6th CT-User Meeting

Joint venture:

DGK-DVG

WISSENSCHAFT FÜR DIE PRAXIS

Deutsche Gesellschaft für Kleintiermedizin
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GHENT UNIVERSITY
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Theme:

Contrast Agents and Applications in Computed Tomography

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Proceedings

Small Animal: Contrast Agents in Computer Tomography

041 Intra-articular contrast : Protocol and applications

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Introduction:

Arthrography is a diagnostic imaging technique that has been used for decades in human medicine to enhance the visualization of intra-articular structures that cannot be seen clearly on plain radiographs.
Computed Tomographic Arthrography (CTA) is an imaging technique whereby intra-articular administration of contrast medium is used to improve the visualization of the intra-synovial and perisynovial soft-tissue structures. The contrast medium diffuses within the joint and these structures, which appear as filling defects outlined in the joint by the contrast and can be clearly visualized. CTA is used to identify abnormalities in the articular surfaces, intra-synovial soft-tissue structures, synovial surface of the joint capsule, and peri-articular structures that have a close relationship with the joint compartments. The cartilage layers in canine joints are much thinner than those in humans and horses, which makes it difficult to evaluate. CTA has some advantages over MRI or MR-arthrography (MRA), and some human medicine studies have shown that CTA is equal to or better than MRI or MRA for diagnosing various entities. One of CTA's important advantages is the sub-millimetre resolution capability of current generation multi-detector scanners; another is that more contrast can be seen between bone, soft tissues such as hyaline cartilage, and the iodinated contrast material, which make it the superior technique for defining morphologic cartilage defects. CTA also defines calcified structures more clearly. CTA is faster than MRI sequences, which reduces motion artefacts.

Indications for CTA:

• Evaluation of intra-articular ligaments and structures;
• Evaluation of calcified structures within the joint, in addition to internal derangement;
• Examination of the stability of osteochondral lesions of the articular surfaces;
• Examination of the stability of avulsion fractures of intra-articular ligaments;
• Detection of intra-articular fragments ("loose bodies"); and
• Evaluation of hyaline cartilage defects.

Patient Preparation and Injection:

Before the start of the positive arthrography study, a plain CT study must be performed in both bone and soft-tissue algorithms. General anaesthesia should be maintained during the examination with either injectable or gas anaesthetics. The patient is placed on the CT table in lateral recumbency on the nonaffected joint; the upper leg that will be injected must be extended in line with the table. The area for arthrocentesis should be clipped and aseptically prepared before the injection.

Arthrography Technique:

Firstly, remove any excess joint fluid, if possible. Insert a 22-gauge, 1-inch needle into the joint and aspirate synovial fluid to ensure correct needle placement. After the contrast medium has been injected, flex and extend the joint repeatedly allowing the contrast medium to distribute throughout the joint.
Then, reposition the limb on the CT table, as before, and repeat the CT acquisition protocol. Arthrography requires the use of an iodinated contrast medium, preferably

one that is non-ionic, which the joint tolerates better than an ionic iodinated contrast. Whichever product is used, the contrast medium should be diluted with sterile 0.9% physiologic saline solution (NaCl) to obtain a contrast medium concentration of approximately 80 mg of iodine per millilitre. If the contrast medium is too dense, it will surround the joint structures and impede their delineation. The amount of contrast medium injected into the joint differs between patients and depends on the size of the joint to be examined.

Pitfalls:
• Poor contrast-medium distribution within some joints, which can be avoided by repeatedly flexing and extending the joint;
• Insufficient density of the contrast medium, the result of dilution in the joints from a massive joint effusion, which can be avoided by removing the abundance of joint fluid;
• Diffuse delineation of the intra-articular structures, the result of rapid resorption of the contrast medium by the inflamed synovia in the diseased joints, which can be avoided by admixture of 0.2 ml of epinephrine;
• An interpreter's incorrect diagnoses because of his or her lack of experience in assessing CT arthrograms.
The CT scanning protocol will vary, depending on the equipment and the size of the dog. Bone and soft tissue algorithms are ideal for evaluating bone and soft-tissue structures. Assess pre-arthrography and post-arthrography CT images with a bone and a soft-tissue window to allow proper evaluation and comparison of all the structures comprising the joint. MPR, an indispensable software tool available in the CT workstation and with the commercially available DICOM viewing software programs, allows the images to be analysed in all planes. Also, accurate interpretation is dependent upon detailed knowledge of the internal anatomy of the joint to be examined.
The articular surface is visible when contrast medium is in contact with the articular cartilage, which is seen as a smooth, uniform hypo-attenuating line between the contrast medium and the subchondral bone. The joint must be fully distended, and the contrast medium must completely cover the superficial
margin of the articular cartilage. Ligaments are difficult to evaluate on pre-contrast images, but on CTA, normal ligaments can be seen as uniform, hypo-attenuating bands of tissue surrounded by contrast medium.

Further reading IA CT:
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