COMPUTERIZED TOMOGRAPHY (CT) OF JOINTS

Ingrid Gielen, DVM, PhD, MSc

Department of Medical Imaging & Small Animal Orthopaedics,
Faculty of Veterinary Medicine,
Ghent University, Belgium.
Email: ingrid.gielen@ugent.be

The history of musculoskeletal imaging begins with Roentgen's discovery of x rays in 1895. In small animal orthopaedics, plain radiography was the routine imaging technique for diagnostic purposes and follow up for decades, and is still routinely used in common practice.
Computerised tomography (CT) has been introduced in the seventies in human medicine and has been more readily available to veterinarians over the last decade. It is a cross-sectional imaging technique using x-rays and computers. Better soft-tissue differentiation and absence of superimposition are the major advantages of CT over conventional x-ray techniques. The first reports in small animals were published in the 1980s and concerned the normal CT brain anatomy and the CT aspect of various tumour types. Although the spatial resolution of CT images is poorer when compared with classical film-screen radiography, the cross-sectional image display and superior discrimination of tissue attenuation enables differentiation of soft tissue structures that cannot be perceived on conventional radiographs. Subtle new bone formation and bone lysis are better identified on CT images when compared with conventional radiography because of their greater physical density discrimination, the ability to manipulate the grey scale of the digital image, and the elimination of overlying structures. While a loss of 30% of bone density is often required for a lesion to be visible on conventional radiographs, CT is able to reliably detect density changes of only 0.5 – 2%.
Another advantage is that the transverse CT images can be reformatted in multiple anatomic planes.
CT enables more detailed and specific morphological diagnosis than radiography. CT greatly facilitates examining complex joint structures like the elbow and tarsus.

CT has been proved to be superior in the diagnosis of fragmented coronoid process of the **elbow join**t. Its use in the diagnosis of elbow incongruity has also been reported. With the use of CT, a clear distinction between kissing lesions and real OCD lesions is possible and is of help in treatment planning. On the transverse scans, OCD lesions present typical features being radiolucencies surrounded by a sclerotic rim. Kissing lesions on the other hand, are appearing as sclerotic stripe formed lesions without radiolucency. CT also helps in the difficult diagnosis of intercondylar fissures, which are difficult to pick up on conventional radiographs. CT can help in the diagnosis of flexor tendon enthesopathy, especially after iv. contrast resulting in enhancement in clinical lesions.
In the **stifle**, compared to radiographic examination, CT provides additional useful information in all processes where avulsions or fragmentation are involved. These disorders are not always visible on radiographs. CT proved to be extremely useful in the detection of avulsion fractures of intra-articular ligaments like the cranial cruciate ligament and the tendons of the extensor digitorum longus and the popliteus muscles. In cases of discrete OCD lesions, CT confirmed the diagnosis. Compared to radiography, the use of CT could detect many more intra-articular fragments, which provides important information to the surgeon, especially when arthroscopic treatment is envisaged. Degenerative changes can be identified in an earlier stage than on conventional radiographs.
In **tarsocrural** OCD, CT is superior in the diagnosis of lateral ridge involvement. In both, medial and lateral tarsocrural OCD, CT allows assessing the exact localisation, the size and number of the fragments. It helps in decision making when using minimal exposure

techniques to treat these lesions. In evaluating intra-articular fractures CT helps in complete evaluation of the fracture status.
In the treatment of **hip** dysplasia CTcan be used to check the status of the dorsal acetabular rim which is an important criterion when triple pelvic osteotomy (TPO) is considered.
Within the **carpus**, CT can help in diagnosing radial carpal bone fractures or fissures.
In cases where treatment of **bone** tumours is considered, CT enables a more exact demarcation of the affected tissue and helps to decide to what extent the tumour has to be excised.

Arthro-CT
A rather recent new application of CT is arthro-CT, the intra-articular application of iodine containing contrast media. Before the application the contrast medium should be diluted till maximum 80-100 mg of iodine per ml. In severely inflamed joints the admixture of epinephrine can be useful to counteract the rapid absorption of the contrast medium by the inflamed, hyperaemic synovial membrane.
Within the **shoulder** joint intra-articular structures including the biceps tendon, glenohumeral ligaments and the joint cartilage can be visualised. Application of arthro-CT in the **elbow** joint is of use in appreciating the status of the articular cartilage in medial compartment syndrome.
Within the **stifle** joint arthro-CT is helpful in evaluating meniscal damage and in evaluating fragment stability.
In **tarsal** OCD arthro-CT can be used to evaluate fragment stability.

The disadvantage of CT is the need for general anaesthesia and the cost for maintaining the equipment.

Suggested reading

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