

## **CT SCANNING: A TOOL OR LUXURY?**

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**ANDREW IVESON** discusses the merits of computed tomography, highlighting advantages and disadvantages, and provides examples where CT scans are beneficial

**COMPUTED tomography (CT) has been used in veterinary practice since the 1980s. Improvements in technology, software and image quality, as well as decreased cost and easier accessibility, mean it is available in more centres and is being used more regularly. However, this begs the question: “Does it improve diagnosis or is it just a fancy toy?”**

The author is fortunate to work in a referral centre that has a General Electric Light-Speed four-slice CT scanner installed and maintained on site, with a fully trained radiographer on call 24/7 to operate the machine and a diplomate in diagnostic imaging available to review the images. This has led to a subtle shift in the way many cases are dealt with and, in the author's view, has led to more accurate diagnosis, in a more rapid timescale, with good feedback from clients and referring veterinary practices. By far the most common indication in the author's clinic is elbows (33 per cent), with spine (24.5 per cent), shoulders (9.1 per cent), middle ear (6.8 per cent) and nasal cavity (4.2 per cent) being other common procedures.

CT is effectively a large number of “slices” of radiographic images, taken in a single plane. These are then reformatted by a computer program, such as OsiriX, to present a two or three-dimensional image, which can then be further manipulated. The slice thickness can be varied depending on the size of the area of interest and the detail required.

Well positioned and exposed radiographs are perfectly acceptable for diagnosis in many conditions and it is not suggested CT should replace them in all situations; however, certain conditions, in the

author's opinion, would benefit from a CT scan, as there is a greater sensitivity (proportion of positive results on test that are actually positive) and greater specificity (proportion of negative results on test that are actually negative), compared to radiography. Examples include the following.

- Elbow dysplasia – fragmented medial coronoid process (FMCP) and osteochondritis dissecans (OCD) are common conditions of juvenile, medium to large-breed dogs. They can easily be missed on radiography due to overlying osseous structures, minimal displacement, fragment fissuring, and if they remain cartilaginous. Often radiography will only show the secondary changes of osteoarthritis (OA). A Cr15LCdMO view has been suggested<sup>1</sup>. CT is reported to be superior<sup>2, 3</sup>, and experience at the author's clinic has certainly confirmed this in many dogs that have had apparently normal or inconclusive radiographs taken; with secondary changes such as sclerosis of the ulna and osteophyte production on the radius and ulna; or have clearly shown FMCP and/or OCD in one or more forelimbs on CT scan. [Figure 1](#) shows a fragment of the coronoid process (arrow).
- Incomplete ossification of the humeral condyle (IOHC): This is a condition mainly seen in spaniels. A Cr15M-CdLO view has been suggested for greater sensitivity<sup>1</sup>. CT has a greater accuracy<sup>4</sup>, which, again, has been borne out at the author's clinic. It has also shown up as an incidental finding in some dogs without, apparently, causing lameness. [Figure 2](#) shows an IOHC (arrow).
- OCD: this can be seen in the stifle, hock, elbow or shoulder. Subtle lesions may not be visible or may be inconclusive on radiographs, but can be clearly seen on a CT scan<sup>5</sup>. [Figure 3](#) shows a 3D-reconstructed left shoulder OCD lesion (arrow).
- Complex/articular fractures: these may benefit from a more detailed analysis of the location of the fragments to allow the best method of approach and fixation to be decided. Synthetic bones can be ordered to match the fragments to enable special implants to be produced if required.
- Patella luxation: many cases, as part of the underlying cause, can have considerable torsion and bowing of the distal femur and proximal tibia – certainly of the grade-three or four cases. This can lead to the standard tibial crest transposition leaving the patella lying at an angle to the trochlear groove and leading to recurrent luxation and lameness if undiagnosed and left untreated. A distal femoral osteotomy allows these forces to be overcome with much better success rates and lower complication rates in selected patients<sup>6, 7, 8</sup>. [Figure 4](#) shows a 3D reconstruction of a bilateral medial patella luxation, with marked secondary osteoarthritic changes.
- Spinal lesions: these will often not show specifically on plain radiographs, such as intervertebral disc protrusion or spinal neoplasms, meaning myelography is invariably required. CT scanning at the author's clinic has allowed 58.7 per cent of spinal lesions to be accurately localised without the need for a myelogram. This has sped up the diagnostic process, minimising risks of complications<sup>9</sup>.

Myelography is still needed in some cases. Visualising any lesion in multiple dimensions also allows more accurate pre-surgical planning. [Figure 5](#) shows a mineralised area in the ventral spinal canal (arrow) and collapsed intervertebral disc space. [Figure 6](#) shows a cervical myelogram with the contrast pushed dorsally due to a left sided extradural lesion (arrow).

- Angular limb deformities: the planning of limb deformities can be made easier by producing a 3D CT reconstruction to allow assessment of bone position and enable precise planning of any osteotomy/ implant placement<sup>10</sup>. Again, synthetic bone models may assist in the preoperative planning of the surgery.
- Metastatic disease: many neoplasms have the potential to metastasise, especially to the liver and chest. CT scanning has a much higher sensitivity than radiography or ultrasound<sup>11, 12</sup>. Contrast media (such as Omnipaque) can be given intravenously to enhance vascular structures and identify metastatic lesions. [Figure 7](#) shows a metastatic nodule within the dorsal right lung (arrow).
- Nasal cavity disease: tumours, aspergillosis and foreign bodies, for example, can be easily seen on a CT scan, with a greater accuracy and detail than radiography<sup>13</sup>. Obviously, rhinoscopy or direct visualisation can be of more benefit in some cases. [Figure 8](#) shows the left nasal cavity with an increase in soft tissue density and the turbinate pattern is still visible due to neoplasia.
- Middle ear disease: radiography has a poor sensitivity with many false negatives seen. CT has a much higher sensitivity to allow early diagnosis and instigation of appropriate treatment<sup>14</sup>. [Figure 9](#) shows increased density in the left tympanic bulla compared to the air in the right side.

Obviously, CT is less available than radiography. The initial cost may seem higher, but given that multiple radiographs may be required, rather than a single CT scan in some cases, the cost difference can be very small ([Table 1](#)). The author's clinic also offers a "CT scan only" option, where a CT scan is performed at the request of the primary vet and a full report issued back to them, without full referral and assessment.

It is accepted that CT is not the answer to everything – other diagnostic methods, such as MRI scans, scintigraphy, ultrasound and arthrography may be better in some cases.

However, the author, having worked in clinics with and without CT, certainly feels it is a tool rather than a "toy" and can bring the benefits of improved diagnosis and treatment to many patients.

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