Radiographic Entrapments

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Evaluation of diagnostic images may be adversely affected by a variety of factors, including technical/quality control parameters, lack of familiarity with normal variation, inconsistent image evaluation, bias (such as satisfaction of search) and communication errors. Use of a consistent, repeatable and systematic assessment of images can help to minimize image interpretation errors.

First, diagnostic images of the appropriate area must be obtained. Radiographing too large of an area or obtaining too few views are common technical errors that may result in entrapments.\(^1\)-\(^3\) Increasing the size of the radiographic area increases scatter radiation, with a resultant decrease in image resolution. For example, appropriate exposure technique for the thoracic spine or cranial abdomen will result in overexposed lungs. Radiographs of the coxofemoral joints take surrounding muscle thickness into consideration, but will result in overexposed stifles. Images centered at the elbow level result in oblique orientation of the carpal joints with respect to the primary X-ray beam and may lead to misinterpretation. Inadequate use of inherent anatomic contrast may also result in imaging entrapments. Repositioning of animal patients to decrease transient positional atelectasis or to allow gastrointestinal gas to move with gravity should be employed to increase radiographic contrast with adjacent soft tissue/fluid structures. Normal radiographic anatomy may be misinterpreted as diseased when unusual oblique positioning of an area occurs. Young animals with radiolucent physes or animals with unique breed conformation may mimic abnormalities.

Digital radiography has reduced some types of technical errors, while other imaging artifacts are inherent to the digital imaging process.\(^4\)-\(^6\) Best practices for viewing of digital images are also important to consider and ideally include rigorously consistent orientation of anatomy and use of a calibrated, high-luminance, high resolution screen in a low distraction setting.\(^7\)-\(^9\)

A complete analysis of diagnostic images may begin with Roentgen sign (size, shape, number, location, margin, opacity) assessment of anatomic structures.\(^9\) A checklist of anatomic structures can be employed to maintain consistency and thoroughness. Evaluation of diagnostic images prior to the introduction of clinical history bias would be ideal, but often cannot be avoided. A second evaluation of any diagnostic image study can be performed to minimize satisfaction of search and inattentional blindness (tunnel vision) errors.\(^10\)-\(^12\)

Evaluation of diagnostic images is a complex decision making process. The most successful image analysis incorporates both rapid, intuitive assessment (Type 1) and more deliberate, analytic evaluation (Type II).\(^9\)-\(^10,13\) Keeping common diagnostic combinations in mind can be useful.\(^14\) Metacognition techniques applied to reduce perception and analysis biases center around self-questioning.\(^10\) Examples include 1)
What else could this be?  2) What clinical information does not fit?  3) “Common things happen commonly.” What recently seen cases could influence interpretation today?  4) Would the interpretation change with a different signalment and presentation or without previous visit information? When possible, radiologic-pathologic correlation provides the most accurate feedback and can aid in decreasing future entrapments.

References