COMPARISON OF DIAGNOSTIC CONSISTENCY AND DIAGNOSTIC ACCURACY BETWEEN SURVEY RADIOGRAPHY AND COMPUTED TOMOGRAPHY OF THE SKULL IN 30 RABBITS WITH DENTAL DISEASE

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Abstract

Accurate diagnosis of dental disease and related complications is extremely important in companion rabbit medicine. When dental disease is diagnosed, a proper prognosis and surgical plan is essential for treatment success. The objectives of this retrospective study were to compare survey radiography and computed tomography (CT) of the skull and teeth in rabbit patients affected by dental disease verifying consistency between observers and diagnostic significance of the 2 techniques, and to evaluate diagnostic accuracy of the 2 modalities for prognostic and therapeutic purposes. In total, 27 pet rabbits were included in the study. A second diagnostic procedure was performed on 3 patients with dental disease for a total of 30 examinations for each technique. A full series of 5 extraoral radiographic views and CT scans of the head without contrast medium were obtained from each patient while under general anesthesia. With both series of imaging modalities, 13 bilateral anatomic and dental structures were evaluated by 2 observers for each patient's skull. Observations were statistically consistent for diagnosis, within the same technique and between the 2 techniques. Diagnostic accuracy of CT was superior in 24 patients (80%) in diagnosis and prognosis and in 17 patients (56.6%) for guiding extraoral dental and surgical treatment. Radiography provided superior accuracy in 5 patients (16.6%) for guiding intraoral dental treatment. Copyright 2016 Elsevier Inc. All rights reserved.

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D ental disease is often diagnosed in pet rabbits and represents one of the most common presenting problems with this companion exotic species.[1-3] Dental disease is acquired in most cases although the underlying etiology can be varied including congenital.[1,2] Hypotheses for pathophysiologic development of clinical dental problems in rabbit patients have been reported to be associated with developmental abnormalities,[1,4] trauma,[1,2,4,5] insufficient wearing of elodont teeth,[1,2,4,5] or as a consequence of metabolic bone disease.[1-3] Dental disease is a syndrome[1-3] and can cause a wide range of clinical signs and symptoms including reduced food intake or anorexia, reduced or abnormal feces, dehydration, painful posture, epiphora, exophthalmos, nasal discharge, dermatitis, mandibular, and/or maxillary swellings.[1,2] Dental abnormalities of incisor and cheek teeth, related complications such as periapical infections, osteomyelitis of the maxilla and/or the mandible, facial abscesses, and empyemas of anatomic cavities of the skull are widely recognized as various disease conditions affecting the head and oral cavity of rabbits.[1,2]

A tentative diagnosis of dental disease in rabbits can be made based on clinical presentation, but a definitive diagnosis relies primarily on diagnostic imaging. Oral endoscopy and survey radiographs represent the standard imaging modalities used for evaluating the rabbit head.[1,2] Advanced imaging techniques (e.g., computed tomography [CT]) may provide a more detailed view of anatomic structures of the head for better patient assessment, especially in advanced and complex dental disease cases.[2,6-11] The normal CT appearance of the rabbit skull-associated soft tissue structures and examples of disease conditions have been well described.[7,10,12-14] Additional diagnostic tests including culture and sensitivity, and magnetic resonance imaging may be helpful in developing a treatment plan where secondary abscess formation is present.[1,6,10,11]

A previously published investigation compared the ability of radiography (RAD) and CT to identify dental disease in 4 rabbits.[15] The purpose of this retrospective study was to compare a larger number of patients, examine in detail abnormalities of dentition and other related abnormalities of the skull, and assess diagnostic consistency between observers within each modality and between the 2 imaging modalities themselves. Further objectives were to assess diagnostic accuracy regarding the clinical prognosis, intraoral dental treatment, and extraoral surgical treatment.

MATERIAL AND METHODS

Patients

A retrospective study was performed on 27 pet rabbits affected by dental disease and related complications, undergoing both RAD and CT of the head between 2006 and 2014. Clinical disease signs and symptoms at presentation included reduced food intake and difficulty chewing, facial swelling, epiphora, exophthalmos, nasal discharge, otitis externa, and/or head tilt.

The radiographic equipment used for this study was located at the Clinica Veterinaria S. Siro, whereas the CT was in a referral veterinary diagnostic center (Clinica Veterinaria Neurovet). Depending on available schedule and owner's preference, most imaging procedures were not performed the same day and under the same anesthetic procedure. However, all of the imaging procedures were performed within 7 days of presentation. A second diagnostic imaging procedure was completed on 3 rabbits (patients #5, #11, and #15) for a total of 30 CT examinations, coupled with corresponding

radiographic examinations. The additional imaging procedures for these 3 patients were repeated for evaluation of new facial swellings unrelated to the previous diagnosis, at intervals of 9, 32, and 9 months, respectively.

The rabbit breeds included in the study were 17 dwarf standard rabbits (63.0%), 9 dwarf lops (33.0%), and 1 European standard rabbit (3.7%). Further, 19 were male rabbits (70.4%), 8 were females (29.6%), while the age range of the subject animals was from 1.5 to 11 years (mean 6.17; standard deviation 2.87). Body weight ranged from 1.2 to 3.0 kg (mean 1.65; standard deviation 0.42).

ANESTHETIC PROTOCOL

All radiographic and CT evaluations were performed while the rabbits were under general anesthesia. Standard physical examination and routine blood analysis were performed prior the anesthesia. The following anesthetic protocol was used: butorphanol 0.2 mg/kg subcutaneous (Dolorex, Intervet, Boxmeer, The Netherlands), dexmedetomidine 35 µg/kg intramuscular (Dexdomitor, Pfizer, New York, USA), and ketamine 20 mg/kg intramuscular (Ketavet, Intervet International, Milano, Italy). Intravenous access was maintained via a 24-gauge catheter placed in the cephalic vein. Endotracheal intubation was not performed on any rabbit during the imaging procedures. Patients were administered oxygen via a facemask that was removed during image production; monitoring was performed with a pulse oximeter detecting oxygen level and heart rate. Atipamezole 175 µg/kg intramuscular (Antisedan, Pfizer Animal Health, NY USA) was administered at the end of the diagnostic procedure.

Radiography

Mammography films were used for 14 examinations, computed radiography (CR) for 11 examinations, and direct digital radiography (DDR) for 5 examinations. To obtain the images, ultraslow mammography film was used (Mamoray HDR, Agfa-Gevaert, Mortsel, Belgium) with a single low-speed intensifying screen (Mamoray screen, Agfa-Gevaert). Standard settings of the radiographic unit were 12 mAs (300 mA × 0.04 second) and 40 to 45 kV; based on rabbit size (40 kV was the most commonly used setting), with no use of the scatter grid. Mammography films were processed with an automatic processor (Cawomat 2000 IR; CAWO Photochemisches