Left Rl: L2l ratio was 2.35 ± 0.25 and right Rl: L2l ratio was 2.36 ± 0.25. Based in this study, a normal radiographic renal size ratio value of 1.85–2.85 could be used in adult ferrets.

Discussion/Conclusions:
Kidney disease is frequent in ferrets, with many ferrets older than 4 years having chronic interstitial nephritis. Infectious diseases, toxics, neoplasia, and urinary tract calculi are frequently described in these patients.[4] Even if radiography is one of the first imaging techniques used in exotic pet practice, normal reference data for kidney size is not available. This study provides normal reference values for ferret kidney size assessed radiographically. These values are similar to those described macroscopically (2.4–3 cm length).[5] Further studies evaluating the effect of gender, neutering state, body weight, and age in renal size should be performed.

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IN VIVO NONINVASIVE MEASUREMENT OF CARDIAC OUTPUT IN MICE USING HIGH FREQUENCY TRANSTHORACIC ULTRASOUND

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Introduction:
Mice have increasingly been used as models of human cardiovascular diseases in the last years. However, noninvasive monitoring of cardiovascular parameters, such as cardiac output, in small animals is difficult. On the other hand, the gender effect in these parameters have not been completely studied in mice.[1–3]

Aim:
We evaluated the use of 40-MHz pulsed Doppler ultrasound to measure hemodynamic parameters of the ascending aorta in intact anesthetized mice of either sex, with the objective to provide normal values for these parameters and to describe possible gender associated differences in them.

Materials and Methods:
High frequency (40 MHz) B-Mode and pulsed Doppler ultrasound scans were performed in the ascending aorta of 27 C57/Bl6 healthy, adult mice (2 months old) of either sex. Mice were anesthetized with isoflurane and respiratory rate, ECG, and rectal temperature were monitored and maintained under physiological values. Aortic diameter (D) and area (A), heart rate (HR), stroke volume (SV), stroke index (SI), cardiac output (CO), and cardiac index (CI) were calculated in four cardiac cycles. Results were obtained before and after normalization for body weight (BW) to detect differences related to gender and/or BW. Results are expressed as 95% confidence interval mean (95% CI).

Results:
No differences were found between male and female in the diameter (1.51–1.62 mm) and area (1.8–2.04 mm^2) of the ascending aorta, neither in the HR (422.9–469.6 bpm), SV (66.67–92.26 mm^3), and CO (29.39–38.59 ml/min). Both SI and CI were statistically lower in male (m) than female (f) (SIm: 2185.12–3510.61 mm^3/kgBW; SIf: 3761.72–4980.08 mm^3/kgBW. CIm: 1014.62–1467.05 ml/min × kgBW; CIf: 1675.28–2175.94 ml/min × kgBW). However, after normalization for BW, these differences disappeared.

Discussion/Conclusions:
Although mice are widely used as models of cardiovascular diseases, there is little information of normal References for murine hemodynamic parameters. Particularly, gender related differences in cardiovascular values have not been completely studied in mice, even knowing that such differences exist in human beings. Results obtained in this study can be used as reference values in further murine cardiovascular studies. Furthermore, they suggest that if male and female mice of the same strain and age are to be compared, values should be standardized for BW.[1]

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PREVALENCE OF NUTRITIONAL SECONDARY HYPERPARATHYROIDISM AND RICKETS IN IRAN: RETROSPECTIVE RADIOGRAPHIC STUDY OF 699 CASES

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Introduction:
Nutritional secondary hyperparathyroidism is seen in young animals fed on meat, which has a low calcium and high phosphorus content. The resulting hypocalcemia stimulates increased production of parathyroid hormone and consequently bone resorption and generalized decreased bone opacity. Clinically, the condition present with signs of locomotor impairment. The bones are painful, and folding fractures are common. Feeding a balanced diet results in rapid remineralization of the bones but deformities may persist.[1–5] Rickets is characterized by a failure of mineralization, particularly at the physis. It may be due to a deficiency of calcium, phosphorus, or vitamin D. In animals with rickets, the physes become deeper, The metaphyseal edge of the bone at the physis becomes wide and concave.[1]
Materials and Methods:
From March 21, 2011 until March 19, 2012, 3034 cases were referred to department of radiology in small animal hospital, university of Tehran. The clinical records and radiographs of 699 cases were randomly reviewed and the cases affected by NSH and rickets were reevaluated.
Results:
In 699 reviewed cases, 62 cases (8.87%) with NSH and 18 cases (2.58%) with rickets were found. Of 62 cases affected by NSH, most cases of NSH were diagnosed in cats (34 cases, 54.84%), birds (8 cases, 12.90%), squirrels (7 cases, 11.29%), iguana (4 cases, 6.45%), and turtles (4 cases, 6.45%), showed less prevalence, respectively. All the cats affected by moderate to severe signs of NSH were between 2 months and 1 year old. In 18 cases affected by rickets, 11 cases (61.11%) were cats and 5 cases (27.78%) were squirrels. In most cases affected by rickets (17 cases, 94.44%) radiographic signs of NSH were also evident. In pets affected by NSH, other accompaniment diseases were pneumonia, megacolon, and rickets.
Discussion:
This research shows the majority of cases affected by NSH and rickets in Iran were cats. Lack of knowledge of the owners about the diet and husbandry may be the most important cause. The majority of cases affected by rickets, showed the signs of NSH, which emphasizes on the same conditions for occurrence of rickets and NSH.
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RADIOGRAPHIC DIAGNOSIS OF PSEUDOMONAS PNEUMONIA IN A PYTHON

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Case Report:
A python (*Python molurus*) presented to the small animal hospital with open mouth breathing, respiratory distress, anorexia, lethargy, and frothy saliva. Lateral and dorsoventral radiographs were taken of the lungs. Discharge from the respiratory tract was sent for fungal and bacterial culture.
Results:
Multifocal opacities were superimposed on the cranial lung field. Also, there was increased opacity of the ventral lung. The radiographic diagnosis was pneumonia. Pseudomonas was cultured from the samples submitted. The snake underwent antibiotic and bronchodilator treatment for 4 weeks. After 2 weeks, a repeat radiograph was taken and showed improvement in the appearance of the lung fields. Complete recovery occurred after 4 weeks.
Discussion:
Indian pythons (*Python molurus*) are especially susceptible to pneumonia. The ventral lung fields are usually the most severely affected. The affected lung will appear inhomogeneous and have areas of increased opacity. In some cases a more diffuse and generalized increase in opacity is seen. The radiographic changes are more easily detected in the cranial lung and lateral projections that are usually most useful. Computed tomography can also be used to diagnose this condition and the density of the affected lung tissue can be measured.[1] In severe cases, large quantities of purulent secretions can collect in the central lumen of the lung. This secretion can be identified in the transverse plane. In addition, computed tomography can be used to monitor response to treatment. Magnetic resonance imaging may show an increase in signal intensity of the lung as a result of the inflammation.[1] Due to the lack of availability of these advanced modalities radiography remains the most commonly used modality.[2,3]
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RADIOGRAPHIC DIAGNOSIS OF SWIM BLADDER DISTENTION DUE TO SYSTEMIC BACTERIAL INFECTION IN AN ORNAMENTAL FISH (FLOWER HORN SPECIES)

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Introduction:
A male Flowerhorn fish (a hybrid cichlide) with abnormal swimming posture was referred to the Radiology Department, Small Animal Hospital, Faculty of Veterinary Medicine, University of Tehran. The ventral part of the fish's abdomen was floating on the surface of the water causing the fish an abnormal swimming posture. The fish had been transmitted to a new aquarium 2 weeks earlier and had not been eating ever since. It was reported to have physical conflict with other fishes as well.
Materials and Methods:
Radiographs were taken in lateral and dorsoventral views the first day.[1] Two days later, the radiography was repeated to monitor the response to treatment. Ultrasonography was also performed to evaluate the fish's internal organs. Under the guidance of ultrosonography, gas from swim bladders was evacuated. Another lateral radiograph was taken afterwards.
Results:
First day radiographs revealed the distention of swim bladders with gas three times bigger than normal limits, which is a rare finding. Abnormal swimming posture was suggested to be the result of distention of swim bladders. Antibiotic therapy was initiated by adding Tetracycline to the water of the aquarium and injecting Oxytetracycline in the dorsal muscles. Third day radiographs revealed smaller swim bladders, but the fish still could not swim normally. After the aspiration, the size of swim bladders became normal and the fish sank under water but it could not swim yet. A week after the treatment was initiated the fish died as a result of a general infection.
Discussion:
Abnormal swimming posture in ornamental fishes could be due to swim bladder problems such as inflammation and infection. Diagnosis of these problems is performed by radiographic, virologic, bacteriologic, and pathologic methods. The treatment of choice in this situation is administration of anti-inflammatory agents and antibiotics.[2] Bacteria are responsible for the majority of the infectious diseases diagnosed in captive fishes. These bacteria mostly act as secondary opportunistic invaders that take advantage of diseased animals by overwhelming their natural host defense response. Opportunistic bacteria represent a threat every time a fish is exposed to a stressful event.[3]
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IMAGING FINDINGS IN HORSES WITH PHARYNGEAL SQUAMOUS CELL CARCINOMA

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Introduction:
Squamous cell carcinoma (SCC) has been occasionally reported in the equine pharyngeal region.[1–3] The aim of this poster is to describe imaging findings in four cases of pharyngeal SCC.
Materials and Methods:
Four old horses, mean age 19.5, two females and two geldings, were referred for dyspnea (three of four) and/or dysphagia (three of four). Because of dyspnea radiographs were realized prior to endoscopy. Ultrasound (US) was performed in all cases by ventral and lateral approach using a linear 7.5 MHz transducer. A postmortem computed tomography (CT) of the head was performed in one case (16 slices CT, Somatom 16, Siemens).
Results:
Radiographic opacity of the pharyngeal region was increased in all cases. A soft tissue mass was also visible in the caudal maxillary sinus in one horse. The epiglottis was either not recognized or difficult to see with an abnormal shape. Pharyngoepiglottic distance and nasopharyngeal diameter were reduced in all cases. The soft palate was either thick or impossible to be outlined, with an irregular surface. In one case it was dorsally displaced. The dorsal pharyngeal wall looked unevenly thickened or impossible to be outlined ventrally due to border effacement. No bony damage was identified on radiographs. A hypoechoic heterogeneous mass was visualized at US in two cases and an enlargement of the mandibular lymph nodes was observed in three cases. Lymphnodes had also heterogeneous echogenicity and increased Doppler signal in one case. Oral and pharyngeal endoscopic examination confirmed a pharyngeal mass in two cases, but was unsuccessful or incomplete because of passage impairment in two. CT revealed maxillary bone lysis in the horse with a mass in the maxillary sinus. Histopathological examination of local biopsies or necropsy revealed pharyngeal SCC invading epiglottis, pharyngeal wall and soft palate in the four horses and the maxillary sinus in one.
Discussion/Conclusion:
Because endoscopy can be impaired by the size of the mass, radiology is helpful in estimating the extent and invasiveness of the process and US to confirm lymphadenopathy. However, because of its relatively low sensitivity and the local increased opacity, radiographic examination may underestimate bone lysis.
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A STUDY OF THE CAECO-COLIC VESSELS AND LYMPH NODES AT TRANSABDOMINAL ULTRASONOGRAPHY

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Introduction:
The lateral caecal vessels run adjacent to the abdominal wall while colonic vessels are located axially to the large colon.[1,2] Caecal lymph nodes follow the caecal vessels' path.[1] The visualization of additional mesenteric vessels at ultrasound (US) has been described as a sign of right dorsal colon displacement.[3]
Aim:
This study aims to describe normal and abnormal transabdominal US features of equine caecocolic vessels and lymph nodes in healthy horses and horses with symptoms related to digestive tract disease.
Materials and Methods:
Transabdominal US images of the right abdomen were obtained prospectively on eight healthy horses. Mesenteric blood vessels were followed and topography and size recorded. Visiblity of caecal lymph nodes was evaluated. US images from horses with digestive tract disease and visible additional mesenteric vessels (nine) and/or visible caecal lymph nodes (eight) were retrospectively reviewed.
Results:
In healthy horses, caecal vessels were visualized adjacent to the body wall from right midparalumbar fossa extending to ventral midline. Caecal lymph nodes were difficult to see. One additional mesenteric vessel was seen in two healthy horses emerging from the caecal vein and running caudocranially on a short lenght. Only two of the sick horses with additional visible mesenteric vessels had right dorsal colon displacement confirmed either at surgery or at necropsy. The seven other cases resolved medically: one had colic due to gastric impaction while six had weight loss and diarrhea without any sign of colic. Four out of the last six showed colonic wall thickening at US, due to eosinophilic colitis. Horses having easily visible caecal lymph nodes along caecal vessels had US evidence of large (seven) and/or small (two) intestinal wall thickening.
Conclusions:
Visualization of additional mesenteric vessels in the right abdomen at transabdominal US is not only associated to right dorsal colon displacement but may happen in medical cases. Easily visible caecocolic lymph nodes are suggestive of infiltrative enteropathy.
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CHARACTERISTIC BONE MARROW METASTASIS OF A PANCREATIC ISLET-CELL CARCINOMA

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Case Report:
A 10-year-old spayed female Boxer was referred for a 3-months history of lethargy and bilateral uveitis refractory to immunosuppressive therapy. The results of the hematology and biochemistry were consistent with steroid administration. Serological screening for endemic infectious diseases was negative. Radiographs of the thorax and abdomen were first obtained, followed by radiographs of the femora and humeri. The main radiological abnormalities were polyostotic, multiple sclerotic lesions affecting the bone marrow of the sternum, femora, and humeri. Neither periosteal reaction, nor bone disruption were observed. The main differential diagnoses for these lesions were sclerotic bone metastasis, hematogenous osteomyelitis (fungal, protozoal, or bacterial in origin) or, less likely, bone infarcts. In the abdominal ultrasound, no relevant abnormalities were detected. Bone marrow cytology was consistent with reactive bone marrow and no evidence of neoplastic cells was observed. Given the radiological findings and clinicopathological results, a neoplasia was suspected. The dog developed refractory glaucoma and the owners elected euthanasia. The postmortem examination revealed a nonfunctional islet-cell carcinoma with metastases in the liver, right kidney, eyes, and bone marrow.
Discussion:
Neuroendocrine pancreatic carcinomas are malignant neoplasias in dogs.[1] Clinical signs are usually related to the hormone produced. In contrast, the nonfunctioning tumors are usually discovered as an incidental finding or related to general neoplastic clinical signs or its metastasis.[2] In dogs, metastases of the islet cell carcinoma are usually located in the liver, lymph nodes, and omentum.[1] In the only reported case of bone marrow metastasis,[3] the radiographic appearance of the long bones was exactly the one described here. The main difference between the two cases was that the carcinoma described here was nonfunctional while the one described previously was secreting insulin.
Conclusion:
Based on the case presented here and the one reported by Pickens et al., polyostotic, multiple sclerotic lesions affecting the bone marrow of long bones should prompt the investigation of a primary tumor, paying particular attention to neuroendocrine carcinomas of the pancreas.
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ULTRASOUND-GUIDED BRUSH CYTOLOGY OF BLADDER AND URETHRAL LESIONS IN DOGS: TECHNIQUES AND RESULTS

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Introduction:
Bladder wall thickening is a common ultrasonographic (US) finding in dogs with bladder neoplasia.[1] Severe chronic cystitis or mural hematomas may mimic US appearance of bladder tumours.[1,2] Histological diagnosis is crucial for the prognosis and treatment planning. US-guided catheter biopsies of the lower urinary tract for histological examination have successfully been used[3,4] but metastatic spread along needle tract after fine needle aspiration has been reported.[4] Endoscopic brush cytology is considered reliable to diagnose urinary transitional cell carcinoma in humans.[5]
Aim:
The aims of this study are to describe the procedure of US-guided brush cytology (USBC) of bladder and urethral lesions in dogs and to evaluate diagnostic quality of USBC sampling.
Materials and Methods:
Twenty-one dogs that underwent bladder or urethral USBC were included. The technical procedure and the results of the cytologic examination were reviewed.
Results:
A urinary catheter was brought caudally to the lesion under US guidance to serve as protection for the passage of the sheath containing the brush (Disposable 3 mm Gastroscope Cytology Brush®). In small dogs, no catheter was used. The brush tip was positioned on the lesion and moved back and forth several times under US control. The couple brush-sheath was pulled out of the urinary catheter and the brush tip rolled on glass slides. The procedure was repeated at least three times. The bladder was reassessed for signs of haemorrhage. Based on cytology reports samplings were of good to high diagnostic quality in 19/21 cases and of moderate quality in 2/21. Neoplasia was cytologically diagnosed in 13/21 dogs and inflammation in 8/21. Bladder bleeding occurred in one patient.
Conclusion:
USBC of bladder and urethral lesions in dogs can be easily performed and provides samples of good diagnostic quality. Complications remain rare.
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RADIOGRAPHIC AND COMPUTED TOMOGRAPHIC ASSESSMENT OF BALLISTIC HEAD INJURIES IN SEALS (*HALICHOERUS GRYPUS*)

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Introduction:
Gunshot head injuries have a high mortality in humans and animals. Radiography and computed tomography (CT) are used to localize shrapnel and injury to the head. However, the presence of strongly attenuating objects causes typical a rebound artifact in computed radiography and streak artifacts in CT, affecting image quality. The purpose of this study is to compare conventional radiography and CT for assessment of penetrating ballistic injuries in seals and to compare different imaging settings for artifact magnitude.
Methods:
Different types of ammunition (including riffle shots and shotgun) were fired to the frontal region of eight seal (*Halichoerus grypus*) cadaver heads from a distance of 5–50 meters. Dorsoventral and lateral computed radiographs (CR) and helical CT (1.5 mm slice width, 168 mA, 120 and 140 KVp) were performed. The CT images were reconstructed using different algorithms. Posterior fossa optimization (PFO) filter and extended CT scale technique (ECTS) were also used and evaluated as potential tools to reduce metal streak artifacts. CR and CT images were subjectively assessed for image quality degradation due to rebound (CR) and metallic streak artifacts (CT). CT artifact size was measured in all reconstructions

using three windows (soft tissue: WW 400, WL 100, bone: WW 4000, WL 1000, ETCS: WW9000, WL 2000).
Results:
CT provided more specific localization of shrapnel in relation to vital structures. Many small fragments could only be detected on CT. In CR, there was no significant image degradation due to rebound artifact. Metallic streak artifacts affected the quality of CT images. ECTS technique considerably reduces their size, showing the highest diagnostic performance. The use of a PFO filter did not improve the image quality, while metal artifacts were much more pronounced using the soft tissue window.
Discussion/Conclusion:
CT is superior to CR to accurately assess ballistic head injuries in seals. Although metallic streak artifacts can significantly affect the quality of the CT scans, a simple ECTS may improve diagnostic performance in evaluating lesions near metal implants.
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THE CT AND MRI FEATURES OF THE NORMAL CANINE NASAL CYCLE

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Introduction:
The nasal cycle is a physiological phenomenon and describes regular cyclical congestion and decongestion of the venous sinusoids lining the nasal mucosa.[1] On MRI, the nasal cycle has been reported to give rise to unilateral increased mucosal volume with hyperintensity in T2-weighted sequences. The changes alternate between the right and left nasal cavity over time.[2,3] The CT appearance has not been reported.
Aim:
To establish the CT and MRI features of the normal canine nasal cycle.
Materials and Methods:
Dogs were selected for the study according to the following criteria; no clinical signs or history of nasal disease, nonbrachiocephalic dogs, 8–15 months old, undergoing anaesthesia for castration or MRI of the spine/brain. Each dog underwent MRI scanning (T2-W, T1-W) and then immediate CT scanning (pre- and postcontrast). Images were evaluated subjectively and objectively by two board certified radiologists.
Results:
Four dogs met the selection criteria (additional cases continue to be recruited). All dogs showed diffuse unilateral mucosal thickening on CT and MRI. This shifted sides between the two examinations in two dogs. The changes were most marked on T2-W scans. CT revealed mild contrast uptake in the thickened mucosa.
Discussion/Conclusion:
The nasal cycle is seen as a unilateral thickened mucosal membrane on both CT and MRI. The changes are best appreciated on T2-W MRI scans and may switch sides depending on the length and timing of the imaging examination. Increased contrast uptake may be seen on CT. These imaging features mimic those seen in inflammatory disease. An appreciation of this normal phenomenon is required to avoid confusion for pathologic change.[2,3]
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ESTIMATION OF THE APPROPRIATE SCAN TIMING OF FDG-PET BASED ON SUV TIME PROFILE IN DOGS

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Introduction:
Most positron emission tomography (PET) studies utilize 18F-fluorodeoxyglucose (FDG), which is a radiopharmaceutical glucose analog. There are only a few reports about FDG distribution patterns about normal or tumor dogs.[1–3] This study was undertaken to clarify pharmacokinetic (PK) parameters and distribution profile of FDG as well as to establish the best timing of PET scan after FDG injection in dogs.
Materials and Methods:
Five healthy male beagle dogs were used for PK study. FDG was administered 5 MBq/kg intravenously. Blood samples were taken before and after FDG injection via indwelling catheter in a fixed time schedule. The blood samples were immediately separated to plasma and each radioactivity was measured. The standard uptake values (SUV) of major oragan at 30, 60, 90, 120 min after FDG injection were estimated. The PK parameters were estimated by two-compartment open model.
Results and Discussion:
Based on the parameter, plasma FDG concentration was reduced to 1/4 ∼1/5 within 1 h after injection. The total clearance was 37.8 +/− 7.34 ml/min. Brain, liver, and spleen showed SUV mean peak about 60 ∼ 90 min after FDG injection. These data suggest it is better to carry out the PET study at 120 min after FDG injection rather than 60 or 90 min to distinguish the physiologic and pathologic accumulation. Moreover, we obtained some clinical examples, including splenic hemangioma and myeloma.
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EVOLUTION AND DOMESTICATION: SKELETAL MORPHOLOGICAL DIFFERENCES BETWEEN WOLF (CANIS LUPUS) AND DOG (*CANIS FAMILIARIS*) REVEALED BY COMPUTED TOMOGRAPHY

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Introduction:
In the tight competition between wolves, coyotes, jackals and other wild canids,[1] the wolf still can not advocate the status of domestic dog's ancestor.[2] Morphological comparison between dog and different wild canids may provide the answer to the puzzling question concerning the domestic dog's origin.
Aim:
To conduct skeletal comparison between wolves and dogs by means of computed tomography (CT), enhancing the existing data based predominantly on subjective inspection and restricted to skull.[3]
Materials and Methods:
A morphologic comparison between dogs and wolves using state-of-the-art tools of high-resolution, 128 slices computed tomography (CT) to analyse CT images of 31 wild European wolves from Germany and 76 dogs of different breeds. For the skull evaluation, only dolicocephalic dogs were used (32/76 dogs).
Results:
Analysis of the CT images revealed morphologic differences not only on the skull, but also on the limbs. Skull's morphological differences were related to presphenoid bone, vomer, supramastoid foramen, petro-occipital fissure, incisive canal, pterygoid process of the maxilla, exoccipital, and tympanic bullae. Distal hind leg morphologic differences were found in the fourth tarsal bone, plantar processes of tarsal bones, metatarsals and dorsal metatarsophalangeal sesamoids. Distal front leg morphologic differences include the first digit, intermedioradial carpal bone, accessory carpal bone, and metacarpals.
Discussion/Conclusions:
The most compelling explanation for the different morphological characters of dogs and wolves is that these differences represent adaptations to dissimilar selection forces. Differences attributed to relaxed selection under domestication may explain why dogs have smaller skulls with smaller tympanic bullae, the auditory acuity being less vital than in wolves. Furthermore, the appendicular skeletal traits in wolves indicate an adaptation to high velocity and durable cursorial locomotion, traits that are less vital for domesticated dogs. In conclusion, computed tomographic morphological analysis of skeletal features in wolves and dogs depict obvious influences of evolution and domestication.
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COMPUTED TOMOGRAPHIC STUDY AND NEW MORPHOMETRIC METHOD TO DESCRIBE THE CAUDAL CRANIAL FOSSA IN FELIDS

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Introduction:
The caudal cranial fossa (fossa cranii caudalis) hosts the cerebellum, pons, and medulla oblongata representing an important landmark of the skull, being of particular interest for veterinary medicine.[1] In addition to Chiari-type malformation in Cavalier King Charles Spaniels, one of the most significant pathologies at this level and a subject of concern for many zoological gardens is the "stargazing syndrome" or caudal cranial fossa stenosis, primarily in lions, that leads to severe neurological signs and frequently even to death.[2] It is hypothesized that malformation of the bones surrounding the caudal fossa, with resulting compression of the brain tissue, is the cause of neurological malfunction.[3,4] Despite its importance, to date no osteometric studies of the caudal cranial fossa in felids have been published.
Aim:
This study was designed to establish the exact anatomical definition of the caudal cranial fossa in felids, determine the aspect, size, and location of caudal cranial fossa structures, and to evaluate modus operandi for a reliable morphometric method.

Materials and Methods:
A total of 128 slices, high-resolution, computed tomography (CT) was performed on skulls and heads of 81 felids, including 34 domestic cats (age range: 11 month to 17 years), and 47 wild felids belonging to 11 different species (lion, tiger, leopard, cheetah, puma, lynx, ocelot, fishing cat, serval, leopard cat, and Geoffroy's cat).
Results:
Analysis of the CT images revealed a distinctive relationship between tentorium osseous cerebelli, dorsum sellae, tuberculum sellae, and orbital fissures. In order to determine reliable quantitative approach, the exact anatomical landmarks and accurate sectional planes for both linear and volumetric measurements of caudal cranial fossa and its related structures were established.
Discussion/Conclusions:
It is indisputable that dissimilar techniques and different anatomical coordinates in quantitative evaluation of cranial caudal structures in felids will lead to reporting inconsistency. Any comparison of the already scarce data will thus be impossible. This study endows with detailed anatomical description of the caudal cranial fossa in felids and provides a new morphometric method for a more standardized, precise and reliable assessment, useful for both clinical and research applications.
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RHINOCEROS FOOT STEPS OUT OF A RULE-OF-THUMB: A SYNCHRONIZED COMPUTED TOMOGRAPHY AND DIGITAL RADIOGRAPHY

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Introduction:
Currently, radiography is the only imaging technique used to diagnose bone pathology in wild animals situated under "field" conditions. Foot pathology is a major health concerns for captive elephants and rhinoceroses, the two largest terrestrial mammals.[1,2] Yet, unlike in elephants,[3,4] for the rhinoceros there are no established, documented imaging procedures. Chronic foot disease in captive rhinoceroses represents a tremendous clinical challenge. Without improved knowledge on foot radiographic imaging techniques, clinical management will remain under the rule-of-thumb.
Aim:
This study was designed to identify the relevant radiographic views and proper exposure parameters for accurate depiction of normal anatomy and pathological changes in the rhinoceros foot.
Materials and Methods:
Using state-of-the-art tools of high-resolution, 128-slices computed tomography (CT), quantitative CT (QCT), and digital radiography, we imaged and analyzed eight distal feet from two southern white rhinoceroses (*Ceratotherium simum simum*) and one Indian rhinoceros (*Rhinoceros unicornis*). Our investigations led to a pioneering approach based on X-ray projections derived from tridimensional CT reconstructed images, applying CT-digital radiography synchronization.
Results:
Both normal anatomical features and pathological findings, such as fractures, periosteal reaction, cortical sclerosis, and reduced bone mineral density, were revealed by CT, QCT, and digital radiography. These pathological findings were not detected previously by standard radiography. Based on CT-digital radiography synchronization, relevant radiographic projection views were ascertained and confirmed by digital radiographs. Subsequently, an optimal exposure chart was established for adult rhinoceros distal feet. By assessing eight digital radiographs per foot (four orthogonal and four oblique radiographic views), the number of autopodial elements that can be depicted with maximal detail and minimal superimposition was defined for each projection. The data revealed that the radiological status of both front and hind distal limbs is best evaluated in palmaro (plantaro) dorsal view that allows best visualization of the highest number of bones (13).
Discussion/Conclusion:
High resolution CT-digital radiography synchronization provided major advances in diagnostic imaging of the rhinoceros foot. The technique has set new standards for clinical management of rhinoceros foot problems and opened new possibilities for wildlife management and animal welfare.
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PRESENCE OF ATLANTOAXIAL LIGAMENTOUS ABNORMALITIES ON MAGNETIC RESONANCE IMAGES IN DOGS WITH AND WITHOUT CHIARI-LIKE MALFORMATION

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Introduction:
Chiari-like malformations (CM) in toy breed dogs are associated with multiple craniocervical malformations, including decreased caudal fossa to cranial cavity volume ratio.[1] In people, thickening or mineralization of periodontoid tissue has been identified in patients with clinical Chiari I malformations.[2] Abnormalities of the occipitoatlantoaxial ligaments in toy breed dogs with and without CM and atlantoaxial instability has not been described. No correlations have been made regarding ligamentous abnormalities and clinical signs in dogs with CM.
Aim:
Evaluation of the craniocervical junction for the presence of occipitoatlantoaxial ligamentous abnormalities with magnetic resonance imaging (MRI) and to determine their association with CM and clinical signs.
Materials and Methods:
A total of 104 small and toy breed dogs with MRI of the craniocervical region were divided into CM positive and negative groups based on established criteria.[1,3] Measurements of the apical, alar and transverse ligament, mid-sagittal cranial and caudal fossae areas, and brain or spinal cord parenchymal changes were analyzed statistically. Comparison of the findings with the clinical signs was also performed.
Results:
Thirty-eight dogs were CM positive with a mean age of 6 years and 66 were CM-negative with a mean age of 7.6 years. Maltese, Shi Tzu, Yorkshire, and Boston terriers were the most common breeds. Atlantoaxial (AA) luxation was identified in five dogs. Twenty-one percent (22/104) of dogs had one or more measurements that could not be performed because of poor visualization or absence of the appropriate sequence. Dorsal spinous ligament length and transverse ligament width were statistically significantly longer in dogs with AA luxations. Significantly more dogs with AA luxations had ligament border irregularities or thickening. No difference in ligament changes or clinical signs existed between CM and non-CM dogs. CM dogs had a greater degree of AO overlapping compared to non-CM dogs.
Discussion:
Ligaments were significantly thicker or longer in dogs with AA luxation. Ligament abnormalities do not appear to be correlated to clinical signs in CM dogs. AO overlap is significantly greater in CM dogs, possibly due to instability from malformed or hypoplastic supraoccipital bones.
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EVALUATION OF ELECTROCARDIOGRAPHY AND THORACIC RADIOGRAPHY FOR IDENTIFICATION OF CARDIAC ENLARGEMENT IN THE CANINE PATIENT: A RETROSPECTIVE STUDY

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Introduction:
Radiographic assessment of cardiac size is often determined based on subjective assessment. Electrocardiography (ECG) and thoracic radiography are two commonly used tools to more objectively evaluate cardiac enlargement in veterinary patients. ECG measurements have been shown to change in well-trained dogs due to physiological hypertrophy and may not always reflect cardiac disease. The vertebral heart score (VHS) is a technique for evaluating heart size intended to serve as an objective standard method of cardiac size evaluation on thoracic radiographs in dogs and cats.
Aim:
To evaluate the correlation between ECG measurements, VHS, and thoracic radiograph changes as methods of measuring cardiac enlargement. To compare agreement between ECG and VHS measurements between a novice veterinarian and an experienced internal medicine specialist.
Materials and Methods:
Medical records between the years 2000 and 2007 were searched for cases that had ECG and thoracic radiographs performed. P wave and QRS amplitude and duration were measured and the VHS calculated by both an experienced internal medicine specialist and a novice veterinarian. Measurements were compared to one another and to an experienced board certified radiologist's subjective interpretation of thoracic radiographs to evaluate for the presence or absence of cardiac enlargement.
Results:
For the prediction of cardiac enlargement increased P wave amplitude has 10.7–16.7% sensitivity and 90–96.7% specificity, with moderate agreement between observers. Prolonged P wave duration has 28.1–50% sensitivity and 56.7–83.3% specificity, with fair agreement between observers. Increased R wave amplitude has 34.5–35.1% sensitivity and 70–73.3% specificity, with poor agreement between observers. Prolonged QRS duration has 30.9% sensitivity and 90% specificity, with poor agreement between observers. VHS has 64.3–70.2% sensitivity and 55.2–78.6% specificity, with good agreement between observers.
Discussion:
VHS is the most sensitive indicator of cardiac enlargement on thoracic radiographs of the measurements evaluated and demonstrates the best agreement between observers.

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ACCURACY OF RADIOGRAPHY IN DIAGNOSING MEDIAL CORONOID DISEASE (MCD) IN DOGS

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Introduction:
The radiographic signs used to diagnose MCD include periarticular osteophyte formation (DJD). Other common radiographic signs of MCD are blurring of the cranial edge, abnormal shape of the medial coronoid process (MCP), and subtrochlear sclerosis.[1,2] Unfortunately, radiographic findings are not specific for MCD and are often inconclusive for a diagnosis.
Aim:
To investigate the sensitivity and specificity of the radiographic detection of MCD compared to CT and using arthroscopy as a gold standard. Radiographic criteria used were DJD, shape of the MCP and subtrochlear sclerosis.
Materials and Methods:
Retrospectively, radiographs of 150 elbows were examined for evidence of osteophyte formation. These 150 elbows were arthroscopically examined for evidence of MCD and all lesions were listed. Sensitivity and specificity were determined using the arthroscopic findings as gold standard. Another radiographs of 180 elbows were examined for evidence of MCD using changes in outline, shape, radiodensity of the MCP, fragment, and increased trochlear notch sclerosis. Then CT and arthroscopy were performed. Afterwards the CT and arthroscopic findings were statistically compared. Sensitivity and specificity of the radiographic findings were then determined.
Results:
The sensitivity and specificity of the radiographic presence of DJD was 82% and 20.5% using arthroscopy as gold standard. The correlation between the CT and arthroscopic findings was 99.2% meaning that the CT findings could be used as gold standard. The sensitivity and specificity of the radiographic evaluation of the MCP delineation and trochlear sclerosis was 97.9 and 64% using the CT findings as gold standard.
Discussion:
The low specificity and only moderate sensitivity of radiographic signs of DJD in diagnosing MCD makes this an unreliable radiographic sign. The high sensitivity of radiographic signs of MCP delineation and trochlear sclerosis in diagnosing MCD was comparable with a previous study[3] although false positive results still present a problem.
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HYPERTROPHIC OSTEOPATHY IN FIVE DOGS

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Introduction:
Pulmonary hypertrophic osteopathy (Marie's disease) is typically characterized by a bilaterally symmetrical, florid, periosteal reaction affecting the distal long bones. The periosteal reaction is usually palisading but can also be smooth and solid. It is a rare pathological condition and is often secondary to neoplasic or infectious pulmonary diseases typically with the presence of an intraparenchymal mass.[1] The literature also describes cases with extra-thoracic disease such as hepatic lesions.[2] The diagnosis is usually based on the identification of the primary lesion and the typical periosteal reaction.[3] This study describes five dogs diagnosed with periosteal new bone formation typical of this condition.
Methods:
Five dogs aged between 7 and 12 years old (three females and one male) presented with lameness, distal limb edema, and pain on palpation of the distal limbs. Thoracic radiographs, abdominal ultrasound, and blood tests were performed.
Results and Discussion:
All dogs had a discontinuous florid periosteal reaction that was more severe distally (abaxial margins of digits) and became smooth and continuous proximally (tibia, femur, radius, ulna, humerus). Four dogs had pulmonary lesions, macronodular in three dogs, and pulmonary lobe consolidation in one dog. Abdominal ultrasound was normal for all dogs. In one dog no intra or extrathoracic lesion was identified. This dog underwent monthly radiographic and ultrasonographic examinations for 3 months without the identification of an underlying cause for the periosteal reaction. There was no progression of the periosteal reaction in this period. Unfortunately the dog died as the result of a road traffic accident after 3 months so further investigations were not possible.
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VALIDATION AND RELIABILITY OF ORTHOGONAL ULTRASONOGRAPHIC PROJECTION DIMENSIONS OF THE KIDNEY IN THE HORSE

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Introduction:
Renal ultrasonography is useful for evaluating equine renal disease. Recently normal reference ranges for ultrasonographic renal dimensions in Thoroughbred horses using the standard transabdominal approach.[1] Previous studies described transcutaneous and transrectal[2] approaches for evaluation of adult[3,4] and neonatal[5] equine kidneys.
Aim:
To evaluate a novel translumbar (TL) ultrasonographic method for assessment of renal dimensions, establish a normal reference range and compare reliability of renal dimensions with conventional transabdominal (TA) projections and measurements obtained at postmortem (PME).
Methods:
Six Thoroughbred horses, weighing 513 $\pm$ 49 kg, were examined prior to slaughter. Both kidneys were imaged in short and long axis using TL and TA projections. For each technique TA, TL, and postmortem examination of the kidneys the mean ($\pm$SD) of each kidney dimension was measured from three separate stored images and these data used to calculate a normal reference range for the population studied (mean $\pm$ 2 SD).The kidney length, width, and depth were determined, as were the thickness of the cortex, medulla, and pelvis. No gross abnormalities of any kidney were noted. Two observer's measurements were used to assess reproducibility and measured on three separate occasions by one observer to evaluate repeatability.
Results:
Both kidneys were identified by both methods in the 15–17th intercostal spaces (ICS) and paralumbar fossa with maximal dimensions for the left kidney in the 16th ICS and for the right kidney in the 15th ICS. Reference ranges for the TL method for left kidney length, width, and depth were 10.6–17.8 cm, 10.4–14 cm, and 6.0–9.2 cm. For the right kidney length, width, and depth were 14.7–19.9 cm, 13.0–17.8 cm, and 6.7–8.7 cm. Image quality was good-to-excellent for both techniques. There was no difference between dimensions obtained by TA or TL projections and good correlation between ultrasound dimensions and postmortem measurements existed (ICC $>$ 0.8). Excellent reliability (ICC $>$ 0.80) was obtained for all measurements. Reliability was better for larger structures.
Conclusions:
The TL technique is easily performed and produces reliable dimensions that may assist with the diagnosis of renal disease in horses.
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ECHOCARDIOGRAPHIC DIAGNOSIS OF TOTAL ANOMALOUS PULMONARY VENOUS CONNECTION TO THE LEFT AZYGOUS VEIN IN NINE CALVES

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Introduction:
Total anomalous pulmonary venous connection (TAPVC) is a malformation in which all the pulmonary veins fail to connect to the left atrium and instead connect to a systemic vein above the heart (supracardiac), below the heart (infracardiac), or directly to the right atrium or coronary sinus (cardiac). TAPVC may occur in isolation or in combination with other cardiac defects. TAPVC appears to be a rare anomaly in bovine as well as other species of animal. Its frequency is about 4.5% of all cardiac malformations in cattle.[1] There have been few reports of antemortem echo diagnosis in animals.[2–4]
Materials and Methods:
We describe two-dimensional (2D), contrast, and Doppler echocardiographic features of nine calves of supracardiac TAPVC draining into the left azygos vein. Methods: Nine calves (eight Japanese Black and one Holstein) with subsequent necropsy confirmation of TAPVC were studied between September 1983 and February 2012. Predominant clinical signs included anorexia, weakness, poor growth, dyspnea, jugular venous distension, right- or left-sided systolic murmur.
Results:
TAPVC was not correctly diagnosed in the first case; however, in the subsequent eight cases, a precise diagnosis was obtained. 2D-echocardiographic findings consisted of an enlarged right ventricle and right atrium with the atrial septum bulging into the left atrium and an abnormal echo-free space (presumed pulmonary venous confluence (PVC) lying dorsal to the left atrium in the absence of the pulmonary venous entry into the left atrium. By

tilting the transducer, a distal part (presumed left azygzos vein) of PVC then connected to a tubular structure (presumed coronary sinus), and finally entered the right atrium. By contrast echocardiography, contrast echoes filled the right atrium and right ventricle with subsequent filling of the left atrium and left ventricle due to right-to-left interatrial shunting through a patent foramen ovale, but did not fill any of the structures representing the PVC, left azygos vein, and coronary sinus. Doppler echocardiography indicated right-to-left interatrial shunt flow across the patent foramen ovale and tricuspid regurgitant flow.

Conclusions:

Our experience with a limited number of cases suggests that bovine TAPVC to the left azygos vein can be diagnosed by 2D, contrast, and Doppler echocardiography.

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ULTRASONOGRAPHIC AND ANATOMIC BIOMETRIC AND STRUCTURAL ASSESSMENT OF THE OSTRICH (STRUTHIO CAMELUS) EYE

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Introduction:

Avian ophthalmology has become an important part of medical investigation of this group of animals and ultrasonographic imaging of anatomical peculiarities of the eye is important in ocular investigation to reach appropriate diagnoses.

Aim:

The objectives were to describe the ultrasonographic appearance of the normal ostrich eye and to compare ultrasonographic and anatomic biometric measurements in order to evaluate the effectiveness and accuracy of ocular ultrasonic biometry in this species. Both eyes of 10 normal ostrichs were examined.

Materials and Methods:

Twenty transcorneal ocular ultrasonograms were performed using a 10 MHz linear transducer on 10 pairs of eyes from healthy ostriches. Measurement included the distances between the anterior and posterior faces of the cornea (D1), between the cornea and anterior lens capsule (D2), between the anterior and posterior capsules of the lens (D3), between the posterior lens capsule and optic disc (D4), the axial diameter of the eye (D5), the height of the pecten (D6), and the length of pecten (D7). The same intraocular and axial measurements were made on transected frozen eyes with the caliper as had been made by ultrasonography.

Results:

Ultrasonographic biometry determined the measurements D1–D7 as being 0.95 ± 0.14 and 0.90 ± 0.13 (D1), 2.63 ± 0.58 and 2.46 ± 0.64 (D2), 8.2 ± 0.30 and 8.2 ± 0.30 (D3), 22.93 ± 0.83 and 22.84 ± 0.75 (D4), 34.57 ± 0.96 and 34.32 ± 1.03 (D5), 17.12 ± 1.13 and 16.7 ± 1.04 (D6), and 10.44 ± 1.81 and 10.57 ± 2.16 (D7) in both eyes, respectively. Anatomical biometry gave results not statistically different apart from D1, D5, and D6 where corneal thickness was greater on anatomical measurement but the axial diameter and pectin length were smaller.

Conclusion:

Real time B-mode ultrasonography can be used in ocular biometry and for assessment of the structure of the eye in ostrich.

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MAGNETIC RESONANCE IMAGING (MRI) SPINAL CORD AND CANAL MEASUREMENTS IN NORMAL DOGS

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Introduction:

Imaging diagnosis of diffuse degenerative spinal cord diseases is difficult.[1,2] Myelography and computed tomography may demonstrate a smaller cord than is seen in normal dogs.[3] Normal spinal dimensions in dogs as measured on MRI have not been published.

Aim:

The goal of this study was to establish MRI reference ranges for spinal measurements in normal dogs. The hypothesis was that an increase of spinal cord and spinal canal diameter would be noted with increasing weight, and that the spinal cord-to-spinal canal ratio would remain constant between different weight groups.

Materials and Methods:

A total of 40 dogs (1–10 kg, 11–20 kg, 21–30 kg, >30 kg; 10 dogs per category) underwent spinal MRI (1.0T Siemens Magnetom Harmony). Spinal measurements were performed on sagittal T2-W images at the level of T4, T9, and L3. One-Way ANOVA or Kruskal–Wallis ANOVA on Ranks were used for comparison between groups. A P-value of <0.05 was considered significant.

Results:

Mean/median spinal canal diameter (mm) ranged from 6.07 ± 0.63 (1–10 kg) to 8.27 ± 1.15 (>30 kg) at the level of T4; 6.55 ± 0.61 (1–10 kg) to 9.04 ± 1.26 (>30 kg) at the level at T9; and 6.80 (6.47–7.00; 1–10 kg) to 9.00 (7.90–9.73; >30 kg) at the level of L3. There were significant differences between groups ($P < 0.05$). Mean spinal cord diameter (mm) ranged from 4.46 ± 0.51(11–20 kg) to 4.70 ± 0.35 (1–10 kg) at the level of T4; 4.41 ± 0.50 (>30 kg) to 4.85 ± 0.57 (1–10 kg) at the level of T9; and 4.52 ± 0.51 (>30 kg) to 5.14 ± 0.68 (1–10 kg). There were no significant differences between groups. Spinal cord to spinal canal ratio varied significantly between different weight groups, ranging from 0.51 ± 0.08 (>30 kg at L3) to 0.78 (0.69–0.80; 1–10 kg at T4) ($P < 0.05$).

Discussion/Conclusions:

While a significant increase in spinal canal diameter was noted with increasing weight, no significant differences were noted in spinal cord diameter between weight groups. The spinal cord to spinal canal ratio was significantly smaller in larger dogs. These findings are important when using MRI to evaluate patients with suspected degenerative spinal cord disease.

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MAGNETIC RESONANCE IMAGING (MRI) OF THE CENTRAL NERVOUS SYSTEM IN LARGE FELIDS

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Introduction:

To date, reports describing CNS disorders in large felids and their diagnosis have been limited to a few papers detailing the use of radiographs, myelography, and computed tomography (CT).[1,2] MRI findings have been reported in lions with hypovitaminosis A[3,4] and in a tiger cub following hypoxic arrest during general anesthesia.[5] To our knowledge, MRI findings in a varied population of large felids with CNS disease have not been reported.

Aims

To describe MRI findings in large felids presented to UTVMC with brain or spinal disorders.

Materials and Methods:

The MRI database was searched for large nondomestic cats in which MRI of the brain or spine was performed. The scans were reviewed. The medical records were evaluated and signalment, history, clinical signs, and diagnosis/outcome were recorded.

Results:

Fourteen MRI scans in 13 animals were available for review. All scans were performed using a 1.0T scanner (Siemens Magnetom Harmony). Patients included five tigers (Panthera tigris), four lions (Panthera leo), and one each of cheetah (*Acinox jubatus*), bobcat (*Lynx rufus*), caracal (*Felis caracal*), and leopard (*Panthera pardus*). Median age was 14 years (range, 6 months–17 years). Areas imaged included the head/brain ($n = 11$), cervical spine ($n = 1$), and thoracolumbar spine ($n = 2$). Six cats are alive at the time of abstract submission, six animals had been euthanized. MRI sequences used for evaluation of the head/brain included T2W, T1W, fluid attenuated inversion recovery (FLAIR), T2*-W GRE and postcontrast T1-W. MRI sequences used for evaluation of the spine included T2-W, T1-W, short tau inversion recovery (STIR), and half-Fourier-acquisition single-shot turbo spin–echo (HASTE). Diagnoses based on imaging findings were severe otitis media and cellulitis without intracranial extension ($n = 1$), Chiari-type malformation (presumed hypovitaminosis A) ($n = 1$), hydrocephalus and ependymal contrast enhancement due to intracranial blastomycosis ($n = 1$), normal brain MR examination ($n = 7$), and intervertebral disc herniation ($n = 3$).

Discussion/Conclusions:

MRI is feasible in large felids and provides important information in the clinical evaluation of a variety of intracranial and spinal diseases.

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DETECTION OF ABNORMAL GAS ACCUMULATION ON COMPUTED TOMOGRAPHY EXAMINATION OF SMALL AND LARGE ANIMALS

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Introduction:
A small amount of vascular air embolism has been detected on Computed Tomography (CT) examination of humans as an incidental finding secondary to intravenous administration of contrast material.
Aim:
The purpose of this study is to describe the prevalence and location of abnormal gas accumulation detected on a routine CT examinations of both large and small animal patients.
Materials and Methods:
A retrospective study of CT examination from Nov 2010 to Oct 2011 at Purdue University was performed. All CT examinations were carefully evaluated for any abnormal gas accumulation, and if any, the amount of gas was estimated and location was noted.
Results and Discussion:
A total number of 257 dogs, 33 cats, and 6 horses and 4 other species were examined during this period of time. Abnormal gas accumulation was detected in 67 locations; 17 were intravascular, 9 were detected as vacuum phenomenon, 3 were in the anal sacs and the remaining 38 were mainly found in the muscle and subcutaneous tissue. For those with intravascular gas, the gas was detected in both pre and postcontrast studies in 10 cases. Gas was only present in the precontrast study and was not seen in postcontrast studies in three cases. Gas was only present in postcontrast studies alone in four cases. Most of the gas was located in the axillary vein with only one detected in the caudal vena cava. As for the vacuum phenomenon, six were detected in the intervertebral disc spaces, three were in the synovial joints in which one was at the costovertebral joint. The cause of the intravascular gas was most likely iatrogenic secondary to intravenous administration of drugs and contrast material. Due to the small amount of gas detected in the vasculatures, this normally does not lead to clinical complications such as air embolism. The presence of gas in the muscle and subcutaneous tissues were mainly secondary to trauma, subcutaneous injection or biopsy.
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LOW-FIELD MAGNETIC RESONANCE IMAGING TO DETERMINE THE RELATIONSHIP BETWEEN FOOT CONFORMATION AND FOOT LESIONS IN LAME HORSES

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Introduction:
Foot conformation is commonly thought to be associated with lameness, however scientific evidence is scarce. It has been shown in biomechanical studies that foot conformation does influence the forces acting on the different structures in the foot,[1] but no correlation could be found between foot conformation and risk of disease.[2] Conformation assessment in those studies was based on radiographs, which are prone to measurement as well as interpretation errors.[3] The aim of this study was to determine the relationship between foot conformation and different types of lesion within the foot in lame horses based on magnetic resonance images (MRI). It was hypothesised that certain conformation parameters differ significantly between different types of foot lesions.
Material and Methods:
Conformation parameters were measured on magnetic resonance images in the midsagittal plane of 179 lame horses with lesions of their deep digital flexor tendon (DDFT), navicular bone (NB), collateral ligaments of the distal interphalangeal joints and other structures.
Results:
MRI based foot conformation measurements resulted in smaller measurement errors compared to radiographs. Conformation parameters differed significantly between lesion groups. A larger sole angle decreased the likelihood of combined DDFT and NB lesions, but not NB lesions alone. A more acute angle of the DDFT round the NB was associated with DDFT and NB lesions, and a decrease in heel height index with DDFT injury. The larger the sole angle the smaller the likelihood of a DDFT or NB lesion with odds ratios of 0.86 and 0.90, respectively. Foot conformation is different in horses with deep digital flexor and navicular bone lesions and foot conformation should hence be optimized as a preventive/therapeutic precautionary measure.
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USING MRI, HEAD CONFORMATION APPEARS TO INFLUENCE THE CRANIAL FOSSAE IN DOGS

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Introduction:
Craniometry can define the different shape and size of dog heads, and thus might contribute to the identification of those animals that are susceptible to certain intracranial diseases[1]: meningiomas in dolichocephalics, astrocytomas, and choroid plexus neoplasia[2,3] in brachycephalics.
Aim:
To investigate if there was a relationship between head conformation and the cranial fossae.
Methods:
Forty-eight dogs [36 brachycephalics; 8 mesaticephalics, and 4 dolichocephalics] with no clinical pathological changes to the cranial cavity were selected. Using a 1.5 Tesla magnet (T1-W/T2-W images) on midline sagittal plane, the following measurements were made (i) Head conformation parameters: Evans, Stockard indices, and olfactory bulb angulation. (ii) The rostral, middle, and caudal fossae areas, (iii) ethmoidal fossa area, each corrected for brain area.
Results:
(i) Significant correlations were found between head conformation [Evans and Stockard indices and olfactory bulb angle] and the areas of rostral, middle [$P < 0.0001$ for all of the parameters] and caudal fossae [$P = 0.0229$, 0.0242, and 0.0420 for head conformation parameters], (ii) significant correlation between body weight and areas of the above fossae [$P = 0.0019$, 0.0047, 0.1269, respectively], (iii) correlation also existed between the rostral, middle, but not the caudal fossae and head conformation, but no correlation was established with body weight when the above parameters were compared in brachycephalic breeds, (iv) The ethmoidal fossa of the rostral fossa was most impacted by head conformation.
Conclusion:
It is suggested that head conformation is the factor affecting cerebrum size, but not cerebellar. The ethmoidal fossa part of the rostral fossa is variable in dogs and dependent on head conformation.
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SINGLE DIMENSION PARAMETERS FOR DETERMINING THE DEGREE OF HEAD CONFORMATION IN DOGS USING IN VIVO MRI

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Introduction:
The selection for specific physical characteristics, by dog breeders, has resulted in over expression of certain related but undesirable phenotypes in some breeds. One of these features is extreme brachycephalic skull conformation that is commonly associated with secondary conformational changes affecting airways, eyes, and central nervous system[1] (CNS). Subjectively, one CNS feature that varies with skull conformation, and which can be determined by magnetic resonance imaging (MRI) is the position of the olfactory bulb.
Aims:
Is using in vivo MRI one-dimensional parameters, instead of the classic two, feasible for determining the degree of skull conformation?
Material and Methods:
A total of 44 dogs, representing a spectrum of skull conformation, with no clinical signs or pathology of either cranial or olfactory bulb were recruited. The following measurements were made using T1-W/T2-W images: (i) on transverse and sagittal—the cephalic index using historical formulae[2,3]; (ii) on sagittal—the olfactory bulb position and orientation relative to the rest of the cranium were calculated.
Results:
There were (i) a significant association between olfactory bulb angulation and both Stockard and Evans indices ($P < 0.001$); (ii) significant correlation between body weight and areas of the rosral and middle but not the caudal fossae [$P = 0.0019$, 0.0047, and 0.1269, respectively]
Conclusions:
(i) Using one-dimensional parameters, i.e. the olfactory bulb position and orientation, is feasible for determining the degree of the skull conformation (ii) The new parameters may be a useful tool for selection of appropriate breeding animals in breeds with a skull conformation phenotype at the extreme brachycephalic end of the spectrum.
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MAGNETIC RESONANCE IMAGING CHARACTERISTICS OF SUSPECTED VERTEBRAL INSTABILITY ASSOCIATED WITH FRACTURE OR SUBLUXATION IN ELEVEN DOGS

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Aim:
The imaging assessment of traumatic vertebral fractures and subluxation in dogs has only been described previously in radiographic and computed tomographic studies.[1,2] This paper

documents the magnetic resonance imaging (MRI) features associated with suspected unstable vertebral fractures and subluxations in dogs.
Materials and Methods:
Eleven dogs that had MRI prior to surgical stabilization of vertebral fractures and/or subluxations were included in the study. Nine dogs also had survey radiographs. Four dogs had cervical fracture or fracture-subluxation and presented with tetraplegia with intact nociception ($n = 2$) or nonambulatory tetraparesis ($n = 2$). Seven dogs had thoracolumbar fracture-subluxation or subluxation and presented with paraplegia with intact nociception ($n = 5$) or non-ambulatory paraparesis ($n = 2$). A three-compartment model was applied to the interpretation of both the radiographic and MRI studies.[3,4]
Results:
Radiography identified compartmental disruption suggestive of spinal instability in seven out of the nine cases radiographed. On MRI the sites of trauma were all associated with rupture of the supportive soft tissue structures and/or fracture in at least two compartments. Nine cases had spinal cord changes on MRI including signal intensity changes, swelling, compression, and intramedullary hemorrhage. Each injury was associated with paravertebral muscle intensity changes, which could be used to help identify sites of trauma.
Discussion/Conclusion:
MRI was found to provide information on the supportive soft tissue structures associated with spinal stability and enabled assessment of spinal cord injury in vertebral fracture and subluxation.
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TERMINOLOGY AND CLASSIFICATION OF LUMBAR DISC PATHOLOGIES IN VETERINARY RADIOLOGY

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Introduction and Objective:
Latest developments in the field of veterinary radiology have increased the reliability on the diagnosis of disc hernias, and simultaneously enabled new medical and surgical methods.[1] Surgical treatment is necessary regarding only the 15% of lumbar disc herniations.[2] The purpose of this study is to search for the frequency of disc pathologies, which are quite frequent in human, in dogs, their classification and consistence.
Materials and Methods:
Between 2005 and 2012, a total of 26 dogs (16 female, 10 male) which were suspected to have disc pathology were examined by sectioning 0.625-mm thickness and obtaining reconstructions using GE Optima, Siemens symphony Spiral CT and GE Sıgna 1,5 tesla MRI (using FSE T2W, SE T1A sequences for sagittal and axial plans) device. In the meantime the results of the study group with North American Spine Society (NASS), The American Society of Neuroradiology (ASNR), and The American Society of Spine Radiology (ASSR), which gathered together to create a common terminology and classification, were evaluated.
Conclusion:
As a result of the examination, two female and two male dogs were diagnosed with disc pathology in the manner of bulging and three female dogs were diagnosed with degenerated disc hernia. Regarding 26 dogs suspected of having disc disease, various pathologies were detected regarding the% 26,92 of the dogs.
Discussion:
We found that dogs had disc pathologies, which fitted the classification in human. Thus, we concluded that the pathological classifications and terminologies used for humans can be used for dogs as well. Besides every material that made pressure on the medulla spinalis is not a herniation. We have to distinguish herniation protrusion and bulging from each other. Before concluding a hernia disc operation, we should discuss this with a clinician doctor and possess a medical and surgical orientation.
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SPIROCERCA LUPI ASSOCIATED VERTEBRAL CHANGES: A RADIOLOGIC-PATHOLOGIC STUDY

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Introduction:
Spirocerca lupi is a nematode of worldwide distribution with the dog being the definitive host.[3] Pathognomonic thoracic radiographic changes are a caudodorsal mediastinal mass with or without aorta aneurysm formation and spondylitis.[2,3] Spondylitis is either an infectious or noninfectious inflammatory reaction of the vertebral body with no involvement of the vertebral end plate and disc space. Infectious spondylitis has classically been associated with migrating inhaled grass awns[1] involving the mid lumbar vertebra or secondarily to penetrating foreign bodies. Noninfectious spondylitis of the caudal lumbar vertebra is associated with pelvic neoplasia.[1]
Aim:
To evaluate thoracic spondylitis lesions seen on radiographs histopathologically to determine the aetiopathogenesis of the radiological changes.
Materials and Methods:
Eleven dogs with *S. lupi* spondylitis. Some dogs had associated spondylosis and aortic changes. At necropsy the affected vertebral column was removed, reradiographed, and then processed for histological examination. Five dogs had selected additional samples examined by electron microscopy.
Results:
Radiologically 35 vertebra had spondylitis (T5 = 1, T6 = 4, T7 = 6, T8 = 9, T9 = 5, T10 = 8, T11 = 2). Histologically most of these had varying degrees of irregular, metaplastic periosteal woven new bone formation continuous with the surface of the underlying mature ventral cortical bone. The intervening matrix was often composed of collagen. Osteoblasts, hemopoetic progenitor cells, and variable numbers of osteoclasts were observed within and at the outermost edge of the woven bone. Metaplastic cartilage was evident in about 50% of cases. In three dogs histologically and an additional two dogs on electron microscopy convincing evidence of inflammation (lymphocytes, plasma cells, oedema, and fibrin) was seen. In a single microscopic section Spirocerca larvated eggs were seen adjacent to the ventral vertebral body but were not associated with any pathology.
Discussion:
Inflammatory changes of the vertebral body were seen in 5 of 11 dogs confirming that the term spondylitis is an appropriate description of the radiological changes. Additional inflammatory changes may have been present in the paravertebral soft tissues in more dogs but could have been lost during specimen preparation.
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THE RADIOGRAPHIC AND CT FINDINGS OF SPIROCERCOSIS-INDUCED AORTIC CHANGES

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Introduction:
Spirocerca lupi (*S. lupi*) is a nematode of worldwide distribution with the dog being the definitive host.[1,2] Pathognomonic thoracic radiographic changes are a caudodorsal mediastinal mass with or without aorta aneurysm formation and spondylitis.[1,2]
Aim:
To evaluate aortic lesions seen on radiographs and CT.
Materials and Methods:
A total of 42 cases in which benign or malignant *S. lupi* associated oesophageal nodules were diagnosed. Each dog had DV and RLR thoracic radiographs made as well a pre and postcontrast thoracic CT. Radiographs and CT examinations were evaluated independently for visibility, extent, and location of aortic mineralization or aneurysm formation. Additionally for postcontrast CT images aortic thrombi were recorded.
Results:
Dogs had a median age of 60 (range 10–160) months. Aortic wall mineralization, 1–3 mm thick, was seen on radiographs in 2 dogs versus 18 dogs on CT with no circumferential predilection. Eleven dogs had mineralization at one vertebral level with the remainder having more extensive involvement ranging from T4–T12. Thirty-three aneurysms were seen in 25 dogs on radiographs, whereas 20 were seen in 15 dogs on CT. On CT the level of aortic involvement for the largest aneurysm were T2 and T5–T12 with T4–T7 making up 76% of cases. The height of aneurysm protrusion beyond the borders of the aorta varied from 3 to 24 mm. A significant number ($P = 0.002$) of the mineralization's were associated with neoplastic transformation of the oesophageal nodule but not so for the aneurysms. Aortic thrombi were seen in two dogs.
Discussion/Conclusion:
Aortic mineralization is commonly seen on CT and rarely on radiographs and may be associated with oesophageal nodule neoplasia. Aneurysm formation appears to be over diagnosed on radiographs. Unsuspected aortic thrombosis may be present in up to 5% of cases.
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MULTIROW COMPUTED TOMOGRAPHY FINDINGS IN CALVES WITH OTITIS

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Introduction:
Otitis media/interna is an increasing problem in calves and often diagnosed late. It commonly affects several animals of a herd and may be associated with respiratory disease.[1] Computed tomography (CT) is the imaging gold standard to evaluate the middle ear.[2,3]

Aim:
To describe the CT features of affected calves compared to a control group.
Materials and Methods:
Five calves with signs of otitis and pneumonia were examined with a 24-row CT unit. A subsequent contrast study was performed using an injection rate of 2 ml/s with a scanning delay of 120 s. Three calves served as a control group. Data were reconstructed to image series with 0.6–1.5 mm slice thickness. The following changes were assessed: content of the tympanic bulla and external acoustic meatus, osteitis/lysis of the tympanic bulla and inner ear structures, involvement of the nerve canals/brain, presence of rhinitis/sinusitis. Measurements of the volume of the bulla, thickness of the bulla wall, height of the external acoustic meatus and opening of the auditory tube, density of the petrous part of the temporal bone and the bulla content pre and postcontrast were made.
Results:
Otitis was diagnosed with CT in all diseased animals and in one ear of a control animal (11 ears). The bulla and the external acoustic meatus were filled with soft tissue in 11 and 8 affected ears, respectively. Osteitis and lysis of the bulla were seen in 10 and 7 ears and the inner ear and the nerve canals were affected in 3 ears and 1 ear, respectively. Sinusitis was diagnosed in one calf. Affected ears showed a significantly increased volume of the bulla and density of its content, and thickened bulla wall ($P = 0.008$–0.038). Mycoplasma species were cultured from eight affected ears. Otitis was confirmed by histopathology in all affected ears.
Conclusion:
CT is an excellent tool to diagnose otitis media/interna in the calf.
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A NONINVASIVE EXAMINATION OF THE ABDOMEN OF THE AGOUTI (*DASYPROCTA LEPORINA*) WITH DIAGNOSTIC ULTRASOUND

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Introduction and Purpose
The agouti (*Dasyprocta leporina*) is a rodent of nutritional and economic importance in the Caribbean, Central and tropical South America.[1,4] It is, however, potentially a threatened species due to depletion of its habitat and by hunting for human consumption. Various conservation efforts, including scientific research, are being undertaken in order to ensure its survival. Among the scientific work are reports of anatomical studies of the abdominal viscera of the agouti.[2,3] Such studies necessitated killing of the animal. There is no report of abdominal evaluation in the live agouti. This study applied transcutaneous diagnostic ultrasound for noninvasive examination of the abdomen in live agoutis.
Materials and Methods:
The study was conducted on agoutis raised in captivity at the Field Station of the University of the West Indies, St Augustine, Trinidad and Tobago. Nonbreeding adult male and female agoutis were included. Abdominal ultrasonography was conducted on animals placed under general anaesthesia. A veterinary dedicated ultrasound system (MyLab 30 Gold, Esaote, Florence, Italy) with microconvex and linear array probes at 6.6–12.0 MHz was used to perform transcutaneous examination of the abdomen. The Ultrasonographic techniques used and their limitations were noted. The abdominal structures of the agouti were characterized.
Results:
Twelve agoutis (seven females, five males) were examined. Ultrasonographic windows were identified at the xiphoid and pelvic areas, along the costal arch, and the right and left paramedian areas of the ventral abdomen. The liver, stomach, spleen, large intestines, kidneys, urinary bladder, great abdominal vessels, and testes in males were consistently visualized with excellent detail of their internal architectures. The small intestines, uterus, and vagina were occasionally identified. The abdominal lymph nodes, pancreas, adrenal glands, and ovaries were not visualized mainly due to obstruction from gas within the caecum and colon.
Discussion and Conclusions:
Ultrasonography is a useful technique for noninvasive evaluation of the live agouti abdomen. It complements abdominal radiography, and may be a useful tool for reproductive and health management of the agouti, thereby contributing to its conservation.
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ULTRASONOGRAPHIC EVALUATION OF MASSIVE ABDOMINAL SWELLINGS IN COWS AND BUFFALOES

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Introduction:
Abdominal swellings in bovine animals located ventrolaterally are difficult to evaluate for its contents due to its ventral location, massive size, and temperament of the animal. Ultrasonography has been used to evaluate umbilical masses,[1] body wall in cattle[2], or abdominal wall hernias in humans.[3]
Aim:
Differential diagnosis of massive abdominal swellings in bovine.
Materials and Methods:
This study included adult cows ($n = 8$) and buffaloes ($n = 7$) with massive abdominal swelling in ventrolateral or in prepubic area. Palpation of it was done in standing and semidorsal recumbency. Ultrasonography of swelling and adjoining healthy wall was done. Animals were divided into four groups: group A (Prepubic tendon rupture or PPTR: six buffaloes, four cows), group B (Fibrinocystic swelling: one buffalo and two cow), group C (Abscess: one cow), and group D (Inflammatory swelling: one cow). Diagnosis was confirmed by palpation in semidorsal recumbency, needle aspiration or surgery.
Results and Discussion:
Abdominal swellings were soft on palpation except in one cow where it was firm. In group A, hernia defect was palpated in standing cows ($n = 2$) and a buffalo. In semidorsal recumbency, hernia defect was found in all the animals. In animals of group A, B and C, sonographically, muscle layer separated skin at the margin of swelling creating a gap between the two. In this gap, detection of loops of intestine close to skin indicated PPTR (group A), fluid and fibrin shreads indicated fibrinocystic swelling (group B), and echogenic contents indicated abscess (group C). Intact muscle layer was followed upto the hernia ring (group A) or below the swelling (group B and C). Mean $\pm$ SE abdominal wall thickness at healthy site (2.27 ± 0.2 cm) was significantly more compared to that of over the hernial swelling (0.98 ± 0.1 cm) in group A. In group D, ultrasonography revealed gradual increase in the total abdominal wall thickness over the swelling and abdominal viscera was seen away from the transducer indicating inflammatory swelling.
Conclusion:
Ultrasonography is a useful imaging technique in evaluating massive abdominal swellings in standing position. It differentiates PPTR from fibrinocystic, abscess or inflammatory swelling in bovine animals.
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RADIOGRAPHY AND ULTRASONOGRAPHY AS SCREENING TOOLS IN THE DETECTION OF LUNG AND LIVER CYSTS IN BOVINE

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Introduction:
Hydatidosis is an emerging zoonotic disease causing significant economic loss worldwide.[1] Bovine suffering from hydatid cysts usually remain asymptomatic[2] and diagnosed at necropsy.[1] Antemortem diagnosis of this condition may determine prognosis and prevent contamination of slaughter house. Scanty literature is available on radiography[3] and ultrasonography[4,5] of lung/liver cysts in cows and buffaloes.
Aim:
To investigate and compare radiography, ultrasonography, and cytology in the diagnosis of hydatidosis in bovine animals.
Materials and Methods:
Study was conducted on female buffaloes ($n = 12$) and cows ($n = 2$). History, clinical examination, and radiography were conducted. Ultrasonography of liver and lung region was performed with 2.0–5.0 MHz convex transducer. Ultrasound guided fine needle aspiration cytology (USGFNAC) was performed in buffaloes ($n = 7$). Diagnosis of echinococcosis was confirmed on postmortem and cytology in two buffaloes.
Results and Discussion:
Mean age of the animals was 8.31 ± 0.73 years. Partial ($n = 5$) or total anorexia ($n = 9$) upto 4 weeks, persistent tympany ($n = 4$), brisket/ventral edema ($n = 3$), and open mouth breathing ($n = 5$) were recorded. Lateral radiographs detected round, discrete, single/multiple lesions of soft tissue opacity in the lung region of 78.6% animals (nine buffaloes, two cows). Radiography and ultrasonography detected lung cysts in five buffaloes (37.5%). Radiography is a good tool for examining lung lesions[3] but it is not possible to image bovine liver with radiography. Ultrasonography is an alternate imaging modality for evaluation of liver in bovine. Ultrasonography detected single/multiple anechoic cavitary lesions[4,5] in liver; occasionally, degenerated, irregular or calcified, in 10 buffaloes and two cows. Animals with multiple hepatic cysts showed hepatomegaly and elevated liver enzymes. USGFNAC showed no parasites, indicating sterile hepatic/lung cysts. However, cytology of cyst fluid and cyst wall scrapings in two buffalo cadavers confirmed echinococcosis.
Conclusion:
Radiography and ultrasonography complemented each other for detecting lung cysts whereas ultrasonography is reliable for detecting hepatic cysts. Ultrasonography is recommended as a preliminary screening tool for hydatidosis in bovine animals.
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ASSESSMENT OF THE ARTICULAR CARTILAGE AND SUBCHONDRAL TRABECULAR BONE VIA EPIC-μCT IN EARLY STAGE OF MEDIAL CORONOID DISEASE (MCD)

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Introduction:
Medial coronoid disease (MCD) is a common heritable disease in large breed dogs, encompassing pathological changes both of the articular cartilage and the subchondral trabecular bone. Implementation of an ionic contrast agent together with microcomputed tomography (EPIC-μCT), is a contrast imaging technique that has been reported to have high precision and accuracy in assessing the morphology of articular cartilage.
Aim:
The aims of this study were to assess quantitatively the articular cartilage and subchondral trabecular bone changes in the early stage of MCD in growing Labrador Retrievers.
Materials and Methods:
Twenty-eight ulnas were collected from 14 Labrador Retrievers at different ages. The proximal one-third of each ulna was immersed in the contrast agent (Hexabrix 320, Guerbet Nederland B.V.) before scanning in a prototype in-vivo μCT system (Skyscan 1076, Skyscan). The interpretation of the results was performed using Skyscan software.
Results and Discussion:
EPIC-μCT was able to detect the changes in articular cartilage in the very early stage of MCD, which was clinically and radiographically silent. The measurements of mean X-ray attenuation from three different anatomical locations of articular cartilage (lateral, dorsal, and medial aspect of MCP) were highly correlated with each other and in general, the highest mean X-ray attenuation of articular cartilage was obtained from the lateral aspect of MCP. There was a significant correlation between disease status and changes in mean X-ray attenuation in all three different anatomical locations ($P < 0.01$), including the lateral aspect of the MCP, which corresponded to the anatomical location of MCD development. Significant increases in mean X-ray attenuation especially in the diseased group indicated that glycosaminoglycans (GAGs) content started to deplete in the early stage of MCD. In contrast, the micromorphological parameters of the subchondral trabecular bone (BV/TV, BS/TV, and Tb.Th) were affected significantly ($P < 0.01$) by difference in body weight (<20 kg, 20–25 kg, 25 kg), rather than disease status.
Conclusion:
Further investigation of the clinical applicable CT and MRI arthrography might be valuable for the early detection of MCD.
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QUANTITATIVE CT ASSESSMENT OF BONE MINERAL DENSITY IN DOGS WITH HYPERADRENOCORTICISM

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Introduction:
The metabolic effects of canine hyperadrenocorticism (HAC) have long been recognized as causing multiple morphological changes, especially osteopenia.[1,2] Although HAC is probably one of the most common causes of general osteopenia seen radiographically in dogs,[2,3] there is no study about measurement of bone mineral density (BMD) by using quantitative computed tomography (QCT) in dogs with HAC.
Aim:
The aim of this study is to assess BMD in canine patients with HAC using QCT.
Materials and Methods:
The BMDs were compared between normal 76 dogs and 8 HAC dogs (six PDH; pituitary dependent hyperadrenocorticism, two ADH; adrenal dependent hyperadrenocorticism) diagnosed through hormonal assay during 2011–2012 at Chungbuk National University. CT scan of 12th thoracic (T12) to 7th lumbar vertebra (L7) was performed and the elliptical region of interest was drawn in each trabecular and cortical bone. Mean Hounsfield unit values were converted to equivalent BMD with bone-density phantom (calcium hydroxyapatite) by linear regression analysis ($r^2 > 0.95$). Also, BMDs in HAC dogs were evaluated using Z-score.
Results:
The converted mean trabecular BMDs (tBMD $\pm$ SD) of T12-L7 in PDH (ranging from 215.1 $\pm$ 23 to 231.7 $\pm$ 22.21 mg/cm^3) and ADH (172.3 $\pm$ 2.5–238.5 $\pm$ 2.0 mg/cm^3) dogs were significantly lower ($P < 0.001$) than those of normal dogs (252.5 $\pm$ 88.1–292.9 $\pm$ 36.1 mg/cm^3), respectively. ADH dogs showed significant lower ($P < 0.01$) BMDs at cortical bone of T12-L7 (214 $\pm$ 50.7–279.2 $\pm$ 52.1 mg/cm^3) than those of normal dogs (469.0 $\pm$ 123.7–536.2 $\pm$ 127.1 mg/cm^3). The Z-scores of T12-L7 in both HAC dogs were low comparing normal dogs.
Conclusions:
Mean tBMDs of vertebra in PDH dogs using QCT were significantly lower than mean tBMDs of vertebra in normal dogs. Also, both mean trabecular and cortical BMDs of vertebra in ADH dog were significantly lower than mean cortical BMDs of vertebra in normal dogs. Therefore, it is advisable to monitor BMD during follow up of HAC patients to prevent secondary bone disorders.
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THE VALUE OF COMPUTED TOMOGRAPHY IN THE DIAGNOSIS AND TREATMENT OF ORTHOPEDIC DISEASES IN ALPACAS

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Introduction:
The value of computed tomography (CT) examinations in veterinary medicine is confirmed by numerous small animal and equine studies.[1,2] In general, there is only little experience in diagnostic imaging in the alpaca and CT-examinations are only described for diseases related to the head.[3,4] The use of this imaging modality for diagnosis of orthopedic diseases is not yet reported for this species.
Aim:
To describe the importance of computed tomography for diagnosis and preoperative planning of orthopedic diseases in alpacas.
Materials and Methods:
Clinical records from 2008–2012 were reviewed for CT and radiographic examinations related to orthopedic reasons in the alpaca species. Cases are presented and discussed in a case series.
Results and Discussion:
In the defined period 22 alpacas were presented to the hospital for evaluation of orthopedic injuries. Radiography was performed in all, followed by a CT examination in 6/22. CT findings included luxation of the cervical column (2/6), septic femorocoxal osteoarthritis (1/6), scapular necrosis (1/6), luxation of the talocrural articulation with fracture of the medial malleolus (1/6) and septic metacarpophalangeal arthritis with comminuted fracture of a proximal sesamoid bone (1/6). Treatments were performed in four of six of which three had a successful outcome.
Conclusion:
With increasing numbers of alpacas referred to the veterinary hospital, a CT examination is considered as an important diagnostic technique for correct diagnosis and precise preoperative planning. The short examinations time and the ability to examine the entire animal with this three-dimensional imaging modality are superior to conventional radiography, which also requires general anesthesia in most cases.
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ULTRASOUND-GUIDED CERVICAL FACET JOINT INJECTION IN THE DOG

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Introduction:
Ultrasound-guided injection of cervical facet joints is a well-established procedure in both humans and horses for neck pain resulting from osteoarthritis, but it has not been described in dogs.[1,2] Spondylomyelopathy is a common disease in dogs due to both disc disease and osseous lesions of the cervical spine and is a source of neck pain.
Aim:
Describe the sonographic anatomy and landmarks for facet joint injections in the dog and develop a technique for injections. Determine the accuracy of injections and the factors that may influence it. Perform injections in affected dogs and assess clinical outcome.
Materials and Methods:
Bony landmarks for each cervical facet joint from C2–3 to C7-T1 were established using a linear ultrasound probe on a skeleton in a water bath. Using 11 canine cadavers (5.3–24.2 kg

body weight), the joint spaces C2-T1 on the right and left sides were injected individually under ultrasound guidance with 0.1 ml of solution of 10% gelatin and 33% iothalamate meglumine 282 mg/ml iodine. A CT scan was acquired following each injection, and an injection score was assigned. Age, gender, weight, body condition score, transverse and dorsal angle of each joint, neck diameter at each joint, and vertebral mensuration for each vertebra were recorded for each dog. Three client-owned dogs with cervical pain that had MRI to rule out compressive disc disease were injected at multiple sites where arthropathy was diagnosed with a 6% solution of triamcinolone.

Results:

The transverse processes serve as excellent sonographic landmarks for identifying the cervical vertebral joints in dogs regardless of the size of the dog or location along the vertebrae. Accuracy of ultrasound-guided facet joint injection in dogs is high (83%) and similar to published techniques in horses. The three affected dogs all had relief of their cervical pain within 24 h following facet joint injection, which lasted for at least 4 months.

Conclusions:

Ultrasound-guided intra-articular cervical facet joint injection is a feasible technique in the dog. Ultrasound-guided injection of the cervical articular facet joints with anti-inflammatory drugs warrants future clinical trials to determine safety and efficacy in treating arthrosis in affected dogs.

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A COMPARISON OF TRANSTHORACIC ECHOCARDIOGRAPHIC M-MODE MEASUREMENTS TO ALLOMETRIC SCALING DERIVED VALUES IN CLINICALLY NORMAL ADULT DACHSHUNDS

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Introduction:

Mitral valve prolapse (MVP) in Dachshunds is associated with progressive myxomatous mitral valvular degeneration.[1–3] Allometric scaling is currently used to predict normal M-Mode cardiac measurements in adult dogs.[4] However, many studies have reported that breed and body conformation influences canine echocardiographic measurements.[5]

Aim:

To compare transthoracic echocardiographic M-mode measurements to allometric scaling derived values in clinically normal adult Dachshunds.

Materials and Methods:

A total 43 standard Dachshunds, aged 1–7 years, weighing $\geq$ 5 kg underwent physical examination, cursory echocardiography (for MVP and valvular defects), Doppler blood pressure measurements, electrocardiography assessment, complete blood count, and thoracic radiographic examination. Results of 34 clinically healthy Dachshunds were included. Adequacy of allometric scaling was evaluated by calculating the proportion of measured values that fell within the estimated ranges and its 95% confidence interval (CI). Average allometric scaling values were also compared to true values using Pearson's correlation coefficients (r), paired t-tests and Bland–Altman plots.

Results:

Variable	Mean $n = 34$	Measured values range: Min (Mean −2SD)	Measured values range: Max (Mean +2SD)	Allometric scaling range (Mean body weight: 8.3 kg)	Proportion of measured values within allometric scalling range (%)	CI (%)
LA (mm)	20.4	15.2	25.6	12.2–20.1	50	33–66
Ao (mm)	14.5	11.7	17.3	13.0–13.8	100	92–100
IVSd (mm)	6.4	4.8	8.0	4.8–9.8	100	92–100
IVSs (mm)	6.7	6.9	10.5	7.2–13.1	97	86–100
LVIDd (mm)	27.5	21.0	34.1	23.7–34.5	94	82–99
LVIDs (mm)	16.2	10.3	22.1	13.8–25.4	82	67–93
LVPWd (mm)	6.5	4.9	8.1	4.7–9.8	100	92–100
LVPWs (mm)	9.8	7.3	12.3	7.7–13.3	100	92–100

Discussion/Conclusion:

More than 90% of six variables were within the allometric scaling range due to the latter's wide prediction interval. Allometric scaling values may be inappropriate for LVIDs but sample size could be a limiting factor. Acquired LA values did not fit the allometric scaling values because the LA measurements were obtained using two-dimensional right parasternal short axis view compared to the M-mode technique in allometric scaling. Breed-specific echocardiographic references should be used whenever available.

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QUANTITATIVE COMPARISON OF BOLUS VERSUS CONTINUOUS INFUSION CONTRAST ENHANCED ULTRASONOGRAPHY OF PANCREAS AND DUODENUM IN NORMAL DOGS

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Introduction:

In human medicine, contrast enhanced ultrasound of the pancreas is utilized for identification of tumors such as pancreatic adenocarcinoma and insulinoma based on its vascularization. In severe acute pancreatitis, areas of necrosis are delineated as hypoechoic areas. However as the blood supply of the pancreas is entirely arterial, fast washout of bolus method contrast enhanced ultrasound makes correct lesion characterization difficult. Furthermore, the canine pancreas cannot be viewed entirely in a single view due to its anatomy. There exists a need to prolong contrast enhancement of the pancreas and duodenum for better assessment.

Aim:

Quantitatively comparing bolus and continuous infusion contrast enhanced ultrasound of pancreas and duodenum in normal dogs.

Materials and Methods:

Eight adult dogs were imaged using contrast-enhanced ultrasound with Sonazoid®. All dogs received a single bolus and continuous infusion of contrast agent intravenously on separate days. The time to initial upslope from injection, peak intensity, time to peak intensity from initial upslope were measured in the pancreas, duodenum and liver after bolus and continuous infusion. The time to washout was measured only from the pancreas and duodenum.

Results:

For bolus injection, the pancreas was enhanced rapidly followed by the duodenum. Peak enhancement of the pancreas was seen seconds later followed by the duodenum. Gradual enhancement of the liver began when the contrast effect of the pancreas and duodenum decreased sharply followed by gradual loss of enhancement. The liver showed significantly longer time to initial upslope and time to peak intensity from injection compared to the pancreas and duodenum ($P < 0.001$). Peak intensity between the three organs was not significantly different. For continuous infusion, delayed pancreatic enhancement followed by duodenum was observed. Enhancement was more gradual until it reached its peak and then plateau longer than the period of contrast agent infusion. Loss of enhancement was gradual.

Discussion/Conclusion:

The pancreas and the duodenum had a similar enhancement pattern. Bolus injection provided brief window for imaging. Improved imaging of these arterial organs was afforded by continuous infusion method.

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RENAL SECONDARY HYPERPARATHYROIDISM—CASE REPORT

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Introduction:

Renal secondary hyperparathyroidism is one of the most important metabolic diseases related to renal failure. The loss of renal function disturbs the metabolism of calcium and phosphorus considerably. The metabolism unbanlance instigates the parathyroid gland and increases the parathyroid hormone in an attempt to keep the calcium homeostasis, causing bone demineralization.[1,2] As a result, bone radiopacity may be similar to that of soft tissue, cortices may appear abnormally, a loss of definition of the normally dense dental lamina may also occur.[3] Spinal deformity and pathologic folding fractures[3] are common, including mineralization of soft tissues[2,3] and kidneys.[2]

Case Report:

A 10-year-old dog, Cocker Spaniel, male, few days of innapetence, difficult mastication and local edema was submitted to laboratory and radiographic examination. The X-ray revealed a decreased bone opacity, similar to that of soft tissue and a loss of definition of normally dense dental lamina; bone destruction and severe symmetrical rami and jaws; bone lysis, symmetric nasal bones, and frontal and ethmoid cavity flow. Also bone lysis in part of the auditory bullae. Evident swelling of soft tissues in the region. Opacity of sinuses. Laboratory evaluation were: urea (518,29 / 10,0 to 60,0 mg/dl), creatinine (10,4 / 0,5 to 1,6 mg/dl), phosphorus (21,40/ 2,6 to 6,8 mg/dl). Parathyroid hormone (153,60 / 0,50 to 5,80 pmol/l) increased and calcium (6,47 / 8,8 to 11,9 mg/dl) decreased.

Discussion and Conclusion:
The excessive secretion of PTH is due to hypocalcemia in chronic kidney desease. Beside the laboratory exams, radiography is necessary to an appropriate assessment of the axial and appendicular skeleton. An early radiographic diagnosis assists in a better prognosis of the disease and improved quality of life. With industrial and balanced animal food, this kind of disease has become really rare.
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COMPUTED TOMOGRAPHIC VERSUS RADIOGRAPHIC DIAGNOSIS OF MULTIPLE MYELOMA IN A DOG—CASE REPORT

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Introduction:
Multiple Myeloma (MM) is a neoplasia, characterized by proliferation of malignant plasma cells, involving the bone marrow and extra-osseous structures, in a multifocal and asymmetrical pattern.[1]
The diagnosis is based on the presence of plasmocytes in the bone marrow, multifocal moth-eaten type osteolysis, mainly on the axial skeleton, and also Bence-Jones proteinuria.[1]
Case Report:
A 6-year-old, male Boxer dog, weighting approximately 30 kg, was evaluated at a private veterinary clinic for hyporexia and apathy. At the clinical exam, the dog had high sensitivity to palpation at different sites of the spine. On a radiographic study of the spine, ventral spondylosis at L7-S1 was identified, but no evidence of osteolytic areas was seen. In order to gather more information, computed tomography (CT) study of the spine was performed. In the seventh cervical vertebra, multifocal, and asymmetrical osteolytic areas were seen on the vertebral bodies with associated decreased bone density. No medullar compressive lesions were identified, even after a myelogram. After 6 days, the dog died and necropsy was made. At this investigation, bone lysis of C7, and congested and swollen lungs were identified. At the histopathological exam, C7 had lysis and plasmocyte proliferation. The cause of death was speculated as endotoxic shock, and the interpretation of the anatomopathological samples was consistent with MM.
Discussion:
MM is a fatal disease, which could have a quick and painful course, if early diagnosis and adequate supportive care are not provided.[2] Radiographic studies of patients with MM may show no alterations, as significant degree of bone loss is necessary to be radiologically detectable. The characteristic multifocal osteolytic lesions may be missed, especially in early stages of the disease.[3,4] In this case reported, CT enabled detection of multifocal lytic bone lesions. However, due to its availability, the radiographic exam is most frequently used as initial screening. This case study shows that a negative radiographic examiantion does not rule out MM. MM should be considered as a differential diagnosis in cases of spinal pain, renal failure, anemia and neurological symptoms.
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HIP DYSPLASIA: RETROSPECTIVE STUDY IN SÃO PAULO, BRAZIL

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Introduction:
Hip Dysplasia (HD) is a polygenic disease, highly influenced by the environment and with a highly hereditary rate. In dogs, it affects mainly big and giant breeds.[1,2] The definitive diagnosis is reached through radiographic exams, analyzing osteoarticular alterations and grading HD.[3,4]
Aims:
To determine the incidence of HD and quantify the occurrence of the disease in the main breeds in the study group in São Paulo, Brazil.
Materials and Methods:
A retrospective study was made using radiographs archived at Provet—Veterinary Medicine Diagnoses, São Paulo, Brazil, between January 2004 and January 2012. All radiographs were taken and analyzed following the Federation Cynologique Internationale (FCI) and the Brazilian College of Veterinary Radiology (CBRV) classification system. A toal of 561 dogs were evaluated, 242 male and 319 female, of 32 breeds, predominantly German Shepherds, Golden Retrievers, Rottweillers, Labrador Retrievers, and Bernese Mountain dogs. The minimum age for evaluation was 12 months for German Shepherds, 15 for Rottweillers, and 24 for the others.
Results:
In the German Shepherd group ($N = 100$), 20(20%) were HD−, 23(23%) HD+/−, 28(28%) HD+, 18(18%) HD++, and 11(11%) HD+++. In the Golden Retrievers group ($N = 89$), 11(12%) were HD−, 16(18%) HD+/−, 26(29%) HD+, 25(28%) HD++, and 12(13%) HD+++. In the Rottweiler group ($N = 89$), 42(47%) were HD−, 11(12%) HD+/−, 10(11%) HD+, 20(22%) HD++, and 07(08%) HD+++. In the Labrador Retriever group ($N = 62$), 12(20%) were HD−, 10(16%) HD+/−, 15(24%) HD+, 12(20%) HD++, and 12(20%) HD+++. In the Bernese Mountain Dog group, ($N = 50$), 18(36%) were HD−, 10(20%) HD+/−, 06(12%) HD+, 11(22%) HD++, and 05(10%) HD+++.
Discussion/Conclusion:
The allowed grade of HD when choosing sire and dam in Brazil follows individual Breed Club's criteria. Animals classified as A(HD−), B(HD+/−), and C(HD+) are allowed to mate. The high rates of HD found in the five most widely evaluated breeds of our sample can be explained by cross-breeding among the three different grades (C/D/E) of hip dysplasia, still accepted by Brazilian Breed Clubs, allowing the genetic load, even recessive, to be transmitted to the offspring.
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CT SCAN FEATURES OF CEREBROVASCULAR HEMORRHAGIC INFARCTION IN A DOG WITH CUSHING'S DISEASE (HYPERADRENOCORTICISM)

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Introduction:
Brain stroke is the most common clinical presentation of cerebrovascular disease in human, but it is still considered rare in dogs.
Aim:
This poster describes computed tomography features of a presumed haemorrhagic infarct in a dog with hyperadrenocorticism.
Case Report:
A 9-year-old, intact male, Brie's shepherd dog, was referred for a 10 days history of depression and tachypnea of acute onset. The initial clinical evaluation showed obtundation and superficial tachypnea. A complete blood count, biochemistry, blood gas analysis, and urinalysis were within normal limits excepted for a mild increase in serum GGT, ALT and cholesterol. Thoracic radiographs were unremarkable. Three days later, he developed central neurological dysfunction with right-sided amaurosis, ventro-medial strabismus of the left eye and left-sided Horner's syndrome. Sixteen MCT (multislice computed tomography) scans pre- and postcontrast studies of the brain were performed. An intra-axial homogeneous well-circumscribed lacunar hyperattenuating (+/− 62 HU) and mildly contrast-enhancing area was observed in the rostral part of the mesencephalon with mild mass effect on the surrounding structures. This finding was highly suggestive of a hemorrhagic event of unknown etiology. Additional complementary exams performed led to the exclusion of coagulopathies and the diagnosis of pituitary-dependent hyperadrenocorticism. A control CT scan exam was performed 30 days later. It showed the almost complete resolution of the lesion, which correlated with the clinical improvement observed in that patient. In both CT examinations, the pituitary gland appeared within the normal limits.
Discussion:
Brain stroke has sudden and abrupt onset of focal neurological deficits. It is the result of an intracranial arterial obstruction and can be categorized as ischaemic or hemorrhagic. In previous studies hyperadrenocorticism was cited as a potential underlying cause of cerebrovascular accident in dogs, but the actual incidence is not known. The underlying pathogenesis is believed to be caused by the conjunction of a hypercoagulable state and mild-to-moderate hypertension leading to vascular lesions. The greater availability of computed imaging modalities in veterinary medicine can ease the diagnosis and the follow up of brain stroke in dogs.
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SONOGRAPHIC EVALUATION OF PARTIAL RUPTURE OF PATELLAR LIGAMENTS IN A DEER (*BLASTOCERUS DICHOTOMUS*)

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Introduction:
There are few literature report of stifle diseases in deers, particularly in diagnostic imaging. Some authors reported arthropathies in white-tailed deers but did not report on radiographic or ultrasonic studies.[2] Patellar fractures are a direct result of impact to the patella, and are associated with the distractive forces placed on the patellar ligaments.[1] Fracture configurations that have been described include sagittal, transverse, comminuted, and avulsion.[3]
Aim:
To report radiographic and ultrasonographic features of patellar fracture and patellar ligament injuries in a deer and to correlate the applicability and imaging findings by both methods on evaluation of the deer stifle.
Case Report:
A pregnant adult female deer (*Blastocerus dichotomus*), presented with right hindlimb lameness for two months and clinical history of trauma, was referred for imaging diagnosis. Cranio-caudal, medio-lateral, flexed medio-lateral, and cranioproximal-craniodistal oblique (skyline) radiographic views were performed. The following changes could be seen: a sagittal patella fracture with medial and lateral displacement of fragments, loss of definition of patella with several bone fragments, and a mild cranial displacement of tibia relative to femoral condyles. Ultrasound examination showed irregular hyperechoic surfaces forming acoustic shadows at medial and lateral femorotibial joints preventing visualization of the ligaments and menisci. Intermediate, medial, and lateral patellar ligaments had heterogeneously disrupted linear fiber pattern and adjacent anechoic effusion, suggesting partial ligament rupture. Collateral lateral and medial and patellar ligaments were homogeneously hypoechoic, suggesting desmitis.
Discussion and Conclusion:
At impact of the patella while jumping, the stifle joint is partially flexed and the patella is fixed in the femoral trochlea.[1] The more prominent medial trochlear ridge, acting as a wedge, may have caused fracture of the medial aspect of the patella. Injuries leading to a quick and intense pull of the quadriceps muscle have also been reported to create a fracture, especially if the patella is in an upward fixed position.[1]
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THE USE OF CT VIRTUAL ENDOSCOPY FOR PROGNOSIS ON CASES OF SPINE FRACTURE

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Introduction:
A fracture can be considered an emergency when there is brain or spinal cord compression, or when there is pneumothorax. In cases of spine fractures, there is an imminent risk of spinal cord compression.[1] The use of computed tomography is of great importance since it is the unique exam in its ability to image a combination of soft tissue, bone, and blood vessels at high resolution.[2] With CT is possible do a recent technique, virtual endoscopy. Virtual endoscopy allows the radiologist to position the point of view inside any structure that has been imaged with CT, and then, travel down the structure.[2]
Aims:
To describe a recent veterinary technique, CT virtual endoscopy, applied to surgical planning and prognosis in fractures of the spine. With this technique it is possible to travel inside the spinal cord and examine a spine fracture, allowing more accurate prognosis.
Methods:
CT and CT virtual endoscopy were performed in five animals presented with spine fracture. The extent of bone marrow lesions were examined with the aid of the program Voxar 3D. On CT, cuts of 1 mm were made, followed by 3D reconstruction and virtual endoscopy.
Results:
In all animals, the CT virtual endoscopy was conclusive to predict the extension of lesion. Comparing standard CT and the CT virtual endoscopy, although the results were the same, the virtual endoscopy provided better spatial resolution of the medullary canal, allowing a more accurate prognosis.
Discussion and Conclusion:
Using CT virtual endoscopy, the surgical planning were performed with better success compared to the surgeries performed without the CT virtual endoscopy, and thus can provide more accurate predictions.
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MORPHOMETRY OF SHEEP LUMBAR SPINE

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Introduction:
Animals have been used as models for human spine research. However, human specimens are difficult to obtain them fresh especially from the healthy population and in large quantities in order to obviate the wide scattering effect associated with biological variability. Sheep are well accept as model in orthopedic research, due to similarities with humans in weight, sex, bone and joint structure, and bone remodeling process.[1–4] A few data are available about morphometry of normal sheep lumbar spine.
Aim:
To clarify morphometry of lumbar vertebrae in sheep using computed tomography and to compare the generated result with human data.
Materials and Methods:
Computed tomographic scanning was carried out in five healthy Merino sheep (2 years, 62 ± 5.3 kg) under general anesthesia. Transverse images were acquired with 1-mm slice thickness from the cranial level of L1 through L5, and images were reconstructed in sagittal plane. A total of eight parameters on CT images of each vertebra were measured. The current results were compared with human published data.
Results:
Sheep vertebral bodies were wider than deep. The pedicles were higher and longer than wide. Intervertebral disk thickness decreased toward caudal lumbar vertebrae, whereas the other vertebral measurements increased. Compared to the human vertebrae, there were several differences in the ovine lumbar vertebrae including smaller, taller, and narrower vertebral bodies, shorter and narrower pedicles and thinner intervertebral disk.
Conclusion:
The data from this study can serve as a CT reference for ovine lumbar morphometry. It may be also helpful for using sheep spine as a model for human spine orthopedic research such as testing implants, if these differences are taken into account.
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DO LOW-FIELD MAGNETIC RESONANCE IMAGING ABNORMALITIES CORRELATE WITH MACROSCOPIC AND HISTPATHOLOGIC CHANGES WITHIN THE EQUINE DEEP DIGITAL FLEXOR TENDON?

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Introduction:
High-field MR (magnetic resonance) signal intensity changes correlate well with histopathologic changes within the deep digital flexor tendon (DDFT).[1,2] There are many advantages of using a low-field MR imaging system for investigation of lameness in horses[3]; however, low-field systems use different imaging parameters from high-field systems that may alter lesion detection.[3]
Aim:
The aim was to correlate signal changes on low-field MR imaging with macroscopic and histopathologic DDFT findings.
Materials and Methods:
Cadaver feet from lame horses with DDFT lesions diagnosed on low-field MR imaging and that underwent macroscopic and microscopic evaluation of the DDFT were selected. The DDFT was divided into four anatomic locations and the MR imaging findings were graded, macroscopic abnormalities were detailed, and histopathologic findings were graded. Spearman's rank correlation coefficients were used to assess the degree of association between MR imaging and histopathology grades and Kappa statistics were calculated to estimate the agreement between MR imaging and histopathology grades.
Results:
Twenty-eight cadaver limbs from 20 lame horses were evaluated. The location of the lesions detected on MR imaging were consistent with the position of the lesions detected grossly and histopathologically. The MR imaging grade (median 2; IQ 1–3) was not significantly different from the histopathology grade (median 2.5; IQ 2–3) ($P = 0.1$). There was a strong correlation between MR imaging and histopathology grades ($rs = 0.76$, $P < 0.001$). Using Stata weighting of 50% to 1 grade difference and 0% to >1 grade difference, there was moderate agreement (0.52) between MR and histopathology grades.
Discussion:
This study demonstrates that lesions identified on low-field MR imaging are consistent with those identified on macroscopic evaluation of the DDFT. There is a strong correlation between the presence and severity of DDFT lesions identified and graded on MR imaging and validated and graded on histopathology. Overall, there is moderate agreement between the MR imaging grades and histopathology grades within the equine DDFT. The study therefore supports the use of low-field MR imaging for diagnosis of DDFT lesions within the feet of lame horses.
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ULTRASOUND EXAMINATION OF FEMORAL HEAD IN YOUNG NORMAL AND DYSPLASTIC LABRADOR RETRIEVERS

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Introduction:
Canine hip dysplasia is a common orthopedic disease. The onset of mineralization of femoral head is delayed in dysplastic hip joints.[1] Ultrasound is able to show mineralization significantly earlier than radiography.[2]
Aim:
The aim of the study is to assess ultrasonographic features of the femoral head in normal and dysplastic Labrador Retriever puppies.
Material and Methods:
Thirty-four Labrador Retriever underwent ultrasound examination of the hip joints at 19 days of age. A 12 MHz linear probe was used. Hip joints were scanned in dorsal and longitudinal planes. The area and volume of the femoral head and the area of the ossific nucleus were evaluated. Ultrasonographic parameters were correlated to conventional radiographic hip dysplasia classification at 12 months. Spearman's and Pearson correlation coefficients and Fisher's test were considered.
Results:
The FCI scoring mode for hip dysplasia was used. Fourteen dogs were judged dysplastic, while 20 normal. There were a mild negative correlation between the area and volume of the femoral head and the grade of dysplasia at 12 months and a moderate negative correlation between the area of the ossific nucleus and hip dysplasia. A femoral head area less than 75 mm^2 and an ossification centre area less than 3 mm^2 were associated with hip dysplasia. A strong positive correlation between the areas of the ossific nucleus and the femoral head was present.
Discussion/Conclusions:
Ultrasound was useful to evaluate canine femoral head morphology at an early age. A small size of the femoral head and its ossific nucleus was associated with hip dysplasia in this series of cases. A small ossific nucleus could indicate a delayed mineralization of the proximal femoral epiphysis. A small femoral head could predispose to joint instability. Further investigations are needed on a larger number of dogs.
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16-MULTIDETECTOR COMPUTED TOMOGRAPHY ANGIOGRAPHY IN TRACHEMYS SCRIPTA ELEGANS

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Introduction:
Because of limits of physical examination in chelonians, imaging procedures are often necessary. Radiology and ultrasonography are routinely performed in reptile medicine, although the use of these techniques in chelonians is compromised by the shell.[1] Computed tomography[2–4] and magnetic resonance imaging have been recently reported as useful tools for the examination of chelonians.[5]
Aim:
The purpose of this study was to develop a computed tomography protocol for in vivo study of the vascular anatomy in *Trachemys scripta elegans*.
Materials and Methods:
Twelve *Trachemys scripta elegans* (body weight from 710 to 1280 g), underwent 16-MDCT examination for various reasons. Anaesthetized patients were placed in ventral recumbency on the CT table. Scanning parameters were: 0.625 mm slice thickness, pitch of 0.562: 1, 0.7 s rotation, 120 kVp, 160–200 mAs. For enhanced scans, iodixanol (320 mg I/Kg) was injected at a rate of 0.5 ml/s through the jugular vein. Postprocessing techniques, multiplanar reconstruction (MPR), maximum intensity projection (MIP), and volume rendering (VR) were used to analyze the original data set.
Results:
The most immediate result of this study was that this protocols provides an excellent arterial and venous opacification allowing high quality in vivo imaging of the heart and vasculature in each turtle. Two-dimensional MPR and 3D VR models provided detailed maps of arterial and venous normal anatomy and variants. The following vessels were identify: right aorta and its branches to the head and forelimbs (brachycephalic trunk, subclavian, and carotid arteries); left aorta and its arteries to the coelomic organs (superior mesenteric, gastric, and the celiac arteries), arteries from the dorsal aorta to the caudal part of the body (costal arteries, gonadal, adrenal, renal, and epigastric arteries) and rarelimbs. Left and right precava and their tributaries; postcava, left hepatic vein, renal and hepatic portal systems.
Conclusion:
Despite the small size of *Trachemys scripta elegans*, MDCT-angiography combined with postprocessing techniques provided high level of detail and excellent 3D maps of the vessels in these turtles. Noninvasive vascular imaging may represent a valid tool for investigating their normal anatomy and variants. MDCT examination could provide additional information in chelonians, which cannot be visualized by standard imaging techniques.
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MAGNETIC RESONANCE IMAGING ANATOMY OF SLIDER TERRAPINS (*TRACHEMYS SCRIPTA*)

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Introduction/Purpose:
Advanced diagnostic imaging techniques are nowadays more frequently used for the diagnosis of diseases in exotic animals. In the slider terrapin the carapace can impair the examination of the coelomic cavity, due to superposition in radiography or due to the small size of the accessible windows in ultrasonograpy. Although the use of magnetic resonance imaging (MRI) has been reported in some cases[1,2] there are few descriptions of the normal appearance of the anatomic structures in reptiles.[3,4]
Aim:
The purpose of this study was to describe the normal anatomy of the slider terrapin (*Trachemys scripta*) using MRI.
Material and Methods:
Four adult females and one young male slider terrapins were evaluated. Females were between 12–15 years old, weighed between 850–1200 g and the male was 6-year-old and weighed 350 g. The animals had been living outdoor for 5 years in an artificial lake. Before the study the animals were acclimated in an aquarium where the temperature initially was 16°C, increasing to 28°C in 10 days. All the animals were anaesthetized with alfaxalona 10 mg/Kg IM. A low-field MR (0.2-Tesla) was used to evaluate and describe the normal appearance of the anatomic structures of the coelomic cavity of the terrapins. Imaging examination of the coelomic cavity included T2- and T1-weighted sagittal, dorsal, and transverse sequences.
Results:
The liver and gallbladder could be easily and completely visualized in all its extension. Gastrointestinal tract, especially the oesophagus and stomach, could also be identified and examined. The kidneys were visible in the caudodorsal coelomic cavity, although their margins were not very well defined. These organs presented signal intensities similar to those described for other small animals. When present, follicles were seen as well-defined spherical structures, which showed a hypointense signal in both T1 and T2 compared to the soft tissue organs.
Discussion/Conclusion:
MRI allowed identification of most coelomic organs.[3,4] MRI is a good diagnostic imaging technique in terrapins, and in some cases, it can allow a better assessment of the coelomic cavity than radiography and ultrasonography.
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USE OF COMPUTED TOMOGRAPHY TO ASSESS STAGE OF PRESENTATION OF CANINE NASAL TUMOURS IN A REFERRAL POPULATION IN THE UNITED KINGDOM

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Introduction:
Canine nasal tumours are locally invasive but infrequently metastasize. Prognosis is poor without treatment but median survival times of 15 months are reported with definitive radiotherapy (RT).[1] Advanced stage at presentation is a poor prognostic indicator. Computed tomography (CT) is more sensitive than radiography and preferred to MRI for staging nasal tumours.[2] Several CT staging systems have been reported and American and Japanese studies report that 48–61% of dogs are presented with late stage tumours (CT stage 3–4).[3,4]
Aim:
To determine the stage of nasal tumours presented in a UK referral population, and assess whether time from initial presentation to diagnosis associates with CT stage. We also determined whether stage at diagnosis is associated with likelihood of pursuing treatment, and documented survival times with RT.
Materials and Methods:
CT studies and clinical records of 78 dogs with CT diagnosis of a nasal tumour were staged using the modified Adams CT system.
Results:
Two dogs were excluded from staging due to prior debulking surgery. Ten of 76 (13%) dogs were classified as stage 1–2, and 66/76 (87%) dogs as stage 3–4. Median time from initial presentation to CT diagnosis in 62 dogs was 52 days. Time from presentation to referral for CT did not correlate with late tumor stage, but all dogs diagnosed more than 5 months from initial presentation had late stage tumors (5/62). Twenty-two dogs received definitive

RT, including 16/21 (76%) of dogs with late-stage tumors. Late stage did not reduce the likelihood of pursuing treatment. Median survival time for definitive RT dogs was 431 days versus 123 days for dogs receiving palliative treatment.
Discussion/Conclusion:
In this UK population the frequency of late stage presentation is higher than in previous reports. Owners and veterinarians should be aware of the clinical signs of sino-nasal neoplasia and dogs with signs of nasal disease consistent with a nasal tumor should have prompt investigations, such as CT, as treatment at an earlier stage is associated with better outcomes. Definitive radiotherapy remains a valid treatment option for dogs with late-stage nasal tumors.
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IMAGE CLASSIFICATION USING AN ARTIFICIAL NEURAL NETWORK

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Introduction:
Classification of images by region or of images from one region into normal or abnormal is a common task in radiology. Computer assisted image classification is well established in the public domain, e.g. image based searches and automated face recognition. The algorithms that provide this technology may have many uses in veterinary radiological diagnosis, research and teaching.
Aim:
To apply an algorithm commonly used for face recognition in a veterinary setting to classify images according to anatomical region.
Materials and Methods:
VD pelvis radiographs from dogs were used to create 64 $\times$ 64 pixel images of the hip joint and other similarly sized images that do not include the hip. One hundred and twenty images of hips and 80 images without, were used to train an artificial neural network (ANN) to classify an image as containing a hip or not. A further 36 images of hips and 20 without, were used to test the ANN. Accuracy, sensitivity, and specificity were determined for the model on both the training and test image sets. The effect on performance of training set size and the number of iterations in the training cycle was examined.
Results:
The ANN could be trained in 200 iterations to achieve an accuracy of 94.5% on the training set (99% sensitivity and 86% specificity) and an accuracy of 91.1% (85% sensitivity and 100% specificity) on the test images. The trained ANN performed the classification in a mean of 2.19 ms per image. Accuracy on the training set continued to improve up to the maximum number of iterations tested (500) but performance on the test set was static above 200 iterations. Training set accuracy was always greater than test set accuracy for all magnitudes of iteration and sample size.
Discussion:
The classification performance achieved is impressive given that raw image data (pixel values) were used as input and the number of images in the training set was relatively low. More demanding classification, such as discriminating normal from diseased joints would likely require large well-classified training sets, the extraction of relevant features, and input from experts in radiology and machine learning.
Conclusion:
Image pixel values can be used as input into neural networks for classification.
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COMPARISON BETWEEN PRE AND POST CONTRAST FLUID-ATTENUATED INVERSION RECOVERY SEQUENCES (FLAIR) IN MRI OF INTRACRANIAL LESIONS IN DOGS AND CATS

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Introduction:
The FLAIR sequence is essential for the examination of intracranial diseases and the postcontrast FLAIR was shown to be superior to T1-weighted postcontrast sequences.[1] In people, contrast improved lesion detection,[2] border definition and distinction from perilesional edema compared to precontrast FLAIR.[3] In veterinary medicine, a possible benefit of contrast administration in FLAIR sequences has not been examined.
Aim:
In this prospective study, pre- and postcontrast FLAIR were compared concerning detection and characteristics of intracranial lesions in dogs and cats. M&M: 108 dogs and 21 cats underwent MRI of the brain including a pre- and postcontrast FLAIR, using low field in 40, and high field in 91 in a total of 131 examinations. FLAIR images were evaluated in consensus by two radiologists for lesion number and conspicuity, border definition, signal intensity, and pattern. Sequences were evaluated independently and in direct comparison. The reference standard consisted of the complete MRI study, the radiology report, and histopathological examination in 15 cases. The level of significance was set at $P < 0.05$.
Results:
The total number of lesions was 88. Sensitivity to detect lesions in precontrast FLAIR was 85.2%, in postcontrast FLAIR 90.9%. In postcontrast FLAIR more extra-axial lesions were detected (73 vs. 89%) and lesion borders became significantly more irregular. In direct comparison border definition improved, and signal intensity was higher in postcontrast sequences ($P < 0.05$). Signal intensity was significantly influenced by contrast uptake in T1, and field strength. In extra-axial lesions, lesion size was larger in the postcontrast FLAIR ($P < 0.05$). There was no difference in the distinction between lesion and perilesional edema.
Discussion:
In agreement to the literature, mainly extra-axial lesions did profit from the postcontrast FLAIR,[4] possibly due to the location outside the blood brain barrier leading to strong contrast enhancement. Differences between both sequences in signal intensity, border definition, and lesion size were only apparent in the direct comparison and the benefit of an additional postcontrast FLAIR sequence does, therefore, not justify a prolongation of anesthesia and examination time.
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B-MODE ULTRASONOGRAPHY OF THE NORMAL EYE IN PERSIAN CATS

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Introduction:
Ocular ultrasonography is a routine procedure in veterinary ophthalmology to evaluate the intraocular structures of the eyes, especially when severe swelling of the eyelid, keratitis, cataract, and intraocular hemorrhage prevent direct ophthalmic examinations.[1–3] To the best of our knowledge, no study has documented Persian cat ocular biometry.
Aim:
The purpose of this study was to describe the normal ultrasonographic biometry of Persian cat's eyes using B-mode ultrasonography.
Materials and Methods:
Twenty healthy adult Persian cats with no history of previous ophthalmic disease (11 males and 9 females) with average weight of 3.015 kg were examined. Ultrasonographic examination was performed using an 8 MHz linear transducer, Pie medical ultrasound machine, and transpalpebrally. Ocular biometry of the left and right eyes was evaluated by B-mode ultrasonography. Comparison of average of measurements between left and right eyes and between vertical and horizontal approach performed using paired sample *t*-test.
Results:
Mean $\pm$ standard deviation of ocular structures of 40 eyes for corneal thickness, anterior chamber, lens thickness, vitreous chamber, and anterior to posterior dimension of the globe were 0.23 ± 0.04, 4.14 ± 0.67, 7.72 ± 0.54, 8.21 ± 0.39, and 20.68 ± 0.97 mm, respectively.
Conclusions:
No significant difference was found between the ocular biometry of the left and right eyes and horizontal and vertical approach. Regarding to the high rate of referred ocular problems in Persian cats, the present study provide baseline information for further clinical investigations of ocular abnormalities using B-mode ultrasonography.
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RADIOGRAPHS OF THE CARPUS, METACARPUS, DIGT AND TARSUS IN HEALTHY DAIRY CATTLE USING MULTIDIRECTIONAL RADIOGRAPHY

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Introduction:
Radiography has been recognized as a very important examination in cattle, but it has not been used often. Because the film-screen radiography was a traditional development method, it was not only complicated but also difficult to set radiographic conditions. Repeated radiological examinations are not always performed in bovine clinical practice because there is no darkroom at a farm. Radiographic examination became widely available in tandem with the penetration of computed radiography in bovine clinical practice in Japan. Unfortunately,

there is no multidirectional radiograph of healthy cows for comparison with that of pathological cows.
Aim:
To obtain radiographs of healthy cows in order to compare to that of pathological cows.
Materials and Methods:
Radiographic examination was carried out to define the radiographic anatomy of the distal regions of the forelimb and hindlimb in 62 healthy cows from newborn to 20 months of age.
Results:
In these studies, the multidirectional radiographic anatomy of the carpus, metacarpus, digit and tarsus of healthy cows at various time points between newborn and 20 months of age were well defined.
Discussion/Conclusion:
These multidirectional radiographs of healthy cows will be helpful for radiographic diagnosis.
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DIAGNOSTIC IMAGING OF TARSUS PLANTER ASPECT DISORDERS IN HORSES

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Introduction:
Diseases of the equine tarsus have been diagnosed using a combination of clinical, radiography, and ultrasonography.[1] Planter soft tissues swelling were included the long planter ligament, SDFT, DDFT, tarsal sheath, the peritendinous and periligamentous tissue.[2] The area is difficult to access clinically, and diagnostic modalities such as radiography and ultrasonography have been used in the examination of this area.
Purpose:
The purpose of this study was to assess the soft tissue disorders at the planter aspect of the horse tarsus radiographic ally and ultrasonography.
Material and Methods:
Fourteen horses in different ages and sex with soft tissue disorders and lameness were diagnosed. Clinical, radiographic and ultrasonography for soft tissue disorders were evaluated and recorded.
Results:
The ultrasonographic abnormalities of the plantar soft tissues identified were thickening and decreased echogenicity of the superficial flexor tendons (SDF) and deep digital flexor tendons (DDF) tendonitis in three horses. Thoroughpin had accumulation of an echoic fluid around DDFT, false thoroughpin was observed as an echoic fluid in the lateral tarsal area in two horses. Subcutaneous calcaneal bursitis with an echoic fluid above the SDFT was seen in four horses. Intertendenous calcaneal bursitis with an echoic fluid between SDFT and Gastrocnemius tendon in two horses, curb with plantar ligament thickening or soft tissue thickening at site of curb in three horses. The radiographic abnormalities identified were osteomyleitis and osteolytic lesion of tuber calcanei, osteophyte reaction at proximal of fourth metatarsus, Osteophyte reaction at the dorsal aspect of calcaneal bone and fractured fragment at plantar aspect of the tarsus.
Conclusion:
The planter tarsal area represents an imaging challenge to the veterinarian. The visualization of the soft tissues remains a major limitation of radiology. A combination of ultrasonography and radiology allows most planter soft tissues tarsal injuries to be diagnosed successfully.
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COMPUTED TOMOGRAPHY INVESTIGATION OF AN EGYPTIAN CAT MUMMY

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Introduction:
Application of CT diagnostic imaging to investigate archeological mummy animals is not a common procedure. Archeologists have employed radiology to study mummified human, but there are only few reports regarding radiological examinations of mummy cat.[1,2]
Aim:
The aim of this study was to understand the characteristics of mummy cat, the cat's age, and to try to discover which was the exact methodology to prepare it.
Materials and Methods:
The mummy was submitted to CT examination with a third-generation multislice scanner (Philips Brilliance CT 64-channel, Philips MD S.p.A., Monza, Italy), acquiring transversal 1-mm-thick slices, with an index of 0.5 mm and a pitch of 0.5, with both hard and soft convolution filter. Cutting plane was from axial projections for the body (thorax and abdomen), and from dorsal projections for the head due to the position of cat's head. Appendicular skeleton was carried out by MPR in order to evaluating the grow plates. The mummy was entirely covered by multiple layers of material, showing high negative Hounsfield units value.
Results:
The cat's skeleton was complete and the body position appeared the typical one of a feline seated on his rear paws. The neurocranium appeared empty, with multiple fractures in both frontal and orbital regions. Tympanic bullae were normal and filled with air, cochlea was preserved as well as the ossicular chain. The upper and lower teeth were evident. Dental buds of lower molar and first upper molar were present, entirely contained in the alveoli. Many appendicular bones presented opened grow plates. The vertebral column presented some interruptions. It can be assumed that animal's age ranges from 24 to 32 weeks.[3] The discontinuities observed in the spinal column could be due to the manipulation during mummification procedure, and the discontinuities of skull bones could be interpreted as a result of the excerebration process. It seems that the cat does not show evident signs of a deadly trauma. Looking at the mummification method, it can be observed that the animal's internal organs were removed.
Conclusion:
The quality of the mummy could be considered high because of the characteristics of mummification process and of its conservation.
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ADRENAL GLAND VOLUME MEASUREMENT IN DOGS USING THREE-DIMENSIONAL ULTRASONOGRAPHY

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Introduction:
Most diseases of the adrenal gland increase its size. The most common method of assessing adrenal size is by measurement of the diameter of the gland using two-dimensional (2D) ultrasonography.
Aim:
The purpose of this study was to determine the feasibility of using three-dimensional (3D) ultrasonography to measure adrenal gland volume.
Materials and Methods:
Ten mixed-breed dogs of similar weight (15+/−3 kg) with normal serum cholesterol and alkaline phosphatase levels and which had no clinical signs of adrenal disease (e.g., were not polyuric or polydipsic) were used. Three-dimensional images of the adrenal glands were obtained using a GE Voluson 730-Pro ultrasound machine and the volume of the glands was measured using VOCAL® 4D viewing software created by GE services.
Results:
The mean (+/− standard error) volume of the left and right adrenal glands was 0.539 cm^3 (+/− 0.020) and 0.548 cm^3 (+/−0.050), respectively. Acquiring 3D data of the adrenal gland was easy to perform and takes less time than two-dimensional evaluation; however, analysis of the raw data for volume determination was time consuming.
Discussion:
This study shows that using 3D ultrasonography to evaluate the size of the adrenal glands is feasible. It is likely that volume measurement would be able to detect enlargement at an earlier stage than 2D measurements but further research is needed to determine the reliability of this technique.
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ULTRASONOGRAPHY OF URINARY TRACT LITHIASIS IN DOGS TREATED WITH ALLOPURINOL FOR LEISHMANIASIS – A 30 CASE REPORT

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Introduction:
The aim of this study is to evaluate the ultrasonographic findings in the urinary tract of 30 dogs treated with allopurinol for Leishmaniasis.
Materials and Methods:
Between 2008 and 2012 a record was made of the ultrasonographic findings in the urinary tract of 30 dogs during treatment with allopurinol for Leishmaniasis (15 days to 4 years). Seven of these dogs had a normal abdominal ultrasound examination before starting treatment. All animals had BUN and creatinine serum levels measured and urinalysis. The animals had a complete abdominal ultrasound by three ultrasonographers (CM, MV, RF) with either a Sonosite Titan with microconv. transd. from 5–8 MHz; GE Vivid E with a microconv. transd. 5–9 MHz, or Esaote My Lab with a microconv. transd. 5–9 MHz.
Results:
Eleven animals had BUN (>50 mg/dl) and creatinine (>1.2 mg/dl) serum concentrations elevated. All dogs had mobile focal hyperechoic structures in the bladder, between 1–3 mm, with acoustic shadowing. Twenty-three dogs had bilateral focal hyperechoic structures, in

their renal pelvis and diverticula, between 1–20 mm, with acoustic shadowing. Three of this last group also had pielectasia. Twelve dogs had difuse hyperecogenicity of the renal cortex. "Amorphous" crystals in urine compatible with xanthine crystals were found in all dogs. The kidney calculi removed were xanthine in origin. In 12 dogs, the reduction in the allopurinol therapy resulted in a decrease in the amount of crystals lithiasis observed on ultrasound.

Discussion/Conclusion:

Xanthine lithiasis is very infrequent, and its natural occurrence in dogs is extremely rare.[3,4] Allopurinol therapy is directly related to the development of xantine urolithiasis in dogs,[1,2,5] with a higher prevalence and rate of complications (associated kidney failure, obstruction, and cystitis) than previously reported. There is not a direct correlation between analytical evidence of renal failure and degree of lithiasis found. However, a reduction in the allopurinol therapy causes a reduction of the urolithiasis. Ultrasound can easily access the urinary tract and play a major role in detecting and monitoring xanthine urolithiasis, especially in dogs that have associated renal disease, therefore helping to balance the allopurinol therapy.

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SPLENIC ULTRASOUND FINDINGS IN 26 CATS WITH HEMOTROPIC HEMOPLASMOSIS – A PRELIMARY STUDY

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Introduction:

The aim of this study is to evaluate the splenic ultrasound changes in cats with clinical and cytological or PCR evidence of feline hemotropic hemoplasmosis (FHH).

Materials and Methods:

All cats with clinical signs compatible with FHH, a complete blood count, tested for FIV/FeLV, with positive cytological or PCR evidence of Haemoplasma between 2008 and 2012 were included in the study. All cats were treated with resolution of their clinical signs associated with this disease. The animals had a complete abdominal ultrasound by two ultrasonographers (CM, MV) with either a Sonosite Titan with microconvex transducer from 5–8 MHz; GE Vivid E with a microconvex transducer 5–9 MHz, and Esaote MyLab with a microconvex transducer 5–9 MHz.

Results:

The clinical signs were intermittent fever ($n = 23$) with weakness/lethargy ($n = 20$), normal ($n = 5$) to anemic ($n = 21$). All were FIV negative with eight FELV-positive cats. Two animals had slightly elevated BUN and creatinine. Sixteen of the cats had a cytological confirmation of hemoplasmosis, while the other 10 had PCR haemoplasma confirmation. All animals were treated with either doxycicline 10 mg/kg/SID/2–4 weeks or enrofloxacin 5 mg/kg/SID/2–4 weeks and improved, except the two animals with kidney disease that continued to present clinical signs associated with their renal failure. On ultrasonography, the spleen was found to be moderately to severely enlarged with an average thickness of 12 mm in the middle portion of the spleen, margins were smooth, but slightly rounded, with normal ecogenicity and homogeneity of his parenchyma, except for two cats that had small ill-defined hypoechoic focal lesions spread out trough it's parenchyma. Sixteen also had cortical hyperechogenicity of the kidneys with no other changes that the authors attributed to fatty infiltration of the kidney cortex. Two cats also had smaller kidneys with partial loss of the corticomedular definition, associated with the beginning of chronic kidney disease.

Discussion/Conclusion:

Splenic ultrasound findings in cats with with hemotropic hemoplasmosis, does not commonly include a spleen with a mottled appearance. The spleen is more often diffusely enlarged, with rounded margins and homogeneous parenchyma.

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RADIOLOGICAL, COMPUTED TOMOGRAPIC AND MAGNETIC RESONANCE IMAGING FEATURES OF PYOGRANULOMATOUS OSTEOMYELITIS OF THE OLECRANON CAUSED BY ADIASPIROMYCOSIS IN A PONY

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Introduction:

Adiaspiromycosis caused by *Emmonsia crescens* is primarily a respiratory disease affecting small mammals.[1] Adiaspiromycosis has been detected in the lungs of two dogs and one goat.[2–4]

Case History:

A New Forest pony mare presented with moderate left forelimb lameness and a 5-cm-diameter solid mass on the caudolateral aspect of the left elbow. The mass progressively grew (10 cm diameter) subsequently causing nonweight bearing lameness. Lateromedial radiographs were obtained of the elbow and identified multiple sites of moth-eaten to geographic osteolysis with, a marked pallisading periosteal reaction involving the olecranon and proximal aspect of the ulna. Due to marked progression of the disease, the pony was euthanized. The limb was disarticulated at the shoulder joint and the elbow underwent computed tomographic (CT) and magnetic resonance (MR) imaging.

Results:

Histopathological examination identified pyogranulomatous inflammation, with adiaspores characteristic of an adiaspiromycosis infection. The CT images revealed a multifocal, diffuse moth-eaten osteolysis involving the olecranon, including the articular surface of the semilunar notch, and the proximal aspect of the ulna. There was extensive pallisading to spiculated periosteal reaction. On MR images the proximal aspect of the ulna had a markedly altered and irregular signal intensity on all sequences. Variably sized hyperintense areas were present on T2-weighted, T1-weighted, and gradient echo sequences throughout the olecranon. The marked pallisading to spiculated periosteal reaction was most prominent on the gradient echo sequences. The surrounding soft tissues were markedly thickened with altered signal intensity. The insertion of the triceps and proximal aspects of the flexor muscles had T2-W hyperintensity and altered myofibre pattern.

Discussion/Conclusions:

Pyogranulomatous osteomyelitis caused by adiaspiromycosis (*E. Crescens*) has not previously been reported in the horse. The comparative imaging features in this case report may be of use in future diagnoses of this condition.

Acknowledgments:

The authors thank Sarah Powell, Rossdales Equine Hospital for assistance with CT images, and Christelle Volmer, Animal Health Trust for performing the postmortem.

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TENSION PNEUMOCEPHALUS IN A GERMAN SHEPHERD AFTER A CRANIOTOMY

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Introduction:

Tension pneumocephalus is an uncommon complication in both human and veterinary neurosurgery, with only a few reports found in the veterinary literature.[1–3] Diagnosis is usually achieved through CT or MRI. No reports describing radiographic findings in pneumocephalus could be found.

Aim:

Describe the MRI and radiographic findings, including followup studies, in a dog with a postsurgical tension pneumocephalus.

Case Report:

A 10-year-old, female neutered German Shepherd presented with a history of tonic–clonic seizures of 1 month duration. Neurological exam revealed postural reaction deficits on the right side. Lesion localization was left forebrain. The low-field MR (0.2 T) study of the head revealed an extraaxial, broad-based mass with homogeneous contrast enhancement in the left frontal lobe, consistent with a meningioma. A transfrontal craniotomy to debulk the mass was performed. A month and a half later, the dog presented with multifocal forebrain and left brainstem signs. MRI and radiographs were performed. MRI showed marked distension of both lateral ventricles, which had a hypointense signal in all sequences, consistent with gas. Only a small amount of CSF was visible in the most ventral aspect of the lateral ventricles. A fistula containing gas could be tracked from the left ventricle into the left frontal sinus. On dorsoventral and right lateral radiographs of the skull, an oval, well-defined gas opacity was visible in the central area of the cranial cavity. A tension pneumocephalus secondary to a postsurgical dural defect was diagnosed and the dura was repared using a synthetic dural substitute. Postoperative radiographs showed a mild reduction in the size of the pneumocephalus. Control MR and radiographs two months and a half later showed complete resolution.

Discussion/Conclusion:

Tension pneumocephalus is an uncommon complication in both, human and veterinary neurosurgery.[1–3] Although advanced imaging techniques, such as MRI and CT, are the techniques of choice when intracranial disease is suspected, radiography could be used in our case to demonstrate the presence of pneumocephalus. When advanced imaging techniques are not easily available, radiography could be used as a more available first screening or followup technique.

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VERTEBRAL HEART SIZE IN LITTLE SPOTTED CATS

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Introduction:
Thoracic radiographies are commonly used in dogs and cats to determine the dimensions of the cardiac silhouette. Age difference, anatomic conformation, phase in the respiratory, and cardiac cycles make it more difficult to distinguish between normal from abnormal hearts.[1] Various methods have been used to estimate or measure heart size.[2] The Vertebral Heart Size (VHS) method is based in the sum of the heart length and width that is translated into the length of thoracic vertebrae. Thus, the method provides an objective measure of heart size relative to body,[3] but studies using nondomestic cats are few.
Aim:
The aim of this study was to determine the VHS values for sound little spotted cats (*Leopardus Tigrinus*) in captivity.
Materials and Methods:
Eight adult little spotted cats (*Leopardus tigrinus*) of similar size and bodyweight were used. The animals had no signs or known disease process that could affect the present study. Under general anesthesia, a right lateral and ventrodorsal thoracic radiographs were taken. Both projections were used for VHS measurements according to Buchanan and Bücheler.[4] In addition, radiographs were evaluated for appropriate positioning and for the presence of abnormalities that may have affected VHS determination.
Results and Discussion:
VHS values obtained were 7.67 $\pm$ 0.57 vertebrae in right lateral view, and 8.08 $\pm$ 0.72 vertebrae in ventrodorsal view. Only two radiographic projections were used since a previous study in adult stray domestic cats observed no difference between right and left lateral views, or between dorsoventral and ventrodorsal views.[5] The values obtained in the present were comparable to reported for healthy stray cats, 7.3 $\pm$ 0.49 vertebrae in right lateral and 7.5 $\pm$ 0.53 vertebrae in ventrodorsal.[5]
Conclusion:
The VHS values may be useful as a reference to sound little spotted cats. Other studies must be performed using animals of different sizes.
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COMPUTED TOMOGRAPHY FINDINGS OF INTRANASAL TRANSMISSIBLE VENEREAL TUMOR IN A DOG

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Introduction:
Transmissible venereal tumor (TVT) is quite common in Greece, especially among stray dogs. The lesions are often located on the external genitalia and the skin. Extragenital occurrence in the nasal and/or oral cavities is rather rare.
Aim:
The aim of this report was to demonstrate the computed tomography (CT) findings of TVT in the dog as this has not been reported before.
Case Report:
A 2-year-old, intact, male mixed-breed dog was referred to the Companion Animal Clinic, Faculty of Veterinary Medicine, Aristotle University of Thessaloniki, with a 2-month history of nasal discharge. On physical examination bilateral nasal serosanguineous discharge was detected. Lateral and open-mouth nasal radiographs demonstrated diffuse soft tissue opacity in both nasal cavities, more evident on the right side. CT demonstrated obliteration of both nasal cavities (R > L) by soft tissue/fluid density (52.2 HU). There was severe destruction of the nasal turbinates and mild of the ethmoidal turbinates. Lysis of the nasal septum, which was displaced to the left, was also evident. Both frontal sinuses were obscured by soft tissue/fluid density. Contrast medium was not administered. Endoscopy detected the presence of a bilateral, friable and easy bleeding mass in the nasal cavities. Cytological examination of the mass revealed a typical TVT. Treatment consisted of vincristine sulphate 0.5 mg/m^2 body surface area, IV, at weekly intervals for six times, and amoxicillin/clavulanate 22 mg/kg body weight p.o., every 12 h for 25 days.
Results:
The dog was clinically normal 3 months after treatment initiation. Six months after the completion of the treatment, CT reevaluation of the nasal cavities demonstrated areas with lack of turbinates and areas with thickened and normal turbinates. Destruction of the displaced nasal septum was still evident; frontal sinuses were normal.
Conclusions:
CT findings of the nasal TVT resemble those of malignant neoplasms invading nasal cavities. CT scan is useful either for the diagnosis of the disease and identification of the extension of the lesions or for the follow up of the disease after treatment.
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ULTRASONOGRAPHIC FINDINGS OF UTERINE NEOPLASMS IN NINE DOGS

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Introduction:
Uterine neoplasms are relatively rare in dogs comprising 0.% to 0.4% of all canine tumors with the site of origin including uterus horn, body, and cervix. To the authors' knowledge no studies describing the ultrasonographic characteristics of uterine neoplasms in dogs have been reported.
Aim:
To describe the ultrasonographic findings observed in different types of uterine neoplasms in nine dogs and to evaluate the usefulness of ultrasonography to delineate the origin of the uterine masses.
Materials and Methods:
Nine female intact dogs with histologically confirmed uterine neoplasms were included in this study. Ultrasonographic lesions were reviewed for the location, size, margination, and echogenicity.
Results:
Utrasonography detected a well-demarcated mass at the dorsal aspect of the bladder in seven dogs; in those dogs a uterine body mass in six and a uterine cervix mass in one dog were confirmed on surgery. In two dogs, an ill demarcated mass in the midventral abdomen was detected; the origin of the mass was ultrasonographically delineated from the uterine horn in one dog and uterine horn mass was included in differential diagnosis in the other. In those two dogs, uterine horn masses were confirmed at surgery. In all cases the size of the mass measured ultrasonographically varied from 3 to 12 cm in diameter. The mass was characterized as solid in three cases (three leiomyomas), solid with cystic component in four (two adenocarcinomas, one fibromyoma, one leiomyoma), and cystic in two (two leiomyomas). Diffuse hyperechoic foci in the mass were observed in two cases (one fibromyoma and one leiomyoma with dystrophic calcification).
Discussion/Conclusion:
Ultrasonography is a reliable method in demonstrating the uterine body-cervix neoplasms. However, it may not be possible to be certain that the mass is uterine horn in origin unless there is associated fluid distension of the uterine horn to which the mass can be traced. Ultrasonographic appearance of the uterine neoplsms varied and the only way to differentiate the type of the neoplasm is by taking a biopsy of the mass.
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ASSESSMENT OF CONTRAST-ENHANCED ULTRASONOGRAPHY AND CONTRAST-ENHANCED COMPUTED TOMOGRAPHY FOR THE EVALUATION OF ADRENAL TUMORS IN DOGS

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Introduction:
Abdominal ultrasonography (US) and computed tomography (CT) constitutes a crucial step in the diagnostic workup and therapy planning of adrenal tumors.[1–5]
Aim:
The aim of this study was to assess contrast-enhanced ultrasonography (CEUS), and contrast-enhanced computed tomography (CE-CT) in the evaluation of adrenal lesions compared to surgery and histopathology, i.e. identification of vascular invasion, identification of adjacent organs invasion, detection of malignancy potential and characterization of histologic type.
Materials and Methods:
Patients with unilateral or bilateral adrenal lesions underwent US, CEUS, CT, and CE-CT, before surgical adrenalectomy and histopathology. Patients were injected with an intravenous bolus of SonoVue® for CEUS and nonionic iodinated contrast medium for CE-CT.
Results:
Fourteen canine patients with 16 adrenal lesions (carcinoma (n = 10), adenoma (n = 3) and pheochromoctyoma (n = *3*)) met our inclusion criteria. Concerning the ability to detect adjacent tissue invasion or identify thrombus, percentages of correct assessment were 75, 75, and 87.5% for US, US/CEUS, CT/CE-CT, respectively. They could correctly predict malignancy potential of lesion in 56, 94, and 62% of the cases, and tumoral type in 25, 75 and 37.5%. Regional blood volume was lower in carcinomas and pheochromocytomas compared to adenomas (P = 0.014 and P = 0.005). Mean transit time was shorter in carcinomas and pheochromocytomas than in adenomas (P = 0.045 and P = 0.048). The

difference between pre- and postcontrast CT X-ray attenuation values was significantly higher in pheochromocytomas compared to carcinomas ($P = 0.005$).

Conclusion:
Although more sensitive for detection of adjacent organs invasion and thrombus formation, CT/CE-CT was not as correct as US/CEUS for the prediction of malignancy potential and tumoral type.

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CONTRAST ENHANCED ULTRASONOGRAPHY IN DOGS WITH ACTH DEPENDENT HYPERADRENOCORTICISM RECEIVING TRILOSTANE TREATMENT: A PRELIMINARY STUDY

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Introduction:
Several cases report histopathologic evidence of necrosis in the adrenal parenchyma following treatment with trilostane.[1] Moreover, modifications of the echotexture of adrenal parenchyma in dogs treated with trilostane have been reported.[2,3]

Aim:
We hypothesized that contrast-enhanced ultrasonography (CEUS) can might show necrotic areas in patients treated with trilostane.

Materials and Methods:
Five client-owned dogs with untreated ACTH-dependent hyperadrenocorticism (ADHAC) were included in the study. CEUS of both AGs was performed according to a previously described method[4] with intravenous injections of Sonovue©. Dogs were presented at the endocrinology consultation at the diagnostic time and for control of trilostane treatment over 6 to 12 months. The starting dose was between 0.5 to 1.5 mg/kg twice daily and was then adapted. At each control time, an ACTH stimulation test, Na+, K+, urea, and creatininemia dosage were performed. Ultrasonography (US) and CEUS were performed at diagnosis and after 6 to 12 months. Blood results were confronted with CEUS and US findings.

Results:
The height of the caudal poles of the left and right adrenal glands measured 7.7 ± 1.9 mm at diagnosis, and was 8.5 ± 2.1 mm after 6 to 12 months. Besides diffuse enlargement, no US changes were observed in adrenal echogenicity, echotexture or contours. On CEUS, there was no difference observed in enhancing pattern between diagnosis and control times in four of five dogs. In one patient, a large central band in the left adrenal gland did not show any contrast uptake during all CEUS examinations, whereas adjacent adrenal parenchyma displayed a normal enhancement. On blood work, only the former patient presented a relapse and failure to respond to trilostane treatment, as clinical signs of ADHAC were present and post-ACTH cortisol was too high. No clinically relevant abnormalities were observed in blood work of other patients. Although there is no histological evidence of adrenal necrosis in this relapsing patient, the absence of contrast uptake on CEUS is strongly suggestive of necrosis. Whether or not the adrenal necrosis is due to trilostane administration or repeated ACTH injections remains unclear.

Conclusion:
A larger study might assess whether CEUS is a reliable technique to monitor and screen those patients for adrenal necrosis.

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MAGNETIC RESONANCE IMAGING (MRI) OF THE BRAIN IN SMALL ANIMALS—EVALUATION OF SEQUENCES AND PROTOCOL RECOMMENDATIONS

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Introduction:
Magnetic resonance imaging (MRI) is the gold standard in the evaluation of the nervous system in humans[1] and is increasingly utilized in veterinary medicine.[2–4] To minimize overall examination time attempts have been made in human medicine to develop MRI protocols with a limited number of specific sequences. The same would be desirable for veterinary medicine.

Aim:
The goal of this research was to determine the most useful MRI sequences to evaluate the brain of dogs in light of clinical findings.

Materials and Methods:
A retrospective evaluation of 124 MRI studies was performed by two investigators, and a consensus was reached in order to select the two sequences that were most helpful in the identification and classification of intracranial lesions. Sequences evaluated included transverse T1-W SE, T2-W, FSE, FLAIR, T2*-W, GRE, and postcontrast T1-W SE. The contribution of sagittal T2-W images to the diagnosis was also evaluated. Signalment, history, reason for MR examination and final diagnosis/outcome were recorded for each patient. The studies were divided in three groups according to the onset of signs [acute (AC) 6–24 h, subacute (SBA) 24 h–1 week and chronic (CR) > 1 week].

Results:
The most common breed in our study population was the boxer, followed by small breed dogs. There was no obvious age or sex predilection. 9.7% of dogs were in the AC group, 21.8% in the SBA group, and the majority (68.6%) in the CR group. The most common clinical signs regardless of group assignment were paresis/paralysis, seizures, head tilt and circling. The most frequent finding in each group was one or multiple intraaxial lesion(s) (AC 24.7; SBA 44.4%; CR 37.7%). The MRI sequences considered most useful for each group were T2-W followed by FLAIR (AC group), FLAIR followed by T2-W (SBA group), and postcontrast T1-W followed by T2-W/FLAIR (CR group), respectively. Sagittal T2-W images were considered more helpful in the CR group, adding information in 36.5% of the cases.

Discussion/Conclusions:
Choice of MRI sequences based on duration of clinical signs should include T2-W for acute, FLAIR for subacute, and postcontrast T1-W for chronic cases. Acquisition of sagittal T2-W images is also recommended, especially for chronic cases.

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COMPARATIVE STUDY ON PROSTATE DIAMETER MEASUREMENT USING TRANSABDOMINAL ULTRASOUND AND MAGNETIC RESONANCE IMAGING IN INTACT DOGS

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Introduction:
The canine prostate is routinely evaluated by transabdominal ultrasound (T-ABD) scan providing information on dimension, shape and parenchymal texture of left and right prostatic lobes. Magnetic resonance imaging (MRI) is an accurate method to measure prostatic size and become more common in veterinary practice. This study aimed (i) to evaluate reproducibility of T-ABD measurement for prostatic size, and (ii) to compare prostatic size and volume measured by T-ABD and MRI.

Materials and Methods:
Six intact beagles without clinical signs related to enlarged prostate were used. Left and right prostatic lobes were judged symmetrical on rectal palpation. Dogs were placed in dorsal recumbency and the prostate size was measured ultrasonographically. The greatest craniocaudal (L), transverse (W), and dorsoventral (D) diameters were measured.[1] Of each animal, measurements of the prostate diameter were done five times. Repeatability of a specific measurement was evaluated by ANOVA. four of six beagles had both T-ABD and MRI scan. MRI was done while the anesthetised dogs were placed in right lateral recumbency; the legs were fixed and coil was placed. Prostate scanning was performed by a 1.5 Tesla MR scanner.[2] Maximal diameters of the prostate were determined as: L × W × D × 1.8.[1] (W) and (D). The prostatic volume was estimated: volume = [1/2.6 (L Prostate dimension and volume obtained by T-ABD and MRI were compared using independent *t*-test.

Results:
No significant differences in L, W, or D of the prostates measured by T-ABD scan were found. Comparing between T-ABD and MRI showed that the greatest dimension of prostatic L and W obtained by the two modalities did not differ ($P > 0.05$). When dorsoventral diameter of prostatic lobes was compared separately, significant differences between T-ABD and MRI measurement of the right lobe were found ($P = 0.03$). Prostatic volume calculated from L, W, and D measured by either modality did not differ significantly.

Conclusion:
Our findings suggested that T-ABD measurement of prostatic dimension is reproducible. Prostatic dimension measured by T-ABD and MRI appeared to be reliable. Difference in depth of the right prostatic lobe possibly resulted from different scan position and degree of UB distension.

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"LET'S GET PHYSICAL": ADVANTAGES OF PHYSICAL MODELS OVER 3D COMPUTER MODELS IN LEARNING MRI ANATOMY

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Introduction:
Three-dimensional (3D) information plays an important part in medical healthcare, with recent advances in diagnostic imaging technologies leading to an even greater dependence on 3D visuospatial capabilities. Appreciating complex 3D spatial relationships requires a strong foundational understanding of anatomy and 3D mental visualization skills, especially when utilizing advanced imaging technologies such as magnetic resonance imaging (MRI). Recent pedagogical advances have lead to the development of novel learning resources in an attempt to address the need for more 3D orientated teaching. However, objective evaluation of their efficacies is largely absent from the literature.
Aim:
This study developed, implemented, and evaluated the use of a novel physical model in demonstrating the complex anatomical spatial relationships of the equine foot, comparing its efficacy as a visuospatial learning experience to both traditional and modern teaching modalities.
Materials and Methods:
Third year veterinary students at The Royal Veterinary College London were randomly assigned to one of three teaching aid groups (physical model; textbooks; 3D computer model). The comparative efficacies of the three teaching aids were objectively assessed through students' abilities to identify anatomical structures on MRI, and subjectively assessed through student feedback.
Results:
Overall mean MRI assessment scores were significantly higher in students in the physical model group (86.39%) compared with students in the textbook (62.61%) and computer model groups (63.68%) ($P < 0.001$), with no significant difference between the textbook and 3D computer model groups ($P = 0.685$). Student feedback was also significantly more positive in the physical model group compared with both the textbook and 3D computer model groups ($P < 0.05$).
Discussion:
Our results suggest that physical models hold a significant advantage over alternative learning resources in 3-D understanding of complex anatomy, and that 3-D computer models as well as textbooks, have significant limitations with regards to 3-D learning. With the availability of cadavers in decline, physical models may provide the necessary hands on 3-D teaching essential in modern medical teaching.
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EFFECT OF ELBOW FLEXION ON HUMEROULNAR INCONGRUENCE

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Introduction:
Elbow joint incongruity is believed to contribute to the pathogenesis of elbow dysplasia. A role of humeroulnar incongruity (HUI) in dogs with elbow dysplasia is controversial. It is proposed that HUI is physiological in large breeds.[1] However, significant difference was detected between size of HUI in Labrador Retrievers with medial coronoid disease and without it.[2] Joint incongruence is thought to be dynamic condition. Elbow positioning alters the estimation of HUI in vitro model.[3] To the authors' knowledge no work has been published relating specifically to influence of elbow flexion on HUI in vivo model.
Aim:
The purpose of this study was to establish the influence of the degree of elbow flexion on appearance of HUI in vivo study.
Materials and Methods:
Sixteen elbows of sixteen heavily sedated dogs with HUI detectable on standing angle (ML 135° extension) were used in the study. Mediolateral elbow radiographs in different position (ML 45°, 90°, 100°, 110°, 120°, 135°, 145°, 155°) was made in each joint. HUI was measured in different joint angles using a previously reported method of subluxation index (SI).[2] Subluxation index was measured in the above mentioned positions of the elbow blindly by one evaluator. Humeroulnar SI in all the elbow positions was compared. For statistical analysis ANOVA test was used.
Results:
Influence of the degree of elbow flexion on the size of humeroulnar SI. Angle of elbow flexion 45° (SI 0), 90° (SI 0), 100° (SI 0.13), 110° (SI 0.18), 120° (SI 0.22), 135° (SI 0.27), 145° (SI 0.23), 155° (SI 0.22). The biggest SI was found in elbows with 135° of extension. Significantly smaller angles ($P < 0.05$) were found in elbows with 45°, 90°, 100°, and 110° of flexion in comparison with the joint with 135°angle of extension. No significant differences ($P < 0.05$) were found between elbows with 135° and 120°, 145°, 155° of extension.
Discussion/Conclusion:
Elbow flexion influences the measurement of humeroulnar incongruence in vivo. Elbow flexion reduces the radiographic recognition of HUI. For radiographic examination of HUI standing angle (135° extension) is recommended. Minimal angle of elbow extension should not be less than 120°.
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B-MODE AND POWER DOPPLER ULTRASONOGRAPHY OF THE SUSPENSORY LIGAMENT BRANCHES IN SPORT HORSES

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Introduction:
B-mode ultrasonography (US) is routinely used to achieve the diagnosis of suspensory ligament desmopathies.[1,2] In human medicine, the presence of Doppler signal is reported in painful tendinopathies.[3,4] A previous study has suggested the same pattern of Doppler activity in both humans as horses.[5] The aim of this study was to compare B-mode ultrasonographic findings with Power Doppler (PD) ultrasonographic findings in equine suspensory ligament branches (SLBs).
Material and Methods:
Nineteen hindlimbs and 15 forelimbs of 13 horses were examined for a total of 68 SLBs. Of the 13 horses included, 5 were free of lameness, and 8 had a lameness considered related to pain in the region of the SLBs based on the clinical examination and local analgesia. All branches were assessed by B-mode US and PD US using an Aloka 3500 US machine equipped with a 7.5 MHz linear transducer. PD US was realized on the non weight-bearing limb. PD and B-mode US images were obtained at three levels in each branch. PD US images were scored using a 4-point scale and images with maximal color activity were selected for analysis. B-mode images were classified as normal or abnormal based on shape, size, architecture, and echogenicity changes and B-mode abnormalities were classified as mild, moderate, or severe. B-mode and corresponding PD US images were subjectively compared. PD score was compared in lame versus nonlame limbs, in acute lameness versus chronic lameness and in SLBs with mild B-mode abnormalities versus SLBs with moderate to severe abnormalities.
Results:
Forty-three SLBs were abnormal in B-mode US while 25 had no B-mode US abnormalities. The PD signal was detected in 23 of the 43 SLBs abnormal at B-mode US. In 20 SLBs with mild heterogeneity at B-mode US, PD signal was not detected. None of the 25 SLBs classified as normal at B-mode US showed PD signal. PD score was higher in the lame limb, in acutely lame horses and in SLBs with more severe abnormalities at B-mode US.
Discussion/Conclusion:
This study demonstrates the absence of PD signal in SLBs with normal B-mode US in nonexercised horses. The results also suggest a correlation between PD signal and clinical symptoms, with PD signal being more evident in branches more severely affected at B-mode in lame horses.
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ULTRASONOGRAPHIC EVALUATION OF THE URINARY BLADDER, URINE RETENTION AND BLADDER RUPTURE IN THE DROMEDARY CAMELS (*CAMELUS DROMEDARIUS*)

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Introduction:
Literature on urine retention in camel is very meager, However, a few clinical reports showed that obstruction is caused by urethritis or urolithiasis.[1] Thereafter imaging of the urinary systems were described in conjunction with abdominal distention.[2]
Aims:
The aim of the present study was to evaluate the bladder in healthy camels and compare them with distended or ruptured bladder secondary to obstructive urolithiasis, or urethral stenosis.

Materials and Methods:
Ten male dromedary camels (three male normal; three distended bladder; four ruptured bladder) with a mean body weight of 678 kg, mean age 7.7 years (5–12 years) was included in the study. Camels were judged to be normal based on results of physical examination, serum biochemistry, and urinanalysis. Obstructive urolithiasis caused reduced activity, decreased appetite, side-to-side rolling associated with anurea. When rupture occurred, the animal's appetite improved but the abdomen was severely distended. Urine samples were obtained through cystocentesis per rectum or abdomenocentesis. Camels were examined in the sternal recumbent position. The bladder was assessed by rectal examination. Thereafter ultrasonographic assessment was performed using linear transducer fitted with 7.5 MHz probe.
Results:
Ruptured bladder produced increased thickness in the bladder. Wall layering appeared as hyperechoic bands and the lumen was a slit-like anechoic structure. The spleen was floating over the abdominal fluid. Urinary distention caused increased volume of the bladder. There was anechoic appearance on its upper part and an increased echogenicity toward the lower two-third.
Discussion and Conclusions:
Differentiation between distention and rupture of the urinary bladder depends on presence of urethral pulsation. The test is positive before rupture. Ultrasound is essential to assess bladder volume and measure its thickness and thereafter the amount of abdominal fluid.
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IMAGING DIAGNOSIS: RADIOGRAPHIC EXAM OF RICKETS IN A DOG

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Introduction:
Rickets is a young growing dog disease, rare nowadays in Brazil.[1,2] It occurs due to deficiency of vitamin D, calcium, or phosphorus in blood. Main causes are nutritional deficiency of these elements, inability of vitamin D absorption, metabolism or utilization, renal diseases, and intestinal absorption deficiency.[1–4] Moreover, its presentation occurs mainly due to imbalanced diets offered after weaning, which is uncommonly at the present time, because of the large availability of commercial foods. Affected animals can present bone deformities and fragility, joint swelling, dental disorders, and appetite disturbance.[2–4] Radiographic signs include general loss of bone density, generalized widening of physeal lines, joint swelling, angular limb deformities, thoracic deformities, and costochondral joints swelling, known as rachitic rosary.[2,5] In this report, we present a case report with radiographic images compatible with rickets.
Case Report:
A 3-months-old male mixed-breed dog, presented with intense loss of weight, and multifocal swollen and painful joints was submitted to radiographic exam of fore and hind limbs. Radiographic findings of the hip, bilateral carpus, and elbows include generalized loss of bone density, cortical bone thinning, and both metaphyseal and growth plate enlargement, assuming a mushroom-like appearance. Blood test was also performed, which showed decreasing levels of calcium (0.83 mEq/l), sodium (139 mEq/l) and potassium (3.2 mEq/l), and increasing levels of alkaline phosphatase (1791 UI/l). Besides mild anemia (erythrocytes 5.4 million/mm^3), no other blood abnormalities were identified.
Discussion and Conclusion:
In dogs, the mainly differential diagnosis for rickets includes nutritional secondary hyperparathyroidism (NSHP) and chondrodysplasia. However growth plate disorders are not usually seen and hyperphosphatemia is expected in cases of NSHP. Concomitant physeal widening and epiphyseal changes are expected in cases of chondrodysplasia. On other hand, rickets do not show epiphyseal changes, just physeal widening and long bone bowing. Therefore, the presented case is compatible to rickets, due its clinic presentation, and radiographic and blood work findings, even though it is considered a rare disease.
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RETAINED CARTILAGE CORE IN THE DISTAL ULNA IN THE DOG. PREVALENCE AND OUTCOME IN THREE LARGE DOG BREEDS

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Introduction:
Retained cartilage core (RCC) has been regarded as a lesion with serious implications for the affected dog, resulting in a reduction in longitudinal growth of the ulna with all its consequences Decreased growth and formation of RCC has been suggested to occur due to failure of the metaphyseal or physeal blood supply.
Aim:
RCC was observed frequently lacking the described consequences during the progression of a larger study that focused on skeletal lesions in growing dogs with regard to environmental and genetic factors. It was decided to describe the prevalence and outcome of this lesion based on relevant data, which has never been done before.
Material and Methods:
This study included 364 dogs (Newfoundland = 112, Leonberger = 180, Irish wolfhound = 72). Radiographic and clinical examinations were scheduled at 3, 4, 6, 12, 18, and 24 months of age, including radiographs of the right antebrachium. Presence, magnitude, and consequences of RCC were recorded and the magnitude of RCC was graded 0 to 6 according to length of the core at 4 months of age: where Grade 1 $<$ 1 cm, Grade 4 $>$ 3 cm, and Grade 6 $>$ 6 cm.
Results, Discussion, and Conclusions:
RCC was evident in 282 dogs (77.5%) at 4 months of age. There was a significant difference between breeds both regarding presence and degree of RCC: NF: 33% and 0% grade 4 or more, LEO: 96.7% and 48.9% grade 4 or more, and IW: 98.6% and 44.4% grade 4 or more. When RCC was present, it was often developing from 3 months of age and disappearing before 6 months of age, although sometimes present at 3 and 6 months of age. The cartilage formed were captured in the diaphysis and eventually remodeled from all sides. Traces were visible in the diaphysis at 6 months but not at 12 months of age. The longitudinal growth, and thus the formation of cartilage in the productive layer of the growth plate, had normal speed. The ulna reached normal length, shape and structure, and no angular deformities or any other signs of "short ulna" were recorded in any of the 282 affected dogs. There is probably a significant difference in RCC development between dogs with different growth rate at the current age, and probably a difference between litters, but this has not yet been fully investigated. This study shows that the longitudinal growth of ulna is not impaired when RCC is present, as stated in previous publications. RCC should be regarded as a frequent finding in large breeds with no obvious clinical significance. Although not found in this study, RCC may make the growth plate more vulnerable to injuries.
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EVALUATION OF A PROTOCOL FOR AWAKE VERSUS SEDATED CONTRAST-ENHANCED MULTIDETECTOR HELICAL CT OF THE ACUTE ABDOMEN IN CANINE PATIENTS

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Introduction:
Contrast-enhanced multidetector computed tomography (CE-MDCT) is the current modality of choice in the evaluation of acute abdominal pain in the human emergency patient. CT imaging of canine patients with acute abdominal signs was of particular interest given the clinical instability of these patients.
Aim:
We propose a CE-MDCT protocol including precontrast, arterial, and portal venous phases for use in the canine acute abdomen and hypothesized that this protocol may be used in awake or minimally sedated patients.
Materials and Methods:
Eighteen client-owned dogs presented with acute abdominal signs were enrolled as part of a separate ongoing prospective comparative imaging study of canine patients with acute abdominal signs. Eight dogs were scanned awake while 10 were given minimal sedation.
Results:
Sixteen of 18 scans were considered fair to excellent in diagnostic quality with no statistical difference in distribution of diagnostic quality noted when comparing awake and sedated patients. One of the poorly diagnostic scans was the result of severe beam hardening due to previously administered barium contrast agent and the second the result of severe motion artifact in two of the three scan phases. No intravenous contrast-related adverse events were noted.
Conclusion:
We conclude that this dual-phase MDCT protocol can be performed rapidly, safely, and with excellent diagnostic quality in both awake and minimally sedated patients presented with acute abdominal signs.
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COMPARISON OF THE GRAY MATTER-WHITE MATTER RATIO IN NORMAL DOGS AND DOGS WITH VENTRICULAR ENLARGEMENT. A MORPHOLOGIC STUDY BASED ON MAGNETIC RESONANCE IMAGING (MRI)

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Introduction:
Variation of lateral ventricular size has been reported in dogs.[1] Ventricular enlargement is frequently observed in small toy breeds and dogs with brachycephalic head morphology. A trend between increasing ventricular volume and decreasing body size was suggested.[2] Due to this variation, the assessment of a normal ventricle size can be challenging in veterinary medicine. It is well known in neurobiology, that a constant allometric relation between cerebral white matter (WM) and gray matter (GM) exists, which increases with general body size of all mammals.[3] We calculate the WM/GM ratio in relation to body weight in a large group of dogs and use these results to identify a possible loss of WM in dogs with "enlarged ventricles."
Materials and Methods:
MRI scans of 91 dog brains were retrospectively analyzed. Group 1 included 35 brachycephalic dogs and 35 mesaticephalic dogs of different size with no apparent changes in brain morphology. Group 2 included 21 brachycephalic breeds in which subjectively enlarged cerebral ventricles were noticed in their MRI examination. Quantifying WM and GM volume was achieved using graphical software that allowed manual segmentation of WM and GM of the cerebrum. The slopes of the regression lines between body weight and WM: GM ratio of group 1 and 2 were compared, testing the null hypothesis that their slopes are identical.
Results:
The slopes of the regression lines were significantly different between groups ($P = 0.007$). Regression line of group 2 showed a less increase of the WM: GM ratio with increasing body weight. This indicates that a loss of WM occurred in the dogs with enlarged ventricles.
Discussion:
The current definition of hydrocephalus requires an excessive accumulation of fluid within the cerebral ventricles. What constitutes the word "excessive" accumulation of fluid in the cerebral ventricles was never determined in the dog. In contrast to hydrocephalus, enlarged ventricles have been usually assessed as having no apparent clinical significance. However, if the enlargement is associated with a loss of WM it might be a consequence of elevations of the intraventricular pressure, which gradually falls but still maintains a slightly elevated level. This is referred to as normal pressure hydrocephalus (NPH) in human medicine, which does not produce the classic signs of hydrocephalus but can lead to other neurological dysfunctions.
Conclusion:
Our study suggests that the enlargement of the cerebral ventricles in brachycephalic dogs is not a normal variant of ventricular volume as this accumulation is associated with a loss of white matter tissue around the ventricles. This finding may represent a canine analogue of human NPH.
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MULTISLICE CT PROTOCOL FOR THE DIAGNOSIS OF URINARY INCONTINENCE IN DOGS

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Introduction:
CT has been used for the diagnosis of urinary incontinence in dogs[1–3] with repeated scanning to demonstrate the ureters. The examination protocols did not investigate the entire urinary system.
Aim:
To develop a helical CT protocol for the entire female and male canine urinary tract with minimal patient preparation.
Material and Methods:
A 4-slice CT unit and IV contrast medium with 400 mg iodine/kg were used.[1] Dogs were positioned in ventral recumbence with the pelvis elevated without enema preparation or bladder catheterization. A survey, parenchymal and excretory phase were performed, followed by 1–3 30 s dynamic CT ureterography using four 5-mm-wide detectors over the bladder neck and cranial urethra. A positive contrast retrograde CT vaginogram in females or a CT-urethrogram in males was if other causes of incontinence were suspected.
Results:
A total of 14 dogs were included in the study, 2 male castrated, 4 females, 8 female neutered. Twenty-seven kidneys were seen, one had been removed, six kidneys showed abnormalities. A total of 27 ureters were identified, one had been removed, 19 were normotopic, 8 were ectopic with a termination in the caudal bladder in 5 and in the urethra in 3 ureters. The mean time of ureteral jet arrival was 2.6 s, with a range of 1 to 13 s, with similar timings for left/right, normo/ectopic ureters. In two dogs the fecal distended colon impeded on the visibility of the ureters. The urinary bladder was normal in 11 dogs and intrapelvic in 3 dogs. In nine dogs a retrograde CT-vaginogram and in one dog a retrograde CT-urethrogram was performed. The male urethra was normal six dogs had vaginal abnormalities.
Discussion:
Multislice helical CT offers an efficient one-stop examination of the entire urinary tract. The parenchymal phase postcontrast CT demonstrates the renal architecture and mucosal enhancement of ureters, bladder, urethra, and vagina. To visualize the course and ending of the ureters a combination of excretory phase and dynamic CT is ideal. A confident diagnosis of the ureteral endpoint is possible, when the caudalmost point of the ureter is identified as well as a visible jet in the bladder or urethral filling. A 15 s dynamic CT series is sufficient to identify the ureteral jet. A minimal enema preparation is recommended.
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PLAIN RADIOGRAPHY VERSUS COMPUTED TOMOGRAPHY FOR THE DESCRIPTION OF THE SCAPULA IN GIANT ANTEATERS

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Introduction:
The giant anteater, *Myrmecophaga tridactyla* (Linnaeus, 1758), belongs to the Class Mammalia, Order Xenarthra, and Family Myrmecophagidae.[1] The anteaters have forelimbs morphologically adapted for obtaining food, defense, and locomotion.[2] These special features of the giant anteater forelimbs are associated with its classification as a specialized fossorial mammal, whereas it is adapted for opening walls of termite nests.[3] Few anatomical descriptions have been made about this uncommon species.[2,3]
Aim:
For this, the aim of this study was to describe the bone morphology of the scapula in giant anteater of different ages using plain radiography and computed tomography (CT), and to compare the accuracy of the imaging modalities for scapula evaluation.
Materials and Methods:
Two adult cadavers, one young adult cadaver, and one young giant anteater (Myrmecophaga tridactyla) were used to obtain the images. Laterolateral and caudocranial radiographic projections and CT scans of both scapulae were performed for the description. Sequential transverse images were acquired on a spiral scanner (Shimadzu SCT-7800CT). The scanning parameters were 120 kVp, 100 mA, with a slice thickness of 2.0 mm, pitch of 1.0, and 1 s/rotation. The images were reconstructed using the Voxar 3D software.
Results and Discussion:
Radiographs and CT images revealed two spines of scapula, described as greater spine and lower spine. 3D CT reconstruction allowed an adequate visualization of the acromion, which ended in a hamate process that arched forward and medially rather high above the shoulder joint. The hemate could not be adequately visualized radiographically due to the overlapping. In the young giant anteater there was a scapular notch situated caudal to the supraglenoid tubercle. This structure was gradually closed according to the animal's age and became the foramen of scapula. However, the epiphyseal line could be observed in young adult animal.
Conclusion:
By eliminating overlapping tissue inherent in conventional plain radiography, CT was more sensitive to evaluate the scapula morphology. The knowledge of these special features of the scapula allows estimation of the age in giant anteater.
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CT CORRELATES VISCERAL FAT WITH ADVERSE CARDIAC CHANGES IN CANINE OBESITY AND WEIGHT LOSS

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Introduction:
Obesity and cardiovascular disease are strongly connected in humans, but are poorly understood in dogs.[1] Heart rate and cardiac output elevations are associated with dog obesity[2], but whether visceral fat quantity predicts these changes and whether weight loss normalizes them have not been investigated.
Aim:
To evaluate effects of fat distribution during obesity and weight loss on cardiac structure and function in dogs.
Methods:
Hemodynamic variables were measured before and after weight gain, then again after weight loss in beagles ($N = 8$). After baseline measurements in lean body condition, free access to a commercial diet resulted in obesity after 12 weeks. Then, restricted food portions normalized weight within 8–16 weeks. Cardiac structure and function were measured using echocardiography while blood pressure was measured using high definition oscillometry.[3] Computed tomography (CT) scans were used to quantify visceral and total fat distribution in dogs while obese and after weight loss.[4]
Results:
Baseline mean body weight was 9.8 $\pm$ 0.6 kg, but weight increased to 12.1 $\pm$ 0.7 kg (123 $\pm$ 3% ideal body weight) during obesity. Heart rate, cardiac output, and left ventricular free wall thickness at systole (LVFWs) significantly increased while total peripheral resistance significantly decreased with obesity. At this point of obesity visceral fat significantly correlated with LVFWs. Food restriction decreased weight to 10.2 $\pm$ 0.7 kg (105 $\pm$ 2% above baseline). Hemodynamic variables that increased with obesity normalized after weight loss with values tending to remain higher than, but not statistically different from, baseline. An exception was LVFWs that decreased to an even lower level than baseline. Weight loss negated the correlation between visceral fat and LVFWs.

Discussion:
Increases in LVFWs thickness and heart rate likely reflect hyperdynamic cardiac function, versus structural change, in short term canine obesity. Weight loss helped to normalize most measures of cardiac function, but the effect on cardiac function of further reducing LVFWs thickness below baseline is unknown. Using CT to measure visceral fat shows promise in predicting detrimental changes in canine cardiac function; particularly during weight gain, but not weight loss.
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RADIOGRAPHIC AND PATHOLOGIC FEATURES OF OSTEOARTHRITIS OF THE FELINE ELBOW JOINT

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Introduction:
Feline osteoarthritis (OA) is a common disease. Cats affected with OA show changes in behaviour and lifestyle rather that overt lameness.[1–4]
Aims:
The purpose of this study was to define the radiographical features of elbow OA and to relate the radiographical findings to the gross pathological features.
Materials and Methods:
Thirty adults cats euthanatized for reasons unrelated to this study were recruited. All medio-lateral radiographs of the elbow were evaluated for the presence of OA and scored using an OA Radiographic Score.[5] The same joints were dissected for visual inspection of changes indicative of OA and the macroscopic findings were scored using an OA gross pathological score.
Results:
Twenty-eight cats were affected with elbow OA (26 cats bilateral, 2 cats unilateral) as diagnosed by the presence of gross pathological changes of the articular cartilage. There were 10 castrated males, 7 females, and 11 spayed females. The mean age was 5.98 years. The mode global radiographic score of the left and right elbows were 1 (range 0–3). Thirty-eight (70.4%) of the 54 elbows had radiographic osteophytes, 39 (72.2%) had increased radio-opacity beneath the ulnar notch, 10 (18.5%) had areas of abnormal mineralization, 29 (53.7%) had a radiographically detectable supinator sesamoid bone, 29 (53.7%) had changes in joint space, and 14 (25.9%) had joint remodelling. Joint incongruity was observed in 6 (11.1%) elbow joints. Two joints were radiographically normal. All elbows with increased radio-opacity beneath the ulnar notch including those with equivocal change had cartilage changes. The mode global gross pathological score of the left and right elbow were 2 and 3, respectively (range 1–3). All elbows with a radiographically apparent supinator sesamoid bone had gross pathological signs of OA although 25 joints with no visible sesamoid did show gross pathology. None of the six normal joints had a visible supinator sesamoid bone. The gross pathological scores were significantly different between left elbows with a radiographically visible supinator sesamoid bone and left elbows without a radiographically supinator sesamoid bone ($P = 0.0060$). A similar finding was also observed in the right elbow ($P = 0.0127$). Areas of mineralization on the radiograph were caused mainly by mineralization within the joint capsule. Osteochondromas were present within two elbows but could not definitively be identified on the radiograph.
Conclusion:
Cartilage pathology can occur with minimal or no radiographic changes in the elbow joint but generally there was good correlation between radiographic scores and gross pathological scores with $r > 0.70$ and $P < 0.001$. Increased radio-opacity beneath the ulnar notch is a useful indicator of elbow OA and is more reliable than in other species.
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RADIOGRAPHIC CHARACTERIZATION OF ENLARGED STERNAL LYMPH NODES IN 71 DOGS AND 13 CATS

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Materials and Methods:
In this retrospective study, radiographically enlarged sternal lymph nodes were evaluated in 71 dogs and 13 cats for average size, location, and most representative radiographic view. Concurrent clinical diagnoses were also noted and grouped into one of three categories: neoplastic, inflammatory, or hematological.
Results:
There were no statistically significant differences in size between lateral views within each species. Enlarged sternal lymph nodes were more cranially positioned in dogs than cats. No statistical difference was noted between lateral views for reliable for sternal lymph node discernment. Neoplastic disease (78.9%) was the most prevalent condition seen in association with lymph node enlargement in dogs, followed by primary infectious or inflammatory diseases (14.1%), and various hematological conditions (7.0%). In cats, neoplasia was most common (69.2%), followed by inflammatory diseases (30.8%). No hematological conditions were noted in cats. The most common etiologic agent seen concurrently with enlarged sternal lymph nodes in both dogs (33.8%) and cats (38.5%) was malignant lymphoma.
Conclusion:
The results of this study provide a clinically useful representation of the average size and location of radiographically enlarged sternal lymph nodes for dogs and cats. The diseases represented demonstrate the wide spectrum of potential causes of sternal lymphadenopathy.
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COMPUTED TOMOGRAPHIC IMAGING OF AWAKE CATS WITH UPPER AIRWAY OBSTRUCTION

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Materials and Methods:
Ten cats with clinical signs of upper airway obstruction underwent computed tomography (CT) imaging without sedation or anesthesia. CT was performed using a 16-slice helical CT with the cats placed in a positional device. Three-dimensional (3D) internal volume rendering was performed on all image sets and 3D external volume rendering was performed on cats with evidence of mass lesions. Definitive diagnosis and etiology of upper airway obstruction was achieved using visual laryngeal examination, endoscopy, fine needle aspirate, biopsy, and necropsy.
Results:
Seven cats were diagnosed with intramural upper airway masses, two with laryngotracheitis and one with laryngeal paralysis. The CT and 3D volume rendered images identified presence upper airway disease in all cats. In cats with masses, CT accurately identified the mass and location in all cases. The CT findings in cats with laryngotracheitis and laryngeal paralysis compare favorably; however traditional diagnostic methods are required for definitive diagnosis.
Conclusion:
CT imaging of awake cats with upper airway obstruction is a noninvasive, clinically useful diagnostic technique.
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COMPARATIVE CROSS-SECTIONAL IMAGING OF THYROID CARCINOMA IN DOGS

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Materials and Methods:
This study describes the ultrasound, computed tomography (CT), and magnetic resonance imaging (MRI) characteristics of 16 prospectively, and 7 retrospectively recruited dogs with suspected thyroid tumors. Of these, 17 were confirmed thyroid carcinoma, while 6 were initially misdiagnosed. These were four carotid body tumors, one para-esophageal abscess, and one undifferentiated squamous cell carcinoma.
Results:
This study is the first report of carotid body tumors and thyroid carcinoma using MRI and CT, and describes imaging characteristics differences between these tumor types. Thyroid carcinomas occurred in older dogs without evidence of sex-predilection, and were more often unilateral. They all were large, heterogeneous, moderately to strongly vascularized, and most commonly contained areas of dystrophic mineralization and/or fluid accumulations. On MRI, they appeared hyperintense compared to surrounding musculature on all imaging sequences used, while on CT they had a lower attenuation value than normal thyroid gland tissue. Tumor capsule disruption with invasion of the surrounding structures was most commonly seen on MRI, and best corresponded to histopathology findings. Palpation of the mass was not accurate in differentiating locally invasive from well-encapsulated masses. CT had the highest specificity (100%) and MRI had the highest sensitivity (93%) in diagnosing thyroid carcinoma, while ultrasound had considerably lower results.

Conclusion:
We therefore consider ultrasound as a routine screening tool for suspected thyroid carcinoma, but recommend either CT or MRI for better staging these tumors.
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COMPARISON OF CLINICAL, OTOSCOPIC, RADIOGRAPHIC AND ULTRASONOGRAPHIC FINDINGS IN DOGS WITH OTITIS EXTERNA: PRELIMINARY REPORT

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Introduction:
Otitis externa in dogs is diagnosed by clinical and otoscopic examinations but all details are not always visible. Additional examination methods are needed. Radiographic examination is one of the additional diagnostic methods as well as ultrasonography. Radiography and ultrasonography provide an insight to deeper structures beyond the bony ear canal wall.
Aim:
The aim of this study was to determine the value of ultrasonographic examination in dogs with otitis externa and compare findings with those determined by other methods. This report describes the preliminary findings of this modality in dogs with otitis externa.
Materials and Methods:
Twelve dogs of different breeds, ages, and sexes presented with ear problems to the Animal Hospital of Uludağ University, Faculty of Veterinary Medicine were included in the study. Clinical, otoscopic, radiographic, and ultrasonographic examinations were performed, respectively. Ultrasonographic examination was done before and after saline application in order to create an acoustic window. Longitudinal and transverse scanning was made and the results were recorded.
Results and Discussion:
All dogs showed typical clinical signs related to otitis externa. Unilateral and bilateral otitis externa were observed in five and seven dogs, respectively. Clinical examination revealed narrowing of the external ear canal in 10 cases. Foreign body was detected in one case. Some changes related to the horizontal canal wall and tympanic membrane were not clearly visible due to narrowing of the ear canal during otoscopic examination. Ossification of the ear canal cartilage was seen radiographically in three cases. All tympanic bullae were normal on radiographic and ultrasonographic examinations. Narrowing of the ear canal was confirmed by ultrasonographic examination in six cases. Abnormal cerumen ($n = 3$), proliferative tissue ($n = 2$), foreign body ($n = 1$), and inflammatory changes related to the external ear canal and surrounding tissues ($n = 6$) were observed on ultrasound. This preliminary report with a low number of animals precluded statistical evaluation of results. Further comparisons will be made between diagnostic tools for otitis externa.
Conclusion:
Although the results are only preliminary, ultrasonography appears to facilitate the diagnosis of soft tissue changes in dogs with otitis externa.
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LOW-FIELD MR ARTHROGRAPHY OF THE CANINE SCAPULOHUMERAL JOINT

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Introduction:
Compared to MR, MR arthrography (MRA) has the benefit of joint distension, providing better delineation of several intra-articular structures.[1–3] A limitation of MR/MRA in low-field deals with the tradeoff between slice thickness and scan time. However, as low-field MR systems are more frequently available, an evaluation of this technique is still required.
Aim:
Investigate the execution time and the visibility of intra- and periarticular structures performing MRA of three extended[2] canine cadaveric scapulohumeral joints in a 0.2 T unit.
Materials and Methods:
Three millimeter slices Gradient Echo (GE) T1-Weighted (T1-W), High Resolution Gradient Echo Short T1 Inversion Recovery (HRGE STIR), and High Resolution Turbo Spin Echo (HRTSE) T2-W sequences were performed. The shoulder joints were then injected with gadodiamide diluted in NaCl (5 mmol/l1) and scanned in GE T1-W, HRGE STIR, and SE T1-W sequences. The limbs were cut along the same planes for anatomical comparison.
Results:
The infraspinatus, supraspinatus, and subscapularis muscles and insertion tendons, teres minor, and biceps brachii tendons, joint capsule, lateral and medial glenohumeral ligaments were visualized and their identity was confirmed. A slice thickness of 3 mm allowed satisfactory delineation of all the clinically relevant structures. The overall scan time (MR + MRA) was 129 min.
Discussion/Conclusion:
Obtaining a satisfactory delineation of the shoulder's clinically relevant structures with low-field MRA requires a long but still realistic time. The STIR sequence provided the best capsule delineation,[1] but was inferior compared to GE T1-W in tendons depiction. Compared to high-field, low-field MRA allowed obtaining equal sized slices, with comparable conspicuity of intra- and periarticular structures but longer scanning time.[2]
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CANINE SHOULDER CT AND CT ARTHROGRAPHY

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Introduction:
High-field-strength MRI has become the gold standard for imaging of the canine shoulder joint.[1–3] However this remains an expensive, time consuming procedure with limited availability. Computed tomography (CT) has been shown to be effective for the canine shoulder.[4] There is currently no information available regarding the optimal positioning and arthographic contrast medium concentration for shoulder CT. It has not been described which relevant anatomic structures can be identified.
Aim:
To identify relevant anatomic structures of the shoulder region in different joint angles with and without positive contrast medium arthrography. To determine the optimal contrast medium concentration for CT arthrography.
Materials and Methods:
Nine cadaver thoracic limbs from dogs without previous history of thoracic limb lameness were used. Test tubes with 10 ml of nonionic iodinated contrast medium in concentration of 10, 20, 30, 40, 50, 60, 70, 80, 90, and 100 mg I/ml were scanned and evaluated for optimal brightness. The optimal concentration was used for shoulder CT arthrography. Shoulders were imaged with a helical 4-slice CT with bone and soft tissue algorithm in three different angles (140° extension, 90° neutral, 70° flexion) as survey CT and CT arthrography. The anatomic structures of the shoulder region were scored for image detail. Curvilinear reconstructions of the biceps tendon were performed to demonstrate its relationship with neighbouring structures.
Results:
A total of 60 mg I/ml was determined as the optimal concentration. The muscles of the shoulder region were visible in all angles, but best in extension. Only CT arthrography provided excellent visualization of the subscapularis tendon insertion, medial, lateral glenohumeral and transverse humeral ligaments. Curvilinear biceps tendon reconstructions demonstrated an impinging effect of the supraspinatus tendon on the biceps tendon in the flexed position.
Discussion:
CT provides excellent detail for imaging of the canine shoulder joint. The extended position is most beneficial allowing maximal image detail and avoiding positional artifacts that could be confused with tendon pathology. Using CT arthrography at 60 mg I/ml, excellent visualization of the shoulder ligaments can be achieved.
References:
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DETECTION OF PORTOSYSTEMIC SHUNTS IN CATS BY ULTRASOUND GUIDED TRANSSPLENIC INJECTION OF 99MTC-PERTECHNETATE

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Introduction:
Portosystemic shunts (PSS) are relatively rare in cats. Abdominal ultrasound (US) is often the first choice imaging modality for PSS detection. In dogs with an inconclusive US result, scintigraphy is helpful in diagnosing PSS. Arrival of pertechnetate (99mTcO4-) in the heart prior to the liver is diagnostic for PSS. The shunt fraction (SF) can be calculated, it is an indication for the size of the PSS and can be used for followup after surgery.

Aim:
The applicability of transsplenic portal scintigraphy using 99mTcO4- (TSPS) for diagnosis of PSS in cats was evaluated retrospectively (2001–2011).
Materials and Methods:
Nine cats (6 months–4 years) suspected of PSS were included. In one cat with PSS, the scintigraphic study was repeated after surgical PSS attenuation (total of 10 scans). All cats were anesthetized (propofol 6 mg/kg IV) and placed in right lateral recumbency over the gammacamera (Toshiba GCA901). A low dose of 99mTcO4- (mean ± SD 2.3 ± 0.95 mCi) was injected in the splenic parenchyma under ultrasound guidance (7.5 MHz probe). The dynamic acquisition (4 frames/s for 60 s) was started seconds prior to the injection. Images were then first reviewed in film mode. Afterwards, all frames were superimposed onto each other and regions of interest were drawn manually over the heart, the liver and a background region in the cervical area to calculate the SF.
Results:
In five cats a PSS was diagnosed with TSPS, whereas in only three of them a PSS was detected with US. In three cats (including the surgically treated cat), TSPS indicated the absence of a PSS, which was in agreement with the US results. One cat had a relatively increased SF while no abnormal vessel was seen on the scintigram. This cat was suspected of having hepatic portovenous hypoplasia. In one cat, 99mTcO4- was injected intraabdominally instead of into the splenic parenchyma, leading to a nondiagnostic scan.
Conclusion:
Also in cats, TSPS is a fast and simple method to confirm the presence of a PSS. Furthermore, it can be used to evaluate surgical attenuation of the shunt. Due to the relatively small size of the cat's spleen, 99mTcO4- injection into the parenchyma might sometimes be technically challenging.
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INFLUENCE OF BACKGROUND ROI AND TIME INTERVAL SELECTION ON GFR ESTIMATION USING 99MTC-DTPA IN NORMAL CATS

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Introduction:
Scintigraphic imaging with 99-m-technetium labeled diethylene pentaacetic acid (99mTc-DTPA) knows a widespread use for glomerular filtration rate (GFR) estimation. It simultaneously gives information on global and individual kidney function. However, postprocessing may influence the absolute GFR values.
Aim:
This study investigated the effect of background (BG) correction and time interval choice.
Materials and Methods:
Dynamic 99mTc-DTPA scans were performed in 9 healthy adult (6–12 years) cats. Clinical exam, blood exam, and urinalysis were normal. The cats were anesthetized (propofol IV, 6 mg/kg) and positioned in dorsal recumbency over the gamma camera equipped with low energy collimators. A dynamic scan (6 s/frame, 6 min total) was started simultaneously with tracer injection. All frames were summated and regions of interest (ROIs) were drawn over both kidneys for GFR estimation. Three different background ROIs were manually placed for comparison: caudolateral (BG1), C-shaped around the entire kidney excluding overlap with ureter (BG2) and two rectangles at the cranial and caudal pole of each kidney (BG3). GFR was then calculated with the three different BG corrections (same kidney ROI for all GFRs) following a previously established formula, using the kidney and BG tracer uptake from 60 to 180 s (Interval 1). Additionally, GFR was also calculated over the period of 60 to 120 s (Interval 2), and 120 to 180 s (Interval 3).
Results:
GFRs calculated with one specific BG ROI, whether this was BG1, BG2, or BG3, but using the different time intervals significantly differed from each other ($P = 0.01$). Comparing GFRs using the three BG ROIs within a specific time interval did not give statistical differences for Interval 1 and 2. However, within Interval 3, GFR was significantly different when comparing BG1 with BG3, and BG2 with BG3 but GFR was similar using BG1 and BG2 ($P = 0.01$). Different time intervals seem to cause significant variation in absolute GFR values, regardless of the choice of BG ROI. However, within 1 specific time interval, GFR can in some cases be influenced significantly by the choice of BG ROI.
Conclusion:
Even though not all differences weresignificant, consistency in 99mTc-DTPA scan processing remains advisable, especially in followup examinations for one patient.
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ULTRASONOGRAPHIC FINDINGS IN THE STIFLE JOINT OF ACTIVE JUMPING AND DRESSAGE HORSES

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Introduction:
Ultrasonography (US) is frequently used to evaluate the equine stifle joint. Some soft tissue US findings are known to be clinically relevant such as lesions affecting the echogenicity of the meniscus,[1,2] others are considered incidental such as hypoechoic areas in the patellar ligament.[3] These considerations are not always evidence-based and are sometimes the result of personal experience. This study aims to describe the US changes observed in the stifle of clinically sound, active jumping and dressage horses.
Materials and Methods:
To be selected, horses had to meet four criteria: (i) be competing at least 1 time/month at national or international level, (ii) be in full work, (iii) be free of lameness, (iv) the riders should not have any complains on the horse's performances. Both stifle joints of each horse were scanned systematically and findings were recorded.
Results:
A total of 46 Warmblood horses (mean age = 9 years) fulfilled the criteria (28 show jumpers, 18 dressage horses). US was normal in 21 horses. Abnormalities were seen in one stifle in 7 horses and in both stifles in 18 horses. The medial femorotibial joint showed changes in 18 horses: periarticular new bone, effusion of medial recess, subchondral cyst in medial femoral condyle and lesions in the cranial meniscal ligament or medial collateral ligament. Four horses had abnormalities in the lateral femorotibial joint: mild effusion, subchondral cyst in lateral femoral condyle. The femoropatellar joint had abnormalities in 16 horses: medial patellar ligament, intermediate patellar ligament, effusion or osteochondrotic lesions.
Discussion:
Mild changes can be seen in the stifles of sporthorses. Lesions in the menisci, the tendinous portions of the popliteus muscle, long digital extensor muscle, or peroneus tertius muscle or the lateral collateral ligament are likely to be clinically important.
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ANATOMIC VARIATIONS OF THE EQUINE CERVICAL VERTEBRAL COLUMN: AN EX VIVO CT EVALUATION

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Introduction:
Cervical vertebral pathology in horses has been related to neurological deficits and/or lameness.[1] Radiography of the vertebral column is part of the routine examination of these patients but can be challenging due to superposition. Patient size has been a limiting factor for computed tomography (CT) of the entire cervical vertebral column in vivo and only limited post-mortem studies have been performed.[2,3]
Aim:
To evaluate the entire cervical vertebral column of healthy and ataxic adult horses with CT and compare these findings with the described normal anatomy of equine vertebrae.[4]
Material and Methods:
Postmortem CT examination of the cervical vertebral column (C1-Th2) of healthy (6) and ataxic (21) adult horses (20 KWPN, 2 Friesian, 6 other breeds) of a median age of 8 years and 10 months was performed. Images were reviewed, compared with the described normal anatomy and scored for number of cervical vertebrae and morphology.
Results:
Variations of the described anatomy were mostly present in C6 and C7, while fewer changes were seen in C1–C5. Variations encountered were asymmetry in size of cranial and caudal articular processes when comparing left to right (1 × C2, 2 × C3, 3 × C4, 5 × C5, 11 × C6, 5 × C7), asymmetry between left and right transverse processes due to a differing shape and position (8 × C6, 3 × C7), absence or asymmetry of the ventral lamina of the transverse process in C6 (8) and presence of a ventral lamina in C7 (13). The transverse canal diameter was slightly asymmetric in several vertebrae of 13 cervical columns and present in C7 (4). Most horses (27) had a normal number of seven cervical vertebrae and only one (ataxic) horse had eight cervical vertebrae. Asymmetry of articular processes, transverse processes, transverse canal diameter, ventral lamina in C6 and presence of a ventral lamina in C7 were seen in healthy horses (1, 2, 3, 1, 1) and ataxic horses (26, 9, 10, 7, 12).
Discussion:
The findings in this preliminary study are yet of unknown clinical significance. Important, however, is the fact that varying conformation in size, shape, and position of different parts of the cervical vertebrae in healthy and ataxic adult horses have been confirmed and should be kept in mind when reviewing radiographs of the equine cervical vertebral column.
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RADIOGRAPHIC CONTRAST STUDIES OF THE DIGESTIVE TRACT IN PIGEONS

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Introduction:
Conventional radiographic examination of the digestive tract of the pigeon has been shown to be limited by the presence of the large air sacs.[1,2]
Aim:
The aim of this study was to further investigate the distribution and propagation of contrast through the various parts of the digestive tract of the pigeon.
Materials and Methods:
Contrast radiographic studies were performed on six pigeons using barium sulphate. A lubricated cannula was used to introduce 2 ml of contrast at each of the following sites: the base of the beak, the ingluvia and the cloaca. Radiographs were taken immediately for assessment of the esophagus and glandular and muscular stomach. For assessment of the ingluvia repeated administration of contrast was necessary every 3–4 min. Exposures were made after 15, 30, 60, and 120 min for visualization of the intestine. The intestine and cloaca were also assessed with radiographs taken immediately after contrast administration into the cloaca.
Results and Discussion:
The barium sulphate solution passed too quickly through the glandular and muscular stomach for any contrast to be seen in these structures on the radiographs and this was thought to reflect stress from handling. Thus, we administered ketamine to one of the pigeons.
Conclusion:
For adequate examination of the ingluvia repeated administration of contrast is necessary resulting in distension of the gizzard and the visualization of two symmetrical lateral compartments. The crop area is well delineated. The two rudimentary caeca of the pigeon are also evident and are tubercular in shape.
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ENDOVASCULAR TREATMENT AND/OR EVALUATION OF CANINE INTRAHEPATIC PORTOSYSTEMIC SHUNTS: SHORT- AND LONG-TERM EXPERIENCE IN 100 DOGS

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Introduction/Aim:
The purpose of this study was to retrospectively evaluate the results following endovascular management of canine intrahepatic portosystemic shunts.
Materials and Methods/Results:
A total of 100 dogs with congenital IHPSS received 112 procedures (80% had one treatment, 15% had >1 treatment, and 5% had 0 treatments due to excessive portal-central venous pressure gradients). Percutaneous vascular access and angiography identified 41 right divisional, 35 left divisional, and 19 central divisional shunts (5 not reported) of which 9% were complex/multiple shunts. Partial shunt attenuation was performed in 92 cases using caval stent placement and thrombogenic coils within the shunt while monitoring portal blood pressure.[1–3] Complete acute shunt occlusion was possible in three cases. Major intraoperative complications (2/112; 2%) included temporary severe portal hypertension in one dog and GI hemorrhage in one dog. Major peri-operative (<1 week postop) complications (12/110; 11%) included seizures/HE (6%), cardiac arrest (2%), jugular site bleeding (2%), pneumonia (1%), and acute death (1%). Median follow time for treated cases was 828 days (range 0–3411). Median survival time for treated dogs was 2204 days (range 0–3411) with 93% 60 day, 83% 1 year, 74% 2 year, and 63% 3 year survival rates. Outcome was considered excellent (48/90; 53%) or good (19/90; 21%) in 74% of treated dogs.
Discussion/Conclusion:
Endovascular treatment for canine intrahepatic shunts may result in lower peri-operative morbidity and mortality rates with similar success rates when compared with previously reported open surgical procedures. Gastrointestinal ulceration was a common finding among this population of dogs and lifelong gastroprotectant medications are now recommended by the authors.
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INTRODUCING A NOVEL TECHNIQUE TO IMAGE THE SKELETAL SYSTEM DURING MOTION: EQUINE DISTAL LIMB KINEMATICS DURING LOCOMOTION ASSESSED WITH HIGH-SPEED FLUOROSCOPY

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Introduction:
In this study, we used the horse's foot as an example to validate a novel X-ray based method for visualization of the musculoskeletal system during movement. Normal fluoroscopy systems are of limited use in moving animals due to their low frame rate. High-speed fluoroscopy combines cineradiography with high-speed video techniques and allows frame rates of up to 5000 Hz. In this study, we used this technology to visualize the kinematics of the equine foot during motion. The foot is the most common site of lameness[1] and biomechanics plays an important role in the aetiopathogenesis of lesions within the foot.[2]
Material and Methods:
Six horses were walked and trotted over force plates, through the field of view of a high-speed fluoroscopy system until six strides of acceptable quality were obtained. Joint angles, moment arms, and tendon angles were measured repeatedly and the repeatability coefficient determined[3]. The force exerted on the navicular bone by the deep digital flexor tendon was calculated.
Results:
High-speed fluososcopy is a reliable method to assess distal limb kinematics in the horse with smaller repeatability factors than established kinematic assessment methods. The force exerted on the navicular bone was greater on the proximal border than on the distal border and increases with ground reaction force, but this relationship was not linear and not the same for all horses. The maximum force acting on the navicular bone was observed at stance.
Conclusion:
High-speed fluoroscopy provides a new method that allows dynamic assessment of the musculoskeletal system, thus allowing the visualization of the mechanical interplay between the different structures. This will enhance basic understanding of biomechanics and will open up new opportunities for treatment and prevention.
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ANTIVASCULAR ULTRASOUND THERAPY IN MICE WITH IMPLANTED MELANOMAS

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Introduction:
Antivascular cancer therapy has been studied extensively with a focus on the use of pharmacological agents.[1] We demonstrated that low-intensity ultrasound also disrupted tumor neovasculature in the presence of a circulating microbubble-containing ultrasound contrast agent.[2]
Aim:
To study growth of a melanoma following a single episode of antivascular ultrasound therapy, and to develop a mathematical framework for describing the microbubble-induced heating that occurred.[2,3]
Materials and Methods:
Following the intravenous injection of 0.2 ml ultrasound contrast agent (definity), ultrasound therapy ($n = 15$) was performed on 1 ml murine melanomas for 3 min(3 MHz; continuous; $2.4 \pm .1$ W.cm^{-2} [ISATA]); control mice ($n = 17$) received a sham treatment. Mice were euthanized once the tumor had reached 3 ml and survival percentage versus time curves were plotted. Biological tissues were modeled as an inhomogeneous continuum of microbubble-filled vasculature, cells, and interstitial fluids with compressibility equal to the sum of the compressibility of each component.
Results:
The median survival time for the treated group was 23 days and for the control group was 18 days ($P = 0.0001$). Mathematical simulations showed that the absorption of ultrasound waves by viscous damping of the microbubble oscillations induced significant local heating of the tissue vasculature. The extent and the rate of temperature increase not only depended on the properties of the microbubbles (including number and peak density radius) and the sonication parameters (frequency and intensity), but were also influenced by blood flow.
Discussion:
Antivascular ultrasound therapy reduced the growth rate of an implanted melanoma and increased survival time. Modeling showed that slow blood flow conditions lead to higher tissue temperatures due to a stronger interaction between microbubbles and ultrasound and reduced heat dissipation. Because tumors have slower blood flow than healthy tissue, the microbubble induced ultrasound antivascular therapy is likely to affect cancerous tissue more extensively than healthy tissue, providing a way to selectively target the vasculature of cancers. Further, the tissue response to thermal, mechanical, or sonochemical injuries by antivascular ultrasound could stimulate an immune response and induce endogenous vaccination.
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LOW-FIELD MRAIR ARTHROGRAPHY AND JOINT DISTRACTION IN THE ASSESSMENT OF EQUINE METACARPOPHALANGEAL ARTICULAR CARTILAGE

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Introduction:
The fetlock is the most affected equine joint with traumatic and degenerative disease.[1] Because of the condylar curvature, thin cartilage, and the articular tightness, the assessment of osteochondral metacarpal defects using low-field MRI is a diagnostic challenge.[1–3] To improve the capability of MR arthrography in very tight joints it was suggested to use negative contrast medium[3] or joint distraction during MR imaging.[4,5] To our knowledge combination of air MR arthrography (MRAir) and articular joint distraction has not been reported yet.
Aim:
The aim of this study was to evaluate the capability of low-field MR imaging in detection of both artificially induced and spontaneous cartilage lesions of the metacarpal condyle by using intra-articular air injection and articular distraction, alone or combined.
Materials and Methods:
Different types of cartilage defects were created under arthroscopic guidance in the metacarpal condyle of 10 cadaveric limbs of 2-year-old horses. MRI in neutral position (MRI–N) was realized before and after intra-articular injection of air (MRAir). Five fetlocks of adult horses were also examined ex vivo using three-dimensional Gradient Echo T1-weighted sequences in neutral position (MRI-N), with joint distraction (MRI-D), and using MRAir maintaining the articular distraction (MRAir-D). Cartilage signal alterations were evaluated on MR images and MR results were compared to macroscopic examination.
Results:
In MRI-N images of the fetlocks of 2-year-old horse 40% of the holes and cartilage abrasion were identified, while MRAir identified 83% of the full thickness circular defects and 100% of full thickness abrasions. In the adult horses' fetlocks, MRAir-D allowed the visualization of all lesions while only 3/10 of the full thickness cartilage defects and 5/10 of all lesions were visualized in MRI-N and MRI-D, respectively.
Conclusion:
The results of this ex vivo study suggest that MRAir in conjunction with articular distraction can be useful in the detection of artificially induced lesions of metacarpal condyle cartilage and may increase the capabilities of low-field MR imaging in assessing of spontaneous cartilage lesions in equine fetlocks. Further studies should be realized to prove the in vivo feasibility of the technique and its usefulness on clinical cases.
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MRI FINDINGS ASSOCIATED WITH NAVICULAR BURSA MEDICATION IN THE HORSE: GOOD THERAPEUTIC CHOICE OR A DANGEROUS ONE? PRELIMINARY RESULTS

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Introduction:
Navicular bursa injection (NBI) with corticosteroids (CS) in horses with palmar foot pain is controversial: NBI often cause a rapid worsening of deep digital flexor tendon (DDFT).[1,2] The magnetic resonance imaging (MRI) has the capability to detect hemosiderin deposition as result of NBI and to evaluate the direction of the needle and verify the correlation with changes in the DDFT.
Aim:
The aim of this study was to investigate the correlation between MRI findings of haemosiderin deposition due to NBI and DDFT lesions. Furthermore, the eventuality of intratendinous injection into the DDFT performing NBI was investigated.
Materials and Methods:
The first part of the study included horses with MRI findings of hemosiderin deposition due to a NBI underwent to MRI examination because of foot pain. MRI examination was performed in nine cadaveric forelimbs to exclude lesions involving the DDFT. NBI of Contrast Medium (CM) using two different approaches (Distal Palmar Approach-DPNP to the navicular position in six limbs, Proximal Palmar Approach-PPA in three limbs).[3] The limbs were re-examined using MRI to evaluate the presence of CM in the NB and the identification of the needle paths. Afterwards the DDFTs were isolated, washed, and X-rays were taken to assess the presence of CM in the tendon thickness.
Results and Discussion:
In the in vivo study were included 6 feet and a correspondence between the presence of hemosiderin depositions due to NBI and severe alterations of the DDFT at the injection site was observed. In MRI images and X-rays of cadaveric limbs well-rendered needle paths through the DDFT were observed injected feet using the PPA and with the needle directed proximally to the navicular bone. In this study, the DPNP approach seems to be safer then PPA approach. From a critical analysis of the literature about the effects of corticosteroids, the diffusion of therapeutic substances from the DIP joint to the NB, on the basis of MRI findings and the possible correlations between DDFT lesions and NBI appeared from this study, we believe that is careful to use this therapeutic approach only in selected cases and only after careful evaluation of advantages and disadvantages of this procedure.[1,2]
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B-MODE AND COLOR DOPPLER SONOGRAPHIC FINDINGS OF AN INJECTION-SITE FIBROSARCOMA IN A PANTHERA LEO

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Introduction:
Fibrosarcoma is a tumor commonly expressed at injection sites in felines with a high probability of recurrence and metastases.[3] The diagnosis is made by histopathologic examination[2] and the treatment of choice is surgical.[3] The macroscopic appearance is often of a large mass with a central cystic cavity surrounded by necrotic tissue and microvessels.[1] Imaging studies, such as ultrasound, are often performed for staging purposes to help decide upon the most suitable therapeutic protocol and to determine the prognosis.[1]
Aim:
We describe the B-mode and color Doppler ultrasonographic findings of an injection-site fibrosarcoma in the interscapular region in a *Panthera leo*.
Case Report:
An adult *P. leo* was admitted to the Animal Medical and Research Center, presented with a soft tissue swelling in the interscapular region. An ultrasound examination was performed to evaluate local extent of the mass and search for metastasis. Ultrasound revealed a cavitary mass within in the interscapular muscles, measuring 22.0 cm × 17.0 cm × 9.0 cm, with heterogeneous and echogenic tissue and anechoic fluid, which contained some suspended echogenic material. The periphery of the mass, which measured 2.11-cm thickness, contained numerous small blood vessels on color Doppler images. Ultrasound-guided fine needle aspiration of the mass (and collection of fluid from the cystic area) was performed and submitted for cytological analysis. There was no ultrasonographic imaging evidence of abdominal metastasis. Subsequently, surgical excision of the mass was performed and the mass was sent for histopathological examination. The cytological and histopathological diagnosis was fibrosarcoma.
Discussion and Conclusion:
Ultrasonography provided useful information about the extent and morphology of the fibrosarcoma and the ultrasonographic and macroscopic pathological findings of the mass were consistent. Although in this case the diagnosis of fibrosarcoma was confirmed by histopathological examination, cytological analysis can differentiate neoplastic from inflammatory processes.[2] Ultrasonography was also useful to allow safe and accurate sampling of the two distinct regions of the tumor.
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TOMOGRAPHIC FINDINGS OF AORTIC DISSECTION IN A DOG: CASE REPORT

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Introduction:
Intima, middle layer, and adventitia are the layers of the aortic wall.[1] In cases of aortic dissection (AD), a sudden tear in intima is developed, resulting in the exposition of the middle layer to the intraluminal blood's pressure. The blood enters into the tear and accumulates between the middle layer and intima, forming a false lumen of variable length.[2] Imaging studies can confirm the diagnosis of this rare disease by allowing the visualization of the double aortic lumen.[3]
Aim:
In this report, we describe a case of AD diagnosed by computed tomography (CT) in a canine asymptomatic for cardiovascular disease.
Case Report:
A 2-years-old female rottweiler with a leiomyosarcoma in the urinary bladder underwent to an urotomography to assess the ureteral integrity. In tomographic images, a double lumen was visualized into the caudal portion of thoracic aorta, both filled with contrast and separated by a flap. In the precontrast phase, the attenuation value found of both lumens was 29 Hounsfield units (HU). In the postcontrast phase, a density value of 81 HU was found in one lumen (considered the true lumen), whereas in the other one an attenuation value of 76 HU was identified (false lumen). The apparent size of AD was 0.7 cm width, 0.9 height, and at least 3.0 cm long. It was unable to establish the region of origin of the double lumen since the CT scan begun in the tenth intercostal space. These findings were consistent with AD in the descending aorta.
Discussion and Conclusion:
Imaging techniques are important to the AD diagnosis and its monitoring since it is a progressive disease that can lead to a sudden death. CT proved to be efficient in the AD

diagnosis in dogs. A few reports were found in the literature, suggesting that this disease rarely affect animals and humans. However, as described in the animal of this report, the AD in dogs can be asymptomatic and therefore it may be underdiagnosed in veterinary medicine.

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COMPUTED TOMOGRAPHY (CT) AND ULTRASOUND IN THE EVALUATION OF THE LIVER IN A SNAKE (*BOA CONSTRICTOR AMARALI*)

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Introduction:

The liver is the largest organ in the coelomic cavity in reptiles. Snake liver is elongated and flattened, and the vena cava and portal vein are located between the two lobes of the liver. The liver has homogeneous parenchyma with well-defined contours, and hypoechoic.[1,4] Ultrasound is considered a noninvasive method of diagnosis.[5] Percutaneous liver biopsy using an ultrasound-guided route has been successfully used in snakes.[2]

Aim:

The aim of this report was to evaluate the liver of a healthy snake using ultrasound and CT examinations.

Materials and Methods:

A captive healthy male snake (*Boa constrictor amarali*) measuring 1.23 m in length and 5.5 cm in diameter was examined. The ultrasound examination was performed with the snake in ventral recumbency, using physical restraint. A GE ultrasonographic device (Logic 3 model) was used with 10 MHz linear probe. The abdominal organs were identified and the parenchymal texture of the liver was evaluated. A CT examination was performed under general anesthesia that was induced and maintained with isoflurane. Sequential transverse images of the body were obtained using a helical Scanner (Shimadzu SCT-7800CT) with the snake positioned in ventral recumbency. The scanning parameters were 120 kVp, 120 mA, with a slice thickness of 2.0 mm, pitch of 2.0, and 1 s/rotation.

Results and Discussion:

Ultrasonographically, the liver appeared elongated, well defined, with hypoechoic parenchyma and echotexture homogeneous, and located at the end of the proximal third of the snake's body. The vena cava and portal vein were visualized. These findings were similar to previously described by other authors.[3,4] On CT, the liver showed hypoattenuation compared with stomach, mean value of 6.5 HU. The inferior vena cava and portal vein showed hyperattenuation compared with the liver and isoatenuation compared to stomach, mean values of 56 HU and 3.0 HU, respectively. The combination of the two imaging techniques allowed a better evaluation of the snake's liver. More cases are necessary to obtain a pattern of normal values.

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