What is CT?
Radiography is based on the absorption of radiation in the form of x-rays as they pass through parts of the animal. Depending on the amount absorbed by a particular tissue (such as bone or soft tissue), a varying amount of x-rays will pass through the tissue and exit the body. During conventional x-ray imaging (plain radiography), the exiting x-rays interact with a detection device (x-ray film or digital plate) and provide a two-dimensional projection radiographic images of the tissues within the horse’s body. Although also based on the variable absorption of x-rays by different tissues, computed tomography (CT) imaging is known as a ‘quantitative’ radiographic technique that provides a different form of imaging known as a cross-sectional imaging. The origin of the word ‘CT’ is from the Greek word ‘tomos’ meaning ‘slice’ or ‘section’ and ‘graphos’ meaning ‘writing’ or ‘drawing’. A CT imaging technique provides a high-quality cross-sectional image or ‘slice’ of anatomy, like a thin slice of bread. The cross-sectional images can be manipulated or post-processed in a number of ways to be used for a variety of diagnostic purposes in a diverse range of pathologic conditions (Figure 1).

With the benefits of other imaging techniques when using complex anatomical areas, CT was first used by veterinary surgeons in the early 1980s, but the machines built for human patients didn’t lend themselves well to use for horses. The modifications for use in equine patients were initially difficult and cumbersome but the advanced imaging technique was soon to prove vital in a range of conditions and D. D. Baribeau and his colleagues at Washington State University first published the technique in the 1980s Proceeding of the American Association of Equine Practitioners.

The progress of CT technology has been relentless and the result is a rapid turnover of equipment, making the techniques available around the country these exquisite diagnostic tools. As more CT scanners become available around the country, the cost of the scan and level of general anaesthesia (when necessary) will be reduced and information from the CT scan affords the clinician, which can be invaluable in the investigation of many conditions.

Computed Tomography of the Equine Head
by Sarah Powell

A horse is positioned on the standing platform at Rossdales Equine Diagnostic Centre prior to entering a CT scan of the head. Achieving an optimal sedation level is essential for the horse to accept the procedure, whilst not being too sedated for the horse to stand steadily on theatted platform, a critical element in the success of the scan procedure.

A single CT image ‘slice’ through the head at the level of the eyes (right) can be used to evaluate the thickness of the bone on the right side of the image (arrow). This horse was scanned during a routine examination, which revealed evidence of a successful CT scan. Sedation methods vary between centres but usually consist of a pre-medication with anxiolytics followed by a combination of hypnotic and sedatives. The use of diazepam may enable extremely nervous horses to be scanned safely. Horses that cannot safely be scanned under standing sedation can be anaesthetised and the images acquired with the horse recumbent on the modified general anaesthesia table.

What are the benefits of CT?
This rapid accumulation of accurate data is proving invaluable for veterinary working in many specialties but particularly for those dealing with head, dental and sinus pathologies. Post-processing of images is extremely useful in the investigation of skull fractures and lesions such as those seen in the skull base, which may be associated with some of the most common conditions affecting the horse.

Imaging.

Sarah is an associate of the European College of Veterinary Diagnostic Imaging.

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Sarah has a particular interest in radiology and advanced imaging techniques, a subject in which she publishes and lectures regularly. Sarah provides an image reading service and MR1 consultancy to a number of veterinary practices around the world. She has a special interest in the use of MR and medical image analysis in rheumatology and has a number of collaborative projects currently in progress both in the UK and in other aspects of equine CT and MRI.

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