Diagnostic Imaging of the Respiratory System in Exotic Companion Mammals

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KEYWORDS

• Respiratory system • Thoracic imaging • Rabbit • Guinea pig • Chinchilla • Prairie dog • Rat • Ferret • Skunk

The level of care for smaller companion mammals has increased significantly during the past few years. Although not truly exotic, rabbits, rodents, ferrets, and other less common mammal species, including artiodactyls and marsupials, were grouped as undefined, and separate from traditional mammalian pets (dogs and cats). Today, exotic companion mammals represent this group and are acknowledged as a specific area of zoologic medicine. Continuing education is encouraged and supported by specific associations, such as the Association of Exotic Mammal Veterinarians and two dedicated boards of specialties: the American Board of Veterinary Practitioners and the European College of Zoologic Medicine.

Owner demands for a higher level of care is increasing dramatically. Because most of these patients are small (less than 2 kg), this represents a great challenge, in particular for the field of diagnostic imaging.

In addition to routine imaging modalities, such as radiography, oral endoscopy, and to a lesser degree ultrasonography, more diagnostic imaging, including advanced endoscopic techniques, computed tomography (CT), and magnetic resonance (MR), have become available. Many of these techniques are extrapolated from dog and cat medicine, but advances in technology also make them effective for smaller mammals.[1]

This article reviews the 5 main diagnostic imaging modalities currently available for investigation of the respiratory system of exotic companion mammals: radiography, ultrasonography, endoscopy, computed tomography, and magnetic resonance.

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Cardiac disease is part of thoracic imaging and can affect the respiratory system. Nevertheless, cardiology is a specific branch of internal medicine and it is classified separately from thoracic imaging or respiratory disease, and for this reason it will not be discussed in detail in this article.

RADIOGRAPHY

Radiography is the mainstay of diagnostic imaging of the respiratory system, in particular of the thorax and lower respiratory tract, and should be considered the first step in an imaging diagnostic trial. Starting from the information provided by the radiographic examination, further indications for other imaging modalities can be obtained.

Because of the small size of exotic mammal patients, obtaining excellent radiographs must be considered a priority. Most standard radiographic equipment is effective for small exotic mammals. Many factors are involved in the process of taking radiographs, but the two most important are the proper combination of cassette and film, and optimal patient positioning.[2,3]

Mammography film is an ultraslow-speed film used with specific cassettes that include a low-speed intensifying screen. They provide good detail, providing a sharp, nongrainy image, and are therefore especially advantageous in small or very small mammal patients.[2] Despite the fact that low-speed screens and films require more exposure than regular screen/film (including longer exposure time for low-powered radiograph machines), they are rarely affected by patient motion caused by physiologic breathing movements.

Because of small size, behavior, and proper patient positioning, general anesthesia is often required to obtain quality radiographs useful for diagnosis.[3] Critical patients in respiratory distress for which anesthesia represents increased risk may benefit from sedation. Protocols for anesthesia and sedation have been reported elsewhere.[4,5] Manual restraint is rarely an option because of excessive stress during handling.[3] On the other hand, sedation and anesthesia might affect radiographic interpretation because of possible artifacts of pulmonary or cardiac imaging.[3]

The two standard views for radiographic study of the thorax are the latero-lateral and the ventrodorsal (or dorsoventral).[2,3,6] For the latero-lateral projection, patients are placed in right or left lateral recumbency. The thoracic limbs must be extended cranially to prevent superimposition of the brachial muscles over the mediastinal portion cranial to the heart.[2,6] This positioning is important for selected species with short chest lengths, such as prairie dogs, and less critical for other species, such as ferrets. Most common small mammal species do not have a round chest; therefore, lifting of the sternum to prevent oblique artifacts is not a special concern. Even if the radiograph will show superimposition of each hemithorax, the image of the hemithorax leaning directly over the cassette will be more detailed. For this reason, both left-to-right and right-to-left lateral projections should be obtained. This practice is important for several intrapulmonary or extrapulmonary diseases, such as lung or pleural metastasis and pleural effusion. Proper collimation of the radiographic beam is another important factor. The image of the thorax should include all the ribs; therefore, it will include the diaphragm and the cranial portion of the abdomen. More appropriately, the frame for the respiratory system should be enlarged more cranially, to include the cervical portion of the trachea.[2]

The ventrodorsal view is obtained with patients placed in dorsal recumbency.[2,6] The thoracic limbs are extended cranially to prevent superimposition of the scapulae on the lung fields. This position is more stressful for patients in respiratory distress; therefore, the sternal recumbency for the dorsoventral projection may be preferable for