Proceedings of the Spring Meeting of the

Veterinary Cardiovascular Society

Friday 20th of March

Austin Court, Birmingham

B1 2NP

Officers of the society

Chair	Proceedings Editor / Web Manager
Gavin McAulay North Downs Specialist Referrals, Surrey Brighton Veterinary Cardiology, Brighton chairperson@vet-cardio.co.uk	**Mattia Basili** ChesterGates Veterinary Specialists, Chester proceedings@vet-cardio.co.uk
Joint Secretaries	**Treasurers**
Julie Hamilton Elliott Northern Ireland Veterinary Specialists Co. Down **Siddharth Sudunagunta** Willows Veterinary Centre Solihull secretary@vet-cardio.co.uk	**Claire Denny** Manor Vets Halesowen **Vicky Ironside** Park Vet Hospital Sheffield treasurer@vet-cardio.co.uk

As in previous editions, we'll be using Mentimeter to collect questions following each talk. Please scan the QR code or click the link below to access the webpage and submit your question.

QR Code:

Website link: https://www.menti.com/al29wgdc14s9

Event Reminder

13-14.11.26

November Meeting

CHESFORD GRANGE HOTEL

KENILWORTH
CV8 2LD

See you there!

MARCH MEETING: 20th March 2026

0830 - 0900	**Registration**
0900	**Introduction**
0905 –0935	**The Physiology of Tricuspid Regurgitation** ***Vivek Muthurangu*** *University College London*
0940 – 0955	**Case report: Pericardial Effusion and Cardiac Tamponade Secondary to Protein-Losing Enteropathy** ***Jessica Dean*** *Willows Veterinary Centre & Referral Service*
1000 - 1015	**Research abstract: Echocardiographic Pulmonary to Left Atrial Ratio as a Diagnostic Tool in Pulmonary Hypertension Classification in Dogs** ***George Farrell*** *Royal Veterinary College*
1015 – 1045	**Coffee break and sponsors exhibition**
1050 - 1120	**Artificial Intelligence in Cardiac Imaging** ***Vivek Muthurangu*** *University College London*
1125 - 1140	**Case report: Ventricular Tachycardia and Pulmonary Lobar Hypoplasia in a 9month old Domestic Short Hair** ***Jordi Balaña Pedrol*** *Small Animal Teaching Hospital, University of Liverpool*
1145 – 1200	**Research abstract: The Feasibility of Using the Eclipse-Mini Ambulatory Electrocardiogram in Dogs to Obtain an Ambulatory Electrocardiogram Recording** ***Katie Glyde*** *Sarah Smith Cardiology*
1205 - 1300	**Proposal for Feline Breed Screening Database Platform hosted by VCS: Benefits, Practicalities, Costs** ***Vicky Ironside***
1300 - 1400	**Lunch break and sponsors exhibition**
1405 – 1450	**Cardiac Interventions with Unexpected Outcomes** ***Tobi Wagner, Rafaela Gregorio, Alex Laver*** *Southern Counties Veterinary Specialists* *HeartVets*
1455 – 1510	**Case report: Giant Left Atrial Appendage in a Cat** ***Sophie Goodrich*** *Willows Veterinary Centre & Referral Service*
1515 - 1530	**Alistair Gibson Memorial Grant: Transcatheter edge-to-edge repair (TEER): the Colorado experience** **Caroline Cutler** *Bristol Vet Specialists*
1530 - 1555	**Coffee break and sponsors exhibition**

1600 - 1640	**Seeing the True Myocardium: Contrast-Enhanced Echocardiography for Accurate LV Wall Measurement in Cats** ***Jose Novo Matos*** *The Queen's Veterinary School Hospital, University of Cambridge*
1640 - 1700	**When the Myocardium Is Thin: Micro-CT and Pathological Insights into Segmental Dysfunction** ***Jose Novo Matos*** *The Queen's Veterinary School Hospital, University of Cambridge*
1705 – 1720	**Approach to anaesthesia in a dog with DCM and atrial fibrillation** ***Dave Sewell*** *Heathside Veterinary Surgery*
1720	**CLOSE**

The Veterinary Cardiovascular Society gratefully acknowledges the support of all our sponsors.

GOLD SPONSOR

Boehringer Ingelheim Animal Health
Tel: +44 (0) 1344 746 959
E-mail: vetenquiries@boehringer-ingelheim.com
Website: https://www.boehringer-ingelheim.com/uk/animal-health

Dr. Teen Presnail BVSc(Hons) CertVOphthal MRCVS

Dr. Teen (Tina) Presnail graduated from Melbourne University, Australia and worked in a very mixed practice there before moving to the UK in the late 90's. She spent most of her career working in a small animal veterinary hospital in Berkshire where she achieved a Certificate in Veterinary Ophthalmology, before taking on a technical veterinary position at Boehringer Ingelheim Animal Health in 2016. Teen is currently the Senior Brand Technical Vet for Boehringer's Vetmedin® and diabetes portfolio – a role she is immensely proud of. Being relatively new to the cardiology therapy area, she is very excited to be attending VCS and hopes to meet many of you there.

SILVER SPONSORS

Ceva Animal Health Ltd,
Telephone: +44 01628 334 056
Website: https://www.ceva.co.uk

Jimmy Bratley BSc (Hons) BVetMedSci BVMBVS MRCVS

I am a veterinary surgeon with over 10 years of experience spanning clinical practice and industry roles within the animal health sector. My professional interests centre on quality improvement, population-level welfare initiatives, and public-facing health campaigns that raise awareness of key conditions affecting companion animals.

Cardiology is an area I am particularly interested in, offering fantastic opportunities for collaboration, research, and innovation. I enjoy working on projects that combine clinical insight, data-driven decision-making, and cross-functional teamwork to advance the diagnostics, therapeutics, and technologies that shape the next generation of veterinary care.

HeartVets

Tel: +44 (0) 800 999 4333

E-mail: diagnostics@heartvets.co.uk

Website: https://heartvets.co.uk

HeartVets are an independent, employee-owned Cardiology service, covering the south-West of England and south Wales. They have 9 cardiologists and a large team of RVNs and dedicated referral administrators, running a very busy clinical service.

Alongside the clinical service, HeartVets also run an online world-wide cardiology diagnostics service, providing ECG and Holter rental and analysis as well as case advice and thoracic imaging reporting service. They operate the Beecardia online ECG system and their team includes two NHS-trained electrophysiologists to analyse the Spacelabs-Pathfinder Holter data. Three RCVS Recognised Specialists in Cardiology (Jo Harris, Julia Sargent and Dave Dickson) lead the clinical reporting service, supported by their team of cardiologists.

Jo Harris has a particular interest in Holter monitoring, with a strong background in Holter research: Jo is one of the few cardiologists in the world who can drive a Pathfinder analysis platform and her ECG knowledge and experience is unrivalled. Dave Dickson leads the clinical service at HeartVets and helps Jo and Julia with the reporting. He has research interests in echocardiography and practical management of cardiac patients and is helping to update the VCS Echocardiography Screening programmes.

Come to the stand and chat to us to learn more about what we can do to help. We are passionate about providing cardiology care to as many pets as possible and are here to give practical advice to help cardiologists and primary vets manage cases.

IMV IMAGING

Tel: +44 (0) 1506 460023

E-mail: Hello@imv-imaging.com

Website: www.imv-imaging.co.uk

IMV imaging has successfully grown into a global diagnostic imaging provider to the veterinary market with over 40 years' experience in providing cutting edge imaging technology. All of our equipment is designed and manufactured in-house by our team of engineers or sourced through our relationships with the world's leading healthcare and imaging providers. We are specialists in veterinary imaging including ultrasound, X-ray, digital image management, endoscopy, CT and MRI.

Craig Hoines has 18 years of experience in the imaging industry and serves as your dedicated contact for new veterinary practice startups. He supports practices from the early stages, offering guidance, reassurance, and expertise gained from working with many new businesses.

Sam Mauchlen BVM&S PGCertVetEd MRCVS FHEA, Clinical and Applications Team Manager, leads a team of vets and a radiographer delivering clinical and product training to IMV imaging customers. The team develops learning materials, teaches CPD courses, creates content for the IMV Imaging Academy, and supports customers with image optimisation and troubleshooting.

QMS LTD

Tel: + 44 01981 433117
Email: info@qms-med.com
Website: www.qms-vet.com
LinkedIn profile:
https://www.linkedin.com/company/qms-veterinary/

QMS supplies veterinary practices with advanced imaging solutions, including CT, MRI, X-ray, and ultrasound equipment. We are a true imaging partner, providing sales, rental, maintenance, and repair services. As the UK distributor for Canon Medical, we offer industry leading systems, supported by first-class, reliable customer service.

VetPlus
Email: customer.services@vetplus.co.uk
Tel: 01253 797400

Founded in 1995 by David Haythornthwaite, VetPlus is still today a family company and very much proud of it. VetPlus is based in Lytham, Lancashire, where it manufactures all of its products in its own state of the art GMP approved manufacturing facility.
Founded on two key principals:

- Make the best possible products for the pet
- Sell them only through veterinary practices

30 years later those principals remain as strong as ever.
With subsidiaries in Germany, Spain, Ireland, Portugal and the USA. Distributers in over 40 countries and regional offices in Singapore and Buenos Aries, we are the globally recognised leader in our field.

CelticSMR Veterinary
Email: sales@celticsmr.co.uk
Website: www.celticsmr.co.uk
Tel: 0800 060 8673

CelticSMR Ltd is a rapidly growing diagnostic imaging supplier with over 40 years' experience supporting both veterinary and healthcare markets across the UK and Ireland. We specialise in the distribution of advanced ultrasound systems and are proud to represent leading technology from SonoScape Ultrasound.
We believe strong, long-term relationships with our customers are at the heart of everything we do. Our experienced and friendly team of vets, engineers and account managers are dedicated to delivering

exceptional customer service, comprehensive training, and ongoing technical support. This personalised approach helps our customers maximise the performance of their imaging equipment and ultimately provide the highest standard of care for their patients.

At this event, we will be showcasing two brand-new, high-specification laptop ultrasound scanners designed with cardiology applications in mind. These systems offer compatibility with a wide range of cardiac probes – including a high-frequency feline cardiac probe – alongside a full cardiac measurement package and an integrated reporting module to support efficient workflow and accurate diagnostics
Visit us on our stand to see the systems in action and speak with our team.

BRONZE SPONSOR

Imotek
Tel: +44 (0) 1487 843 193
E-mail: sales@imotek.com
Website: www.imotek.com

At Imotek International Ltd, we specialise in advanced veterinary imaging solutions that support clinicians in delivering accurate, confident diagnoses. At this year's meeting, we're showcasing our latest high-performance ultrasound systems designed for veterinary cardiology.

Discover the MyLab™Wolf and MyLab™Falcon—powerful, next-generation ultrasound platforms combining exceptional image quality, intelligent workflow, and advanced cardiac analysis tools. Designed for modern veterinary practices and referral centres, these systems provide the clarity and precision required for detailed echocardiographic assessment.

With outstanding Doppler performance, intuitive interfaces, and streamlined cardiac measurement packages, the Wolf and Falcon help clinicians efficiently evaluate cardiac structure and function, making advanced echocardiography more accessible in busy clinical environments. Compact, robust, and highly adaptable, they deliver the performance needed for both specialist cardiology and practices expanding their imaging capabilities.

Jo and Adam will be on the stand throughout the meeting and are looking forward to welcoming you. Stop by for a chat, see the systems in action, and discuss how the Wolf and Falcon could support cardiology imaging in your practice.

Biographies

Professor Vivek Muthurangu MD(res)

Vivek Muthurangu is Professor of Cardiovascular Imaging and Physics at UCL ICS. He is also the Head of the Research Department of Children's Cardiovascular Disease which incorporates all ICS researchers based at Great Ormond Street Hospital (GOSH). As lead for the Centre of Translational Cardiovascular Imaging, he has established a team of physicists, engineers, computer scientists and clinicians that have pioneered the development of new imaging technologies that have had real clinical impact. For instance, through the development of ultra-rapid imaging it was possible to almost triple the number of cardiac MRI scans performed at GOSH with no increase in staff or infrastructure. Recently, he has been at the forefront of developing Machine Learning (ML) techniques to further speed up MRI, reduce post-processing burden, massively accelerate computational fluid dynamics, and enable autonomous robotic catheterisation. Professor Muthurangu is also the programme director of the 4-year BHF PhD programme at UCL.

Jessica Dean BVetMed(hons) CertAVP(SAM) MRCVS

Jess graduated from the Royal Veterinary College in 2015, and went on to work in a busy small animal hospital in London where she developed a keen interest in small animal internal medicine and completed a post graduate certificate through the University of Liverpool. Jess completed a rotating internship at Southfields Veterinary Specialists in 2021, followed by an internal medicine internship at London Vet Specialists in 2022. Following her internship she joined the Willows Internal Medicine team in November 2023 to pursue further training as an internal medicine resident.

George Farrell

George is a final-year veterinary student at the Royal Veterinary College and is due to graduate in July 2026. He has a strong academic interest in cardiology and internal medicine, which has shaped both his clinical training and research focus during his final year. Following graduation, George plans to begin his career in small animal general practice in Skegness, where he aims to build strong foundational clinical skills before applying for a rotating internship. He holds a long-term ambition of pursuing specialist training as his clinical interests develop.

Tobi Wagner Dip ECVIM-CA (Cardiology) Dr.med.vet. MRCVS

Tobi graduated from the University of Munich in 2004, where he continued working in a veterinary echocardiography research project until 2005. After completing a Small Animal Rotating Internship in Georgia, USA, Tobi worked for one year with the busy cardiology department at the University of Giessen, where he gained a lot of interventional cardiology experience. Tobi then moved to the Royal Veterinary College, London, completing his cardiology residency and attaining his ECVIM-CA(Cardiology) Diploma in 2010. Tobi then joined Southern Counties Veterinary Specialists where he has been working as an European Specialist in Veterinary Cardiology for five years. After a brief spell back in Germany, Tobi returned to work full-time as a Specialist in Veterinary Cardiology and continues developing the very successful interventional service at SCVS. Tobi's main interest is feline cardiology and interventional cardiology.

Rafaela Gregorio DVM, MRCVS

Graduated from the Faculty of Veterinary Medicine at the University of Lisbon. The interest in cardiology was sparked during an externship in New York and deepened in the final year of studies in Portugal, where I had the opportunity to closely follow a veterinary cardiologist. She spent four years working as a first-opinion veterinarian in a busy London hospital, an experience that strongly shaped her clinical approach and interest in complex cases. Later completed rotating internships at Davies Veterinary Specialists, followed by a cardiology internship and residency at Southern Counties Veterinary Specialists. She is currently in her second year of residency and has a particular passion for arrhythmology.

Alex Laver BVSc CertAVP(VC) PGCertVPS MRCVS

Alex graduated form the University of Bristol in 2015 and spent three years in small animal practice in Somerset, Monmouthshire and Cardiff before joining HeartVets in 2018, initially completing an internship and then training as a cardiology clinician. Alex achieved the RCVS Certificate in Advanced Veterinary Practice (Veterinary Cardiology) in July 2021. She is part of the clinical referrals and interventional cardiology team at Cave Veterinary Specialists and also offers visiting clinics in the Somerset area. Her research interests include atrial fibrillation and cardiac biomarkers in hypertrophic cardiomyopathy. She also leads the HeartVets marketing and social media team.

Sophie Goodrich BVM&S MRCVS

Sophie graduated from the University of Edinburgh in 2020, and spent a year working in general practice in London. Having developed an interest in cardiology at university and in practice, she then moved to North Downs Specialist Referrals in Surrey to complete a rotating internship, followed by a cardiology internship. Sophie started an ECVIM-CA residency in small animal cardiology at Willows Veterinary Centre & Referral Service in 2023. She is particularly interested in congenital cardiac disease and interventional treatments.

Jordi Balaña Pedrol DVM CertAVP MRCVS

Jordi graduated from the University of Santiago de Compostela in Spain in 2016. He did a rotating internship at the teaching hospital of his university and the moved to the UK, where he worked in general practice, did a rotating internship in a private referral institution and a cardiology internship in an other private institution. He finally joined the cardiology team in the Small Animal Teaching Hospital from the University of Liverpool in February 2025 as a cardiology intern and became a resident in July 2025. Jordi enjoys all the aspects of clinical cardiology and the teaching opportunity.

Katie Glyde BVSc CertAVP(VC) MRCVS

Katie graduated from the University of Liverpool in 2012 and spent the first three years of her career working in a mixed small animal and equine practice before moving to a 100% small animal practice in Coventry. Katie achieved the RCVS Certificate in Cardiology in 2020 and subsequently became an RCVS Recognised Advanced Practitioner in Cardiology. She joined the team at Sarah Smith Cardiology in 2021 and has recently begun a ECVIM residency in Small Animal Cardiology in January 2026. Katie enjoys all aspects of cardiology with a particular interest in interventional cardiology and zoo animal cardiology.

Vicky Ironside VetMB MA CertVC MRCVS

Qualified from Cambridge in 1989 and have been working in GP practices seeing cardiology cases since 1999. Special interest in feline HCM and making things work better! Live near Sheffield in the Peak District where hills & bikes are plentiful.

David Sewell BSc BVM&S CertVC AVPcert(SAM)

David qualified from Edinburgh University in 2003. After developing an interest in cardiology following graduation, he gained an RCVS certificate in Veterinary Cardiology in 2011. He has worked in 1st opinion small animal practice since graduation except for periods as an intern at Dick White Referrals, 2.5 years at Highcroft referrals working part time in the referral department and part-time as a general practitioner covering many of the branch clinics, and as locum cover for Vets Now out-of-hours clinics. He has been at Heathside veterinary surgery since 2009 and for the last 18 months been lead veterinary surgeon for the team. In 2025, he completed a second certificate as an Advanced Veterinary Practitioner in Small Animal Medicine.

Jose Novo Matos DVM, PhD, MSc (Cardiac Pathology), DECVIM (Cardiology), AFHEA, MRCVS

Jose graduated from the University of Lisbon in 2005 and completed a cardiology residency at the University of Zurich, becoming an ECVIM-CA Diplomate in 2014 and an RCVS Specialist in Cardiology in 2015. He worked as a Senior Lecturer at Zurich before completing a PhD on feline HCM at the Royal Veterinary College and a Master's in Cardiovascular Pathology at the University of Padua. Currently, he is a Professor and Head of Cardiology at the University of Cambridge. His clinical and research focus includes feline cardiomyopathies and cardiac imaging. Jose co-hosts The Animal Heartbeat podcast, the first podcast dedicated to veterinary cardiology.

Echocardiographic Pulmonary to Left Atrial Ratio as a Diagnostic Tool in Pulmonary Hypertension Classification in Dogs

George Farrell

Pulmonary hypertension (PH) is a heterogeneous condition in dogs characterised by elevated pulmonary pressures and has numerous underlying causes. Right heart catheterisation (RHC) remains the gold standard for differentiating pre-capillary PH (PrePH) from post-capillary PH (PostPH), but it is rarely utilised in veterinary practice, making differentiation challenging. The echocardiographic pulmonary to left atrial ratio (ePLAR) has been proposed as a novel, non-invasive surrogate marker for PH classification. This study evaluated the ability of ePLAR to non-invasively distinguish PrePH from PostPH in dogs.

Forty-seven dogs with an intermediate to high echocardiographic probability of PH and nineteen dogs without evidence of PH were included in this retrospective cross-sectional study. Dogs were categorised as healthy, PrePH, or PostPH based on echocardiographic and clinical criteria. ePLAR values were compared between groups using Kruskal-Wallis testing with Dunn's post hoc comparisons, and categorical variables were assessed using chi-squared testing. Receiver-operating characteristic (ROC) curve analysis was performed to assess the discriminatory power of ePLAR between PrePH and PostPH. Youden's index was used to identify an optimal cut-off value.

Mean ePLAR was significantly higher in PrePH dogs (0.440 ± 0.168) compared to PostPH dogs (0.219 ± 0.091, $p < 0.0001$). Mean ePLAR in healthy dogs was significantly lower than in PrePH dogs ($p = 0.0026$) but did not differ significantly from PostPH dogs ($p = 0.4544$). ROC curve analysis demonstrated good discriminatory power of ePLAR for distinguishing PrePH from PostPH (AUC = 0.88), with a proposed cut-off point of 0.291.

This study indicates that ePLAR is a promising non-invasive echocardiographic parameter for distinguishing PrePH from PostPH in dogs and may offer additional insight into haemodynamic changes associated with treatment.

Ventricular Tachycardia and Pulmonary Lobar Hypoplasia in a 9month old Domestic Short Hair

Jordi Balaña Pedrol

A 9-month-old female neutered Domestic Short Hair cat presented for further investigation of collapse episodes. These episodes started 2 months prior to presentation as sudden onset episodes of ataxia lasting for 10-20 seconds, and progressed over the following weeks to syncopal episodes that increased in frequency from once a week to once a day. These were characterised by acute onset during periods of activity or excitement, with the patient laying on her side and trembling, with defaecation occurring during the most recent ones. Episodes could last from a few seconds to around 30 seconds), and the patient recovered rapidly back to normal afterwards. A diastolic gallop was audible on cardiac auscultation and an intermittent grade III/VI parasternal heart murmur was only audible during an episode of collapse. An electrocardiogram showed sinus rhythm at 200bpm with normal ECG waves. Doppler echocardiography identified right ventricular concentric hypertrophy and right atrial dilation. An abnormal turbulent flow at the level of both right and left branches of the pulmonary artery was also observed and there was a suspicion of narrowing of both pulmonary branches. Concurrent ECG during the echocardiogram showed sinus rhythm and sinus tachycardia with two episodes of self-resolving wide complex tachycardia just after changing the patient's position. Thoracic computed tomography showed moderate narrowing of the left and right pulmonary arteries suggestive of bilateral pulmonary lobar hypoplasia and right sided cardiomegaly. 24-hour Holter results during hospitalisation were unremarkable. However, she collapsed just after a Holter was fitted before discharge. During that episode her rhythm was a sustained wide complex tachycardia at 290bpm which developed into four beats of accelerated idioventricular rhythm (AIVR) at 150bpm before returning to a wide complex tachycardia of varying amplitude (compatible with polymorphic ventricular tachycardia or Torsade des Pointes) for a further sustained period of time. This terminated with a period of mixed AIVR and sinus before returning to sinus rhythm while the patient recovered uneventfully. An ECG was also obtained at that point. Treatment with Sotalol was started. The cat did not suffer any further collapse for 7 weeks after starting the treatment and she had two episodes in two consecutive days after. The cat has remained stable 3 months after initiation of the treatment.

The Feasibility of using the Eclipse-Mini Ambulatory Electrocardiogram in Dogs to obtain an Ambulatory ECG recording

Katie Glyde

Ambulatory electrocardiograms (ECG) are an important diagnostic tool in veterinary cardiology. This prospective study aimed to describe the use of a new ECG patch device (the Eclipse-Mini), assess whether it was well tolerated in a small population of dogs and able to produce diagnostic ambulatory ECG recordings. 5 dogs of varying breeds, body weights (5.5-26.8kg) and ages (1-13 years) were included in the study. Each dog underwent a full history, physical examination and a standard 6-lead ECG. The Eclipse-Mini monitor was worn in three positions (left lateral, right lateral and sternal) for a total of 5 minutes per position. Recordings were compared to the 6-lead ECG to ascertain the optimum position. The Eclipse-Mini monitor was subsequently worn for a 12-hour period and data analysed.

The Eclipse-Mini monitor successfully recorded an ECG in 4 dogs; one dog was excluded due to the monitor failing to record and the development of pruritus secondary to clipping. The left lateral position demonstrated similar amplitude of P-QRS-T complexes compared to the 6-lead ECG and the lowest artefact percentage; this position was elected for the 12-hour recordings. All dogs tolerated the monitor well for 12-hours and it successfully recorded a minimum, maximum and mean heart rate. Supraventricular and ventricular ectopy were both readily identified. Significant movement artefact was evident during periods of exercise (2.3-28.2%). In conclusion, the Eclipse-Mini monitor provided adequate 12-hour ambulatory ECG recordings, including identification of arrhythmias, and was well tolerated. Significant movement artefact during periods of exercise may limit wider use of this monitor in clinical practice.

Cardiac Interventions with Unexpected Outcomes

Tobi Wagner, Rafaela Gregorio, Alex Pack

Case 1
A 5-year-old cat presented with exercise intolerance and syncope. Investigations revealed a reverse PDA. Treatment with sildenafil resulted in temporary improvement of clinical signs and partial reversion of the shunt direction into a bidirectional shunt. The effect of the sildenafil on shunt direction and clinical signs subsided and could be temporarily improved by a dose increase. Predominant reactive nature (vasoconstriction) of the pulmonary hypertension was suspected based on this response despite the age of the patient. Due to poor quality of life, the owners elected to attempt PDA closure. The Type III morphology of the duct did not allow interventional closure. Temporary occlusion of the duct with invasive monitoring of the right ventricular pressures was performed as initial step. There was no increase of RV pressure following temporary occlusion of the duct, confirming that permanent occlusion would be possible despite the age of the cat.

Case 2
A 15-week-old puppy with extreme pulmonic stenosis and right sided congestive heart failure presented for assessment of balloon valvuloplasty. The extreme nature of the stenosis raised concern if balloon valvuloplasty would be feasible and patch graft ventriculectomy surgery versus balloon valvuloplasty was discussed with the owners. A final decision towards balloon valvuloplasty was made and the balloon dilation was successful. The patient developed acute pulmonary haemorrhage one hour following the intervention and had a cardiopulmonary arrest in ICU. The acute pulmonary haemorrhage was confirmed on postmortem. This complication has not been reported in veterinary medicine. We suspect that a severe and acute increase in pulmonary blood flow following 'balloon dilation' resulted in this fatal complication.

Case 3
A 2-year-old dog with severe pulmonic stenosis (valvular) underwent routine balloon valvuloplasty. Following balloon inflation, the patient developed sudden extreme bradycardia which gradually normalised following administration of atropine. On echocardiographic examination following complete recovery, a left to right shunting aorto-pulmonary communication and severe pulmonic regurgitation was documented. The patient developed right sided congestive heart failure despite a significant drop in pressure gradient. Poor right ventricular compliance in combination with the high right ventricular preload caused by the severe pulmonic regurgitation and the additional shunt volume via the aorto-pulmonary communication are the likely explanation for the right sided heart failure. Following reduction of the right ventricular wall thickness (and presumably improved RV compliance), the right sided heart failure gradually improved and allowed significant reduction of diuretic dose


celticSMR
VETERINARY


VetPlus
A Global Leader in Veterinary Nutraceuticals


QMS
QUALITY MEDICAL SERVICES
VETERINARY

Giant Left Atrial Appendage Aneurysm in a Cat

Sophie Goodrich

Intrapericardial left atrial appendage aneurysm is a rare condition in humans. The acquired form is typically associated with chronic elevations in left atrial pressure, whilst the congenital form has been attributed to dysplasia of pectinate muscles or the left atrial wall. Though individuals may be asymptomatic, the condition can result in thromboembolic events, supraventricular arrhythmias, and compression of adjacent thoracic structures. These aneurysms are therefore a cause of morbidity and mortality in people, usually treated with surgical resection.

There are sparse reports of this condition in dogs, but it has not previously been described in cats. This presentation describes the clinical, echocardiographic, and necropsy findings in a young cat presenting with pleural effusion and subsequent sudden death, diagnosed with a giant left atrial appendage aneurysm (suspected to be congenital).


imv
imaging


HeartVets


ceva

Transcatheter edge-to-edge repair (TEER): The Colorado Experience

Caroline Cutler

Transcatheter edge-to-edge repair (TEER) is a hybrid interventional procedure adapted from human cardiology to reduce the severity of mitral regurgitation secondary to myxomatous mitral valve disease (MMVD). Small-breed dogs in ACVIM stages B2–D with severe mitral regurgitation (regurgitant fraction (RF) >50%) and suitable mitral valve anatomy—assessed using 4D transoesophageal echocardiography—are considered potential candidates. Colorado State University has recently reported one-year echocardiographic and two-year outcome data from their experience with 111 dogs treated between January 2021 and January 2025.
In dogs, TEER is performed via a mini-thoracotomy to facilitate transapical left ventricular access without the need for cardiopulmonary bypass. Transoesphageal echocardiography guides the advancement and positioning of the V-Clamp (Figure 1) device across the mitral valve, followed by simultaneous grasping of the anterior and posterior mitral leaflets. Deployment of the device creates a double-orifice valve configuration (Figure 2). In a minority of cases, a second V-Clamp may be placed based on intraoperative evaluation of clamp stability and residual mitral regurgitation quantification.

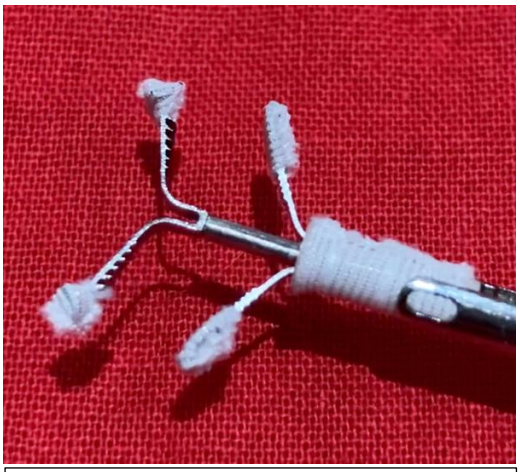

Figure 1. V-Clamp device

Procedural data in humans suggests a steep learning curve during the first ~50 procedures, followed by continued
improvement in procedural success and outcomes up to ~200 cases. In dogs, technical success – defined as successful placement one or more clamps - is achieved in 97% of cases, with a survival-to-discharge rate of 94% (data which incorporates the steepest portion of the learning curve). Single-leaflet detachment is the most frequent device-related complication in both humans and dogs, occurring in about 5% procedures.
Among dogs undergoing TEER, one-year freedom from all-cause and cardiac-related mortality is 75% and 80%, respectively, decreasing to 67% and 78% at two-years. In dogs categorised as ACVIM stage C pre-procedure, furosemide therapy was discontinued in 39%.
Key echocardiographic measurements comparing baseline values to both immediate and one-year post-TEER values are summarised below:

	Baseline	**Immediately post-TEER**	**One-year post-TEER**
Mean mitral RF	60%	35%	31%
LVIDdN	2.07	1.84	1.79
LA:Ao	2.31	2.10	1.94

RF: regurgitant fraction. LVIDdN: left ventricular internal diameter in diastole normalised to bodyweight. LA:Ao: left atrium:aortic root ratio. All measurements significantly decreased from baseline to immediately post-TEER, and from baseline to one-year post-TEER ($p<0.001$).

In summary, TEER is a technically demanding and increasingly important therapeutic option for dogs with advanced MMVD. The second generation of mitral clamp devices is on the horizon, with novel designs and larger sizes in development. These advancements are expected to expand the range of suitable candidates and may contribute to further improvements in procedural outcomes, as has been the case over the last decade in humans.

References

- Feldman T, Foster E, Glower DD et al. Percutaneous repair or surgery for mitral regurgitation. N Engl J Med, 2011;364:1395-406.
- Hausleiter J, Stocker TJ, Adamo M et al. Mitral valve transcatheter edge-to-edge repair. EuroIntervention, 2023;23:957-76.
- Orton EC, Carroll JD. Mitral transcatheter edge-to-edge repair: guidance in dogs from the human experience. J Vet Cardiol, In press 2025: doi.org/10.1016/j.jvc.2025.10.005.
- Otto CM, Nishimura RA, Bonow RO et al. ACC/AHA guideline for the management of patients with valvular heart disease: a report of the American college of cardiology/American heart association joint committee on clinical practice guidelines. Circulation, 2021, 143:e.72-e227.
- Potter BM, Orton EC, Scansen BA et al. Clinical Feasibility Study of Transcatheter Edge-to-Edge Mitral Valve Repair in Dogs with the Canine V-Clamp Device. Front Vet Sci, 2024;11:1448828.
- Potter BM, Orton EC, Scansen BA et al. One-year echocardiographic follow-up and two-year survival in 111 dogs undergoing mitral transcatheter edge-to-edge repair. J Vet Cardiol, In press 2025: https://doi.org/10.1016/j.jvc.2025.12.002.
- Stone GW, Lindenfeld J, Abraham WT et al. Transcatheter mitral-valve repair in patients with heart failure. N Engl J Med, 2018;379:2307-18.

IMOTEK

Seeing the true myocardium: contrast-enhanced echocardiography for accurate LV wall measurement in cats

Jose Novo Matos

Hypertrophic cardiomyopathy (HCM) is the most common cardiac disease in cats, and its diagnosis relies fundamentally on the identification of increased left ventricular (LV) wall thickness using standard echocardiography (S-ECHO). Precise measurement of LV wall thickness is therefore critical for accurate phenotyping and clinical decision-making. However, reliable assessment can be challenging, as intracavitary structures- such as trabeculations, false tendons, papillary muscles, and adjacent right ventricular components- rafoverestimation. In feline patients, where differences as small as 0.5 mm may alter diagnostic classification, such inaccuracies can have significant clinical implications.

In human cardiology, contrast-enhanced echocardiography (C-ECHO) improves delineation of endocardial and epicardial borders, reduces inclusion of non-myocardial structures, and enhances measurement accuracy and reproducibility. Ultrasound contrast agents are widely used and considered safe in small animals, and SonoVue has previously been reported to be well tolerated in cats with advanced cardiomyopathy.

In a prospective study funded by the ECVIM Clinical Studies Fund, we evaluated whether C-ECHO improves LV wall thickness assessment in cats compared with S-ECHO. Specifically, we examined agreement between techniques, intra- and interobserver reliability, measurement variability, and the potential impact on HCM classification.

Across the entire study cohort, interventricular septal thickness in diastole (IVSd) and LV free-wall thickness in diastole (LVFWd) were significantly greater when measured with S-ECHO compared to C-ECHO. On average, LV wall thickness measured by S-ECHO exceeded that measured by C-ECHO by 0.61 mm. Median absolute differences were 0.9 mm for IVSd and 0.4 mm for LVFWd. Bland–Altman analysis demonstrated a consistent positive bias (S-ECHO higher) with wide limits of agreement, frequently exceeding ±1 mm, indicating poor interchangeability between techniques.

Importantly, C-ECHO demonstrated superior intra- and interobserver reliability compared with S-ECHO. Reliability for LV wall thickness ranged from poor to moderate with S-ECHO, but improved to moderate to excellent with C-ECHO. Agreement between techniques for HCM classification was only moderate ($\kappa = 0.50$).

These findings mirror observations in human cardiology, where S-ECHO may overestimate wall thickness due to suboptimal border delineation and inadvertent inclusion of intracavitary or adjacent structures. In cats, false tendons and right ventricular structures frequently parallel the septum and may be misidentified as compact myocardium, particularly affecting IVSd measurements.

C-ECHO enhances visualisation of true compact myocardium, reducing subjectivity and improving measurement consistency. Additionally, C-ECHO yielded larger LV internal dimensions, particularly in systole, suggesting that S-ECHO may underestimate cavity size when endocardial borders are obscured by intracavitary structures.

Conclusions

Contrast-enhanced echocardiography yields lower LV wall thickness measurements, and improved reliability compared with S-ECHO in cats. S-ECHO appears to systematically overestimate LV wall thickness relative to C-ECHO, likely due to incomplete delineation of compact myocardium.

These findings support the use of C-ECHO as a valuable adjunctive imaging modality to enhance accuracy and reproducibility in feline HCM assessment, particularly in cases where precise delineation of myocardial borders is challenging with conventional echocardiography.

When the myocardium is thin: micro-CT and pathological insights into segmental left ventricular dysfunction

We have recently published a large case series describing cats with thin and hypokinetic myocardial segments (THyMS). In people, a similar phenotype represents a form of adverse left ventricular (LV) remodelling in hypertrophic cardiomyopathy (HCM).

In people, adverse cardiac remodelling with marked myocardial fibrosis and progressive LV wall thinning has been described in approximately 15–20% of HCM cases and is considered a serious complication of the disease. Regional LV wall thinning is typically associated with transmural myocardial fibrosis in the absence of extramural coronary artery disease and is thought to result from silent, chronic myocardial ischaemia. Unlike

classical myocardial infarction due to atherosclerotic coronary disease, this process is often not accompanied by typical clinical symptoms, but is instead associated with the development or progression of congestive heart failure.

In cats, THyMS most commonly affects the LV free wall and appears to be associated with advanced cardiomyopathy, severe clinical signs, and poor outcome. In our initial case series, microfocus computed tomography (micro-CT) and post-mortem examination in one cat demonstrated severe transmural scarring within a thin and dysfunctional myocardial segment, suggesting a previous severe myocardial insult such as ischaemic injury or myocardial infarction.

To further characterise THyMS in cats, we subsequently evaluated four feline hearts using post-mortem micro-CT and detailed histopathology, all from cats with echocardiographic evidence of THyMS affecting the LV free wall and/or apex.

One cat had gross and histological features consistent with chronic ischaemic heart disease, including a post-myocardial infarction apical aneurysm. Unexpectedly, the remaining three cats showed histological features most consistent with healing myocarditis, characterised by multifocal mononuclear inflammatory infiltrates, myocyte necrosis, granulation tissue, and early fibrosis. Lesions were predominantly subepicardial in the postero-apical LV free wall and intramyocardial within the apical segment. Importantly, there was no histological evidence of HCM or restrictive cardiomyopathy in these three cats. These findings suggest that extensive inflammation and necrosis led to myocardial loss with subsequent fibrous replacement, resulting in regional thinning and systolic dysfunction.

Taken together, these data indicate that THyMS in cats is associated with advanced cardiac disease and may represent a final common phenotype resulting from different forms of myocardial injury. We hypothesise that potential aetiologies include type 2 myocardial infarction due to oxygen supply–demand mismatch (possibly related to thickened LV segments in HCM), thromboembolic coronary events, and myocarditis.

Further studies involving larger cohorts and systematic pathological evaluation will be required to better define the prevalence, underlying mechanisms, and clinical implications of THyMS in cats.

Anaesthetic Considerations for a Doberman with Dilated Cardiomyopathy and Atrial Fibrillation

David Sewell

This case presentation describes the approach to general anaesthesia for a patient diagnosed with dilated cardiomyopathy (DCM) and atrial fibrillation (AF) seen in general practice.
A 3-year-7month old male neutered Doberman Pinscher presented with a persistent cough that the owners had believed was infectious tracheitis before developing dyspnoea. On physical examination there was weight loss (bodyweight of 42.5kg and body condition score 4/9), a heart rate of 120bpm with a regular rhythm and no audible heart murmur, weak femoral pulses, respiratory rate of 36 breaths per minutes and increased soft bronchovesicular sounds (crackles) on inspiration. Biochemistry (including total T4) and haematology were unremarkable. Echocardiography was performed with the patient standing as dyspnoea worsened during lateral recumbency. Findings included dilation of the left ventricle in diastole and systole, increased sphericity index, left atrial enlargement, and small volume pleural and pericardial effusions.

- LVIDd = 56.51mm (> 48mm consistent with DCM*)
- LVIDs - 52.70mm (> 36mm consistent with DCM*)
- Sphericity index = 1.45 (< 1.65 = increased sphericity*)
- LVIDDN - 1.88 (RR 1.35 - 1.73)
- LVIDSN - 1.62 (RR 0.79 - 1.14)
- LA - 46.05mm
- Ao - 23.45mm
- LA/Ao - 1.96

* (Wess *et al*., 2017)

A diagnosis of congestive heart failure secondary to DCM was made and the patient started on 1.88mg/kg furosemide every 12 hours, 0.24mg/kg pimobendan every 12 hours and a fish oil supplement.
7 days later the patient returned for follow-up. The coughing and dyspnoea had resolved, and no abnormal respiratory noise was present on auscultation. Repeat blood test confirmed no electrolyte abnormalities or azotaemia. A 24-hour Holter was performed which found sinus rhythm with infrequent periods of sinus tachycardia. There were 20 ventricular premature complexes (VPCs) in 24-hours with one couplet and one triplet. There were also 3 short paroxysms of supraventricular tachycardia and 84 short runs of supraventricular ectopy, with 91 paired and 235 single supraventricular premature complexes (SVPCs). Some of the SVPCs were aberrantly conducted. A repeat Holter after 3 to 6 months was recommended.
Approximately 2 months after the initial diagnosis of DCM the patient represented with coughing and exercise intolerance. The heart rate was around 240bpm with a chaotic rhythm, there was increased respiratory effort, and signs of mild abdominal fluid (ascites). Electrocardiography (ECG) confirmed atrial fibrillation.
Management was started using a combination of 5.8µg/kg digoxin every 12 hours and 2.79mg/kg diltiazem every 12 hours, based on the study by Gelzer *et al*. (2009). The patient subsequently failed to return for the recommended follow-up but continued to request repeats for these medications and was seen for routine annual vaccination 5 months later. At the annual health check the rhythm was chaotic with an average rate of 140bpm in the consult room.
3 months following the vaccination (8 months following the initial diagnosis of DCM) the patient presented to a colleague after he was seen swallowing a tennis ball. There were no other concerns noted and he was taking his medications normally. The physical examination was unremarkable apart from the chaotic rhythm and a 2/6 left apical holosystolic heart murmur was now audible. My colleague attempted to manage the foreign body ingestion by inducing emesis using 0.1mg/kg of apomorphine by subcutaneous injection. This successfully induced emesis but apart from a small piece of tennis ball no other foreign material was brought up.
Management of the case was transferred to me, and the options were discussed with the owner. The owners had a limited budget, so referral was declined. It was decided that not removing the known gastric foreign body was too great a risk and the decision was made to attempt endoscopy of the stomach under general anaesthesia (GA). The risk of anaesthesia was discussed with the owner, however a discussion regarding a 'do-not resuscitate' (DNR) order should the patient experience cardiopulmonary arrest (CPA) was not had.
When approaching any anaesthetic I consider the following aspects: Premedication agents, induction agents, anaesthetic maintenance, monitoring, fluid support and analgesia. Along with the patient's condition and risk factors, in this case having cardiac disease associated with poor systolic function, cardiac output and risk of

congestive failure, complicated by a tachyarrhythmia. The goals for anaesthesia both in this case and in general with patients with cardiovascular disease would include maintaining cardiac output and a mean systolic arterial pressure over 60mmHg, minimising the risk of congestive heart failure due to volume overload, maintaining an adequate heart rate while avoiding tachycardia, and minimising the risk of additional arrhythmias such as VPCs. In the preparation phase I also considered the plan for addressing each contingency if problems were encountered such as hypotension, bradycardia, tachycardia, ventricular ectopy and CPA.
Preparation was considered key; the practice has adopted the use of GA safety checklists (AVA, 2026), and this included a team discussion regarding the procedure, patients' condition, contingency planning and preparation of the equipment and medications that may be required prior to starting the procedure.
For anaesthesia, no premedication was given and no analgesia was started as endoscopy was considered a non-painful procedure. Induction was performed using 2mg/kg Alfaxalone and co-induction with 0.3mg/kg midazolam (Miller, *et al.*, 2019). Isoflurane was used for maintenance of anaesthesia. An intravenous cannula was placed but no intravenous fluids given as the patient was considered euvolemic and fluid therapy would increase the risk of volume overload and venous congestion. Monitoring consisted of multiparameter monitoring of ECG, non-invasive blood pressure (both oscillometric and Doppler), capnography and pulse oximetry, alongside the more important qualified veterinary nurse monitoring eye position, muscle tone, peripheral pulses, mucus membrane colour and capillary refill time as well as rectal temperature (as oesophageal temperature monitoring was avoided due to the endoscopic procedure). When endoscopy confirmed the presence of the tennis ball in the stomach, but endoscopic retrieval failed, it was decided to convert to a surgical procedure and perform a gastrostomy. Analgesia was provided with 0.3mg/kg methadone and 10mg/kg paracetamol intravenously. 25mg/kg cefuroxime was also given intravenously at the start of surgery.
The procedure was successful and the patient made an uneventful recovery from the anaesthetic, with no complications reported at the 10-day post-operative check.

Discussion:

This case describes the approach to GA in a patient with DCM and AF considered to be high risk for anaesthesia, as performed in a first-opinion practice. It was a challenging case, presenting on a busy day and where the owners had financial limitations to consider. The outcome was good and I was particularly pleased with the planning and preparation for this procedure, and the teamwork involved. I also feel the use of alfaxan and midazolam co-induction has been a very effective method for minimizing cardiovascular depression when inducing anaesthesia in patients with cardiovascular disease.
Pre-anaesthetic blood screening and echocardiography in this case was not performed due to financial considerations and as it would not likely have affected the decision to proceed with gastric foreign body retrieval. Direct arterial pressure monitoring and blood gas analysis were not available in our practice. In the future I plan to be better and discussing possible DNR instructions with owners prior to anaesthesia.
Although it was not considered appropriate to start an antiarrhythmic medication based on finding SVPC's on the Holter, on reflection I have wondered if the use of amiodarone would have had the potential to reduce the risk of AF developing in this case. Another option not available in my practice could have been electrical cardioversion performed prior to the anaesthetic. Although reversion to AF would have been expected, inducing a sinus rhythm if only for a short time could have provided additional stability during the anaesthetic. Furthermore, the use of lidocaine constant rate infusion for both additional analgesia and to reduce the risk of ventricular ectopy was considered but determined on the day to be an unnecessary complication. The potential for lidocaine to reduce the risk of ventricular ectopy is not well studied or described in the literature.

References:

- AVA (2026) "Anaesthesia Records & Checklists." *Association of Veterinary Anaesthetists* ava.eu.com/resources/checklists/. Accessed 8 Feb.
- Gelzer, A.R.M. *et al*. (2009), Combination Therapy with Digoxin and Diltiazem Controls Ventricular Rate in Chronic Atrial Fibrillation in Dogs Better than Digoxin or Diltiazem Monotherapy: A Randomized Crossover Study in 18 Dogs. *Journal of Veterinary Internal Medicine*, 23: 499-508. https://doi.org/10.1111/j.1939-1676.2009.0301.x
- Miller, C. *et al.* (2019) "Co-induction of anaesthesia with alfaxalone and midazolam in dogs: a randomized, blinded clinical trial." *Veterinary anaesthesia and analgesia* vol. 46,5: 613-619. doi:10.1016/j.vaa.2019.03.009
- Wess, G. *et al*. (2017) "European Society of Veterinary Cardiology screening guidelines for dilated cardiomyopathy in Doberman Pinschers." *Journal of veterinary cardiology : the official journal of the European Society of Veterinary Cardiology* vol. 19,5: 405-415. doi:10.1016/j.jvc.2017.08.00