Journal of Veterinary Cardiology (2014) **16**, 67—72

ELSEVIER

Journal of Veterinary Cardiology
ESVC

www.elsevier.com/locate/jvc

Multi-detector computed tomography of an aortic dissection in a cat☆

Katherine Scollan, DVM*, David Sisson, DVM

Department of Clinical Sciences, College of Veterinary Medicine, Oregon State University, Magruder Hall, Corvallis, OR 97331, USA

Received 14 October 2013; received in revised form 18 November 2013; accepted 25 November 2013

KEYWORDS
ECG-gated MDCT;
Echocardiography;
Systemic hypertension;
Intimal flap

Abstract Contrast enhanced, multi-detector computed tomography (MDCT) is a useful diagnostic imaging modality that has become increasingly available in veterinary medicine. Multi-planar and three-dimensional reconstructions allow accurate and comprehensive assessment of cardiac and vascular lesions with short image acquisition times. ECG-gated, contrast enhanced MDCT was used to assess the lesion extent and therapeutic options in a case of aortic dissection diagnosed in a hypertensive cat.

A 9-year-old, male neutered domestic shorthair cat presented to the Oregon State University Veterinary Teaching Hospital in January 2013 for evaluation of pericardial effusion. Previous history included a soft, grade II/VI left parasternal systolic murmur ausculted in March 2011. Diagnostics at that time included a systolic blood pressure of 220 mmHg measured by Doppler sphygmomanometry; unremarkable bloodwork including a chemistry panel, complete blood count, and thyroxine level; a normal electrocardiogram; and an echocardiogram showing a dynamic right ventricular outflow tract obstruction and mild, focal basilar septal hypertrophy. Antihypertensive therapy was recommended but not pursued. Immediately prior to presentation in 2013, the cat had a

☆ A unique aspect of the Journal of Veterinary Cardiology is the emphasis of additional web-based images permitting the detailing of procedures and diagnostics. These images can be viewed (by those readers with subscription access) by going to http://www.sciencedirect.com/science/journal/17602734. The issue to be viewed is clicked and the available PDF and image downloading is available via the Summary Plus link. The supplementary material for a given article appears at the end of the page. Downloading the videos may take several minutes. Readers will require at least Quicktime 7 (available free at http://www.apple.com/quicktime/download/) to enjoy the content. Another means to view the material is to go to http://www.doi.org and enter the doi number unique to this paper which is indicated at the end of the manuscript.

* Corresponding author.
E-mail address: kate.scollan@oregonstate.edu (K. Scollan).

1760-2734/$ - see front matter © 2014 Elsevier B.V. All rights reserved.
http://dx.doi.org/10.1016/j.jvc.2013.11.002

Abbreviations

LA:Ao	left atrium to aortic ratio
MDCT	multi-detector computed tomography

decreased appetite for 10 days and intermittent vomiting. Complete blood count, serum chemistry, and urinalysis revealed a mildly elevated alanine aminotransferase (275 U/L, reference range 12–130 U/L), mildly elevated blood urea nitrogen (47 mg/dL, reference range 16–36 mg/dL), normal creatinine (2.0 mg/dL, reference range 0.8–2.4 mg/dL), and a urine specific gravity of 1.025. Additional diagnostics included serum thyroxine levels (3.3 ug/dL, range 1.9–5.0 ug/dL) and a feline pancreatic specific lipase test (negative). Fluids and maropitant (1.2 mg/kg) were administered subcutaneously resulting in a mild improvement in clinical signs. An abdominal ultrasound performed at the referring clinic revealed no abdominal abnormalities, although a small pericardial effusion was seen and further cardiac evaluation was recommended.

On presentation to the OSU VTH cardiology service, physical exam abnormalities included a grade III/VI left parasternal systolic murmur and an irregular rhythm. Femoral pulse quality, jugular vein appearance, and intensity of cardiac sounds were all within normal limits. Systolic blood pressure was 230 mmHg. A fundic exam revealed no abnormalities. A sinus rhythm with occasional ventricular premature complexes was recorded on an ECG. Echocardiography revealed an aortic dissection (Fig. 1) and an ECG-gated, contrast enhanced, thoracic MDCT[a] scan was performed to assess the extent of the dissection and evaluate the potential for surgical treatment.

For the MDCT scan, the patient was premedicated (butorphanol, 1 mg IM), induced (propofol, 27 mg IV), and maintained under anesthesia with isoflurane gas and 100% oxygen. A pre-contrast thoracic MDCT scan was performed under breath hold. The MDCT scanning parameters were as follows: 3 mm reconstructed slice thickness, 120 kV, 200 mA, 512 × 512 matrix, and 0.5 pitch. A contrast enhanced thoracic MDCT was performed by power injection of 8 mL of contrast medium[b] through a peripheral venous catheter, followed by 1:1 saline diluted chaser. Image acquisition was automatically triggered by the detection of 180 Hounsfield units in the ascending aorta. A second contrast enhanced MDCT was performed of the abdomen to further delineate the extent of abdominal aortic involvement. Images were transferred to a diagnostic workstation[c] for multiplanar and three-dimensional reconstruction and review.

Image interpretation

Echocardiography revealed moderate concentric left ventricular hypertrophy (left ventricular end diastolic free wall thickness 0.65 cm; normal range 0.22–0.44 cm) with an accentuated bulge in the basilar septum (interventricular septum end diastolic thickness 0.83 cm), and mild left atrial enlargement (left atrium to aortic root ratio [LA:Ao] of 1.65; normal range 0.95–1.65) by right parasternal short axis M-mode measurements.[1] An aortic dissection extended from the noncoronary cusp of the aortic valve to the ascending aorta (Fig. 1A). Color flow imaging showed laminar flow within the true aortic lumen while the false lumen appeared to compress the true lumen (Fig. 1B). A small amount of pericardial effusion without tamponade and mild aortic and mitral valve insufficiencies were also noted.

The ECG-gated, contrast enhanced MDCT images revealed the aortic dissection originated from the aortic root cranially and extended to at least the celiac artery caudally. Axial, coronal, and sagittal imaging planes showed the dissection flap originate at the aortic root, extend up the ascending aorta, aortic arch, and continue in the descending aorta (Fig. 2, Videos 1–3). Contrast was present in both the true lumen and the false lumen indicating communication between the true lumen and the dissection. The abdominal, non ECG-gated MDCT showed the dissection extended caudally to the region of the celiac and cranial mesenteric arteries. There was significantly reduced contrast enhancement of the right kidney, indicating possible flow impairment due to the dissection (Fig. 3); alternatively, the reduced right renal enhancement may have been secondary to chronic systemic hypertension and subsequent renal pathology. Three-dimensional reconstructions showed that the dissection was larger than the true aorta for the majority of its length. The spiraling course of the dissection was observed to proceed from the right of the aorta at its origin,

[a] Toshiba Aquilion 64 CT, Toshiba America Medical Systems Inc., Tustin, CA.
[b] Isovue 370, Bracco Diagnostics, Princeton, NJ.
[c] Vitrea workstation, software version 6.3.2, Vital Images, Inc., Minnetonka, MN.