IMAGING FOR DIAGNOSIS AND SURGICAL PLANNING
Marc-André d’Anjou, DMV, DACVR
Faculty of Veterinary Medicine, University of Montreal
Saint-Hyacinthe, Quebec, Canada

The respiratory system is mainly composed of structures of soft tissue and air opacities, providing great image contrast with radiography, fluoroscopy and computed tomography. In several circumstances however, MRI and particularly US can prove quite valuable. Ultimately, combining these modalities results in most accurate diagnosis and surgical planning.

Radiography and Fluoroscopy: Three radiographic (XR) projections are recommended for accurate examination of all areas of the lung field. Fluoroscopy (FC) is a dynamic procedure using x-rays that is most accurate for detecting and characterizing tracheal and bronchial collapse. While XR is limited by tissue superimpositions that can be misleading, it remains the most useful tool for primary diagnosis of most respiratory conditions. XR is relatively sensitive, but lack specificity for lung abnormalities. Once an abnormal lung opacity is identified, a diagnosis is generally reached based on its location, distribution and considering patient signalment. However, in several instances, the diagnosis remains uncertain and requires other diagnostic procedures. This is particularly the case for conditions requiring surgery. Tracheobronchial stenting is typically performed after characterizing collapse with FC.

Computed tomography (CT): CT is the modality of choice for the assessment of many conditions of the respiratory system, particularly when high-resolution, spiral multidetector row scanners are used. CT is more accurate than XR for detecting lung nodules and for distinguishing subtypes of lung consolidation. For instance, lung lobe torsion (Fig.), space occupying masses, pneumonia and thromboembolism can be differentiated. Thoracic wall mass lesions can also be better differentiated from lung masses and their extent can be evaluated prior to surgery. Detection of thoracic abnormalities can also be affected by the presence pleural effusion on XR, which is not the case with CT. Moreover, vessels can be more easily evaluated, particularly with angiographic techniques, and lymph nodes assessed. In tumor staging, evaluation of these nodes as well as all lung fields for metastases is crucial. Traumatized patients can benefit from CT examination, particularly when diaphragmatic herniation or fractures (ribs or spine) need to be ruled out. Spontaneous pneumothorax represents another indication of CT, looking for bullas or blebs, and ruling out foreign body migration. Vascular ring anomalies are better detected and characterized with CT-angiography, which can have an impact on surgical planning. Finally, fine-needle aspirations (FNA) or biopsies can be performed with CT guidance.

Ultrasound (US): US is mainly limited by the presence of air in the lungs (or pleural space) and overlying ribs. However, when lung consolidation or mass lesion involving the periphery of the lung field is suspected, US can confirm its presence. Mediastinal lymph nodes and masses are often accessible with US. Finally, US can be performed without anesthesia and FNA or biopsies can be US-guided, which justify its use when possible, at least for initial diagnosis.