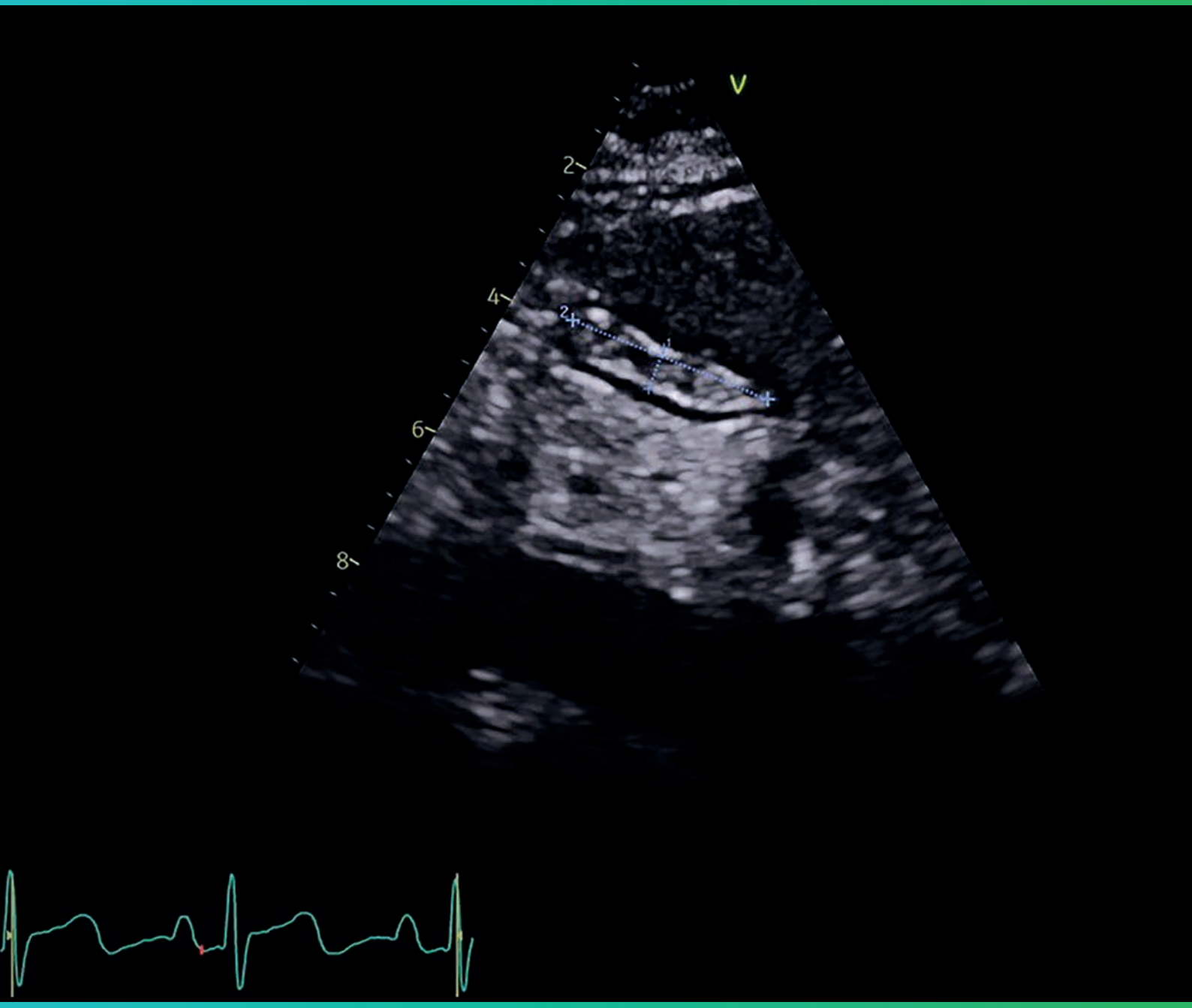
ECHO JOURNAL

British Society of Echocardiography

Summer edition

Issue 134 / June 2026



Inside Summer's edition...

Evelina London
Children's Healthcare

Transoesophageal Echocardiography in Congenital Heart Disease

Monday 5th - Tuesday 6th October 2026

etc.venues County Hall, Riverside Building, Belvedere Rd, Lambeth, London, SE1 7PB

Philips and Evelina London Children's Hospital are delighted to invite you to the Transoesophageal Echocardiography in Congenital Heart Disease taking place on 5th-6th October 2026 at the etc. venues County Hall, London.

This is a two-day course on the current applications of three-dimensional echocardiography in congenital heart disease, with a strong emphasis on the practical aspects of dataset interrogation and interpretation.

Designed for clinicians, cardiologists, physiologists and echocardiographers working in congenital or structural heart disease, it offers practical demonstrations, hands-on guidance and focused teaching from the Evelina London expert faculty.

The course faculty is from the Department of Congenital Heart Disease, Evelina London Children's Hospital, Guy's and St Thomas' NHS Foundation Trust.

Course Directors

Dr Paraskevi Theocharis
Consultant Pediatric Cardiologist

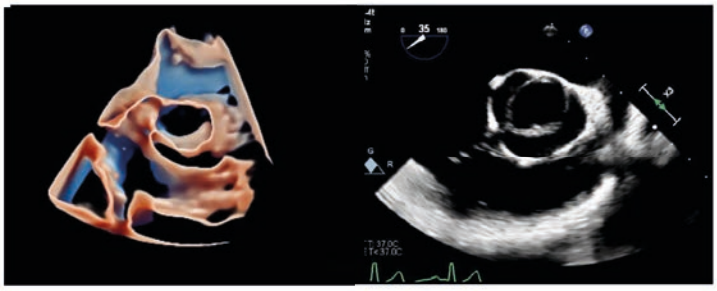
Dr Owen Miller,
Consultant in Paediatric and Fetal Cardiology

Fees: (Inc VAT)

Early Bird Ticket: **£450**

Standard Ticket **£650**

Late Entry Ticket: **£750**



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President's Message

As I sat down to write this, I realised it is my last President's message.

I can't believe it has been nearly three years since I took the baton from Claire. I hope you feel it has been (almost) three years well spent. It has flown by, but I believe a lot has been achieved. In my first President's message in December 2023 I outlined my priorities. The first being to develop progression pathways for our physiologist/scientist colleagues.

Dan Augustine

At the time I said, "There are not many countries where physiologists/scientists provide the depth and breadth of physiologist-led services that we do here in the UK, with concepts such as advanced educator roles and advanced clinical roles including stress echo clinics, bubble studies, contrast lists, TOE lists and valve clinics. We will form a cross committee working group to create a pathway that enables more echocardiographers to develop roles in advanced practice and to be recognised appropriately for this level of practice."

I am immensely proud that by the time you read this, the nominated physiologists/scientists in our Level 3 accreditation pilot sites will be about to embark on the first stage of their clinical skills training at Swansea University and will be gathering the benchmarking data which is pivotal for the project.

This project has been the culmination of an incredible amount of work by many people. In particular, I would like to thank Sadie Bennett, Maria Paton, Shaun Robinson, Emily King, Jo Sopala and our volunteer fundraiser, Carol Hunter. Together, this group have framed and generated the funding for a project which we all believe will be truly transformational.

I would also like to thank the core steering committee members who have added their insight and expertise at every level and especially in terms of the scope of practice for each speciality; heart valve disease, heart failure and inherited cardiac conditions. Huge thanks to Madeline Garbi, Camelia Demetrescu, Lisa Anderson, Carys Barton, Stephen Page and Gemma Bassindale. Special thanks also to Emma Rees for running an additional course at Swansea University for our cohort.

Finally, this project would not be happening were it not for the funding we have received from NHS England, the Office of the Scottish Chief Scientific Officer, British Heart Foundation, as well as unrestricted grants from Bristol Myers Squibb and Pfizer.

We are also very grateful to our key stakeholders including British Heart Valve Society, British Society for Heart Failure, British Inherited Cardiac Conditions Society, NHSE, Swansea University, Chief Scientific Officer for Scotland, Health Education and Improvement Wales, Chief Scientific Officer for Northern Ireland, National School for Healthcare Science and Heart Valve Voice. Thank you all for your valuable contributions.

Away from the Level 3 project, the committees, team and our army of volunteers have been as busy as ever running a number of practical accreditations, the written exam, Advanced imaging, membership renewals and trying to meet the needs of our members. As always, I offer my sincere thanks to them all.

Now our focus moves to BSEcho 2026. Yet again, the Education Committee have put together a world class programme. Aside from the outstanding speakers, including our international speaker, Partho Sengupta and our invited speaker, Robert Kelly, I am looking forward to catching up with people. There really is no substitute for all getting together with our shared passion and eagerness to learn and drive standards. I know the team are planning how we can all maximise our time at the conference, between lectures, workshops, peer to peer learning and the valuable insights we can gain from our industry colleagues. Personally, I can't wait. I very much hope I will see you there.

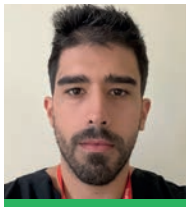
Finally, amidst all of the fantastic contributions in this edition of ECHO journal, you will note two pieces generated by our acute care colleagues. We would like to ensure this becomes a regular feature going forward so please share your copy/speak to your acute colleagues and encourage their submissions.

Best wishes

Professor Dan Augustine

President, British Society of Echocardiography

Latest News



Mr Ivo Ferreira de Andrade

New Honorary Secretary announced

We are delighted to announce the appointment of Mr Ivo Ferreira de Andrade as Honorary Secretary. Ivo takes on the role from Ms Wendy Gamlin, who will become the next President from October 2026.

Ivo is a Consultant Cardiac Clinical Scientist at Manchester University NHS Foundation Trust. He has been a BSE Trustee since 2024, following many years of supporting the Accreditation Committee as an assessor. His commitment to high standards in the profession will stand him in good stead for the role of Honorary Secretary.

New guidance on cardio-oncology

Our newest guidance on echocardiographic surveillance in childhood, teenage and young adult (CTAYA) cancer survivors is in collaboration with the Childhood Cancer and Leukaemia Group (CCLG) and the British Cardio-Oncology Society (BCOS). The position statement aims to summarise recent changes in guidance on echocardiographic surveillance and propose a UK specific approach to long-term monitoring for the cohort in line with previous BSE and BCOS guidance for the adult population.

Read the guidance at bsecho.org/PUG001

Logbook period extensions

We understand the clinical pressures our members face and that for many, collecting the requisite number of cases within the 24 month period has been difficult. To provide greater flexibility and to reduce the volume of extensions required, we have extended the timeframe for case collection across all accreditations:

- **Level 2 Accreditations:** The collection window has increased from 24 months to 36 months
- **Level 1 Accreditation:** The collection window has increased from 12 months to 24 months

Find this and more in the accreditation packs at bsecho.org/personal-accreditation

Education Committee applications open

We're recruiting new volunteers to support the Education Committee, which has responsibility for the planning and delivery of educational events and online learning as well as the production of guidelines and educational materials.

If you are passionate about echo education and professional development and committed to promoting the highest standards of care and supporting our members to deliver high quality echo services, this may be the right opportunity for you.

Find out more at bsecho.org/EdComm26

Call for STP equivalence mentees

We're launching a new STP equivalence buddy system to better support members undertaking STP equivalence. The scheme will pair those on the equivalence pathway with an arms-length peer mentor who has already completed the process, offering guidance around portfolio evidence and interview preparation.

We are now seeking expressions of interest from members requiring a mentor to support their application process.

Find out more at bsecho.org/STP-mentees

Echocardiographer of the Year

The finalists for our Echocardiographer of the Year award, delivered in partnership with the Advancing Healthcare Awards, have been announced. The award recognises an echocardiographer who has made an outstanding contribution to the profession, demonstrating leadership, service improvement and a clear impact on patient care, while championing high-quality practice and professional development.

The finalists are:

- **Mr Adam Langley,** Chief Cardiac Physiologist, Mid and South Essex NHS Foundation Trust
- **Dr Dario Freitas,** Lead Clinical Scientist for Adult Congenital Heart Disease, Guy's and St Thomas' NHS Foundation Trust
- **Bex Parsons-Simmonds,** Lead Critical Care Echo Specialist, Cardiff and Vale University Health Board

The winner will be announced later this month at the Advancing Healthcare Awards ceremony.

SCAN-EF project launched

We're supporting a research project exploring whether AI-enabled handheld cardiac ultrasound can help improve the early diagnosis of heart failure due to reduced left ventricular ejection fraction, while maintaining the high standards of governance, training and quality that underpin UK echocardiography.

Find out more at bsecho.org/research-news

Image of the Year

Our Image of the Year competition returns for a second year, celebrating the fantastic work that our members do every day. Images are judged not only for their clinical merit, but also considering potential comical, surprising or terrifying aspects.

Last year's winner, Ms Karthika Bindhu's image, was featured on the cover of ECHO 132 (December 2025), followed by fellow finalist Mr Ryan Mc Coy's in ECHO 133 (March 2026). Another image from Karthika will be featured in ECHO 134 (September 2026) before the winners of this year's competition are announced at BSEcho 2026.

This edition's image, submitted by Deepa who is a Specialist Senior Cardiac Physiologist at Spire Clare Park Hospital, shows a 53-year-old Caucasian female who presented with a history of a gunshot injury to the chest at the age of 3, following accidental firearm discharge by her brother during bird hunting. The bullet entered the thoracic cavity anteriorly and the patient survived without surgical intervention.

Find out more about Image of the Year and how to enter at bsecho.org/ImOTY

Upcoming events

BSEcho 2026

Save the date for BSEcho 2026, taking place in Manchester on Friday 16 and Saturday 17 October 2026.

With clinical and personal development topics to suit every stage in your career, our 35th annual conference is not one to miss!

Find out more at bsecho.org/BSEcho2026

Foundations in Research Skills and Techniques (FIRST) 2026

Save the date for BSEcho 2026, taking place in Manchester. Our second research course will be held in Manchester on Thursday 15 October 2026. This inspiring and practical afternoon will be dedicated to demystifying the research process and empowering early-career professionals to get started with confidence. Book now: bsecho.org/FIRST

Online learning

Catch-up content

If you have missed a webinar recently, you can now find the content on catch-up and still avail of BSE points. Access the webinars on our website under bsecho.org/webinars

You can also find the recordings of all the sessions from BSEcho 2025 on our website under bsecho.org/past-presentations

Level 1 library

The Level 1 library contains 150 real-world Level 1 echocardiograms, enabling the user to generate a report using the Level 1 reporting template and then providing feedback on performance with a suggested 'ideal' answer. The first 30 cases can be accessed free of charge. Once the first 30 cases have been completed, a further 120 cases can be purchased for a fee of £50 for BSE members and £70 for non-members.

Log on to the library at bsecho.org/L1-library

Instructions to authors

ECHO is published four times per year. It is the official publication of the British Society of Echocardiography. The contact address is: BSE Administration, Unit 111, The Print Rooms, 164-180 Union Street, London SE1 0LH, email admin@bsecho.org

Members of the Society are invited to submit articles, case reports, audits, service improvement projects, or letter correspondence. Submissions should be sent to 'The Editor', ECHO and forwarded by email to: editor@bsecho.org

The format should be text as a normal Word document and images supplied as high resolution (300dpi) jpeg, tiff, eps or pdf files. Other formats including PowerPoint or of web image construction may result in reduced resolution and may be unacceptable. Articles should contain appropriate references. References to be constructed in the Vancouver style with the first two authors, thereafter abbreviate to 'et al', then article title, followed by journal reference.

Submissions to ECHO are currently not peer reviewed. The Editor has discretion on acceptance.

All submissions to ECHO should be anonymised to protect patient privacy. Written patient consent is required for all case reports and case series, both for patients living and no longer living. It is the responsibility of the author to obtain written consent and the author will be asked to sign a BSE consent document confirming that written consent has been obtained. BSE editors may call on authors to provide evidence of patient consent. As such we would encourage patient consent to be recorded within patient notes.

If the submitted article (or a very similar version) has been submitted to or been published by another journal, the submitting author(s) should clarify this at the time of submission to ECHO with a justifiable reason for requesting re-publication. Additionally, permission from the previous publisher should be obtained and authors are required to seek permission to use images from other sources. It should be noted that opinions expressed in articles or letters are the opinions of the author(s) and not that of the Council of the British Society of Echocardiography (BSE).

Official BSE Council views or statements will be identified as such. Information with respect to advertisements can be obtained from events@bsecho.org

BSEcho 2026: 35 years of excellence

As we move through 2026, the British Society of Echocardiography (BSE) is approaching a milestone that invites both reflection and ambition for the future.

This marks the 35th anniversary of the Society – three and a half decades of setting standards, providing education and building a professional home for those dedicated to the art and science of echo. To celebrate, we are returning to the heart of the North for our flagship annual conference, BSEcho 2026, held at Manchester Central on Friday 16 and Saturday 17 October 2026.

The landscape of echocardiography has shifted dramatically since 1991. What was once a niche diagnostic tool has become the foundation of cardiovascular diagnostics. Our 35th conference is not just a celebration of longevity; it is a testament to the resilience and growth of our community, and a chance to look forward to the next generation of imaging.

Scientific programme

Our Education Committee, co-chaired by Dr Kelly Victor and Dr Lynne Williams, has curated a programme that reflects both our heritage and the cutting edge of cardiac imaging. We are thrilled to welcome a world-class faculty of over 50 speakers, including international keynote Professor Partho Sengupta (Chief of Cardiology, Rutgers Robert Wood Johnson Medical School) and invited speaker Dr Robert Kelly (Consultant Cardiologist, Beacon Hospital, Dublin).

As well as a strong emphasis on valvular heart disease, attendees will benefit from insights into acute care, congenital heart disease and multi-modality imaging, ensuring that there is truly something for everyone. And whatever stage you are at in your career, there is complementary content for you, covering areas key to our workforce such as career development and workflow solutions. View the programme: bsecho.org/ACG001-programme

Championing research

A cornerstone of our annual meeting is the Investigator of the Year (IOTY) competition. At the BSE, we have always believed that the evolution of our field is driven by those on the front lines – clinicians and researchers who apply evidence-based guidelines to solve real-world problems.

This year's IOTY session promises to be exceptionally competitive. We are looking for abstracts that showcase not just traditional research, but also interesting audit processes, novel working practices, and innovative service improvements. For the finalists, the opportunity to present their work to a national audience is a career-defining moment.

If you or your department have been driving excellence through a recent project, we strongly encourage you to submit your work. The deadline for abstract submissions has been extended to Friday 5 June 2026: bsecho.org/IOTY

Social highlights

While the daytime sessions focus on professional development, we believe a milestone this significant deserves a proper celebration. We are delighted to announce that on Friday evening, we will be hosting an anniversary dinner in addition to our popular drinks reception.

In an era of overloaded services and burnout, the value of sitting down with colleagues cannot be overstated. The dinner will be a dedicated space to celebrate our shared history, acknowledge the contributions of our long-standing members, and toast to the future of the Society. It promises to be the social highlight of the year – an evening of heritage, excellent food, and the chance to reconnect with friends from across the UK in a relaxed, celebratory atmosphere. Find out more: bsecho.org/ACG002

Flexibility and accessibility

We remain acutely aware of the challenges regarding study leave and service demands. To ensure our education remains accessible, we are once again offering a hybrid format. For those unable to join us in person, our bespoke platform will launch on Wednesday 21 October, offering on-demand access to the sessions.

However, there is no substitute for the face-to-face experience. Attendees in Manchester will benefit from bonus live events, including hands-on education from partners like GE HealthCare and Philips, and top-class workshops from our faculty. View the sessions: bsecho.org/ACG001-bonus

Join us in Manchester

Registration is now open, with **early bird rates available until Friday 31 July 2026**

As a Society, we have spent 35 years building a reputation for excellence, and this conference is the culmination of that effort. Whether you are coming for the world-class speakers, the practical workshops, or the anniversary dinner, we want this to be an event that leaves you feeling inspired and equipped for the year ahead.

We look forward to welcoming you to Manchester this October as we celebrate our history and together, map out the next 35 years of echocardiography.

Register now: **bsecho.org/BSEcho2026**

Insights from the British Society of Echocardiography's echocardiography and artificial intelligence survey

Sadie Bennett

Sadie Bennett, FBSE, Cardiac Clinical Scientist, *University of North Midlands. Visiting Researcher, Cardiovascular Clinical Research Facility, University of Oxford. On behalf of the Trustees of the British Society of Echocardiography.*

Artificial intelligence (AI) is a broad overarching term that encompasses computer programmes, algorithms, and models designed to mimic aspects of human intelligence. Across healthcare, interest in AI has accelerated rapidly, with applications emerging across imaging modalities to support improved diagnostic accuracy, workflow efficiency, and patient outcomes. Yet despite this momentum, its real-world adoption, perceived value, and associated risks remain poorly understood.

To address this gap, the British Society of Echocardiography (BSE) sought to understand how echocardiographers are currently engaging with AI and what they believe is needed for safe, effective, and equitable implementation.
The objectives were threefold:

1. Establish an overview of current AI use in echocardiography.
2. Determine broader opportunities for AI across the echocardiography care pathway.
3. Consider how the BSE can best support its members in their use of AI within their clinical practice.

To understand these objectives, a survey was undertaken. The survey was launched in March 2025, promoted through the BSE's communication channels, and remained open for five weeks. Responses were sought from those who perform echocardiography as part of their role, regardless of BSE membership status. To complement the survey, virtual discussions were conducted with healthcare professionals working in echocardiography (n=9) and industry representatives (n=6). This work was led by Linden Muirhead, an independent consultant with expertise in digital and AI integration.

The survey comprised 31 questions, using a combination of closed questions with predefined response options and open-ended questions to capture more detailed perspectives. Free text boxes were also included to enable respondents to provide additional information where relevant. These questions were organised into five domains: respondent characteristics (location, job role and NHS banding where applicable); echocardiography system details (vendor, model, age and timing of the most recent software update); awareness of AI enabled functions within echocardiography systems and current use of these features; perspectives on the future direction / potential applications and anticipated challenges relating to integrating AI into routine echocardiography practice. The following sections present the survey findings, including both responses from closed questions and thematic insights derived from open-ended items and virtual discussions.

Respondents and echocardiography equipment

The survey received 384 responses and while there was international reach across all continents, 70% of respondents were based in the UK. The respondents were predominantly physiologists/scientists (70%), followed by medics (20%), Nurses and Allied Health Professionals (<1%), and other roles (9%) including clinical academics, researchers, and a veterinary cardiologist. Respondents reported working across a wide range of settings, including echocardiography / cardiac physiology departments within district and tertiary centres, acute care settings, research, anaesthetics, community or primary care services. Where information on NHS banding was provided, respondent banding ranged from band six to band nine. Echocardiography equipment varied (See Figure 1) as did the age of the equipment (ranging from six months to 25 years old). Where known, the latest software update ranged from one month to five years.

Echo equipment by manufacturer

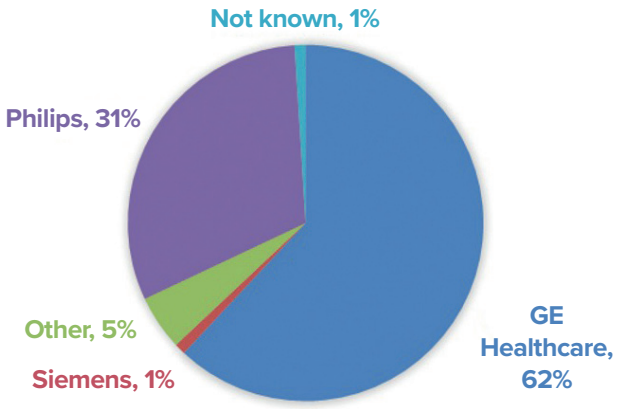


Fig 1. Echo equipment by manufacturer.

Current awareness and use of automation / AI tools

Awareness of in-built automation / AI functionality was high with 82% of respondents reporting familiarity with automated / AI features being readily available on their echocardiography systems (See Figure 2). However, despite this awareness, many respondents still prefer manual methods (See Figure 3). Interestingly, 6.7% of respondents reported to have a departmental policy not to use automated / AI functionality despite their availability on current echocardiography systems.

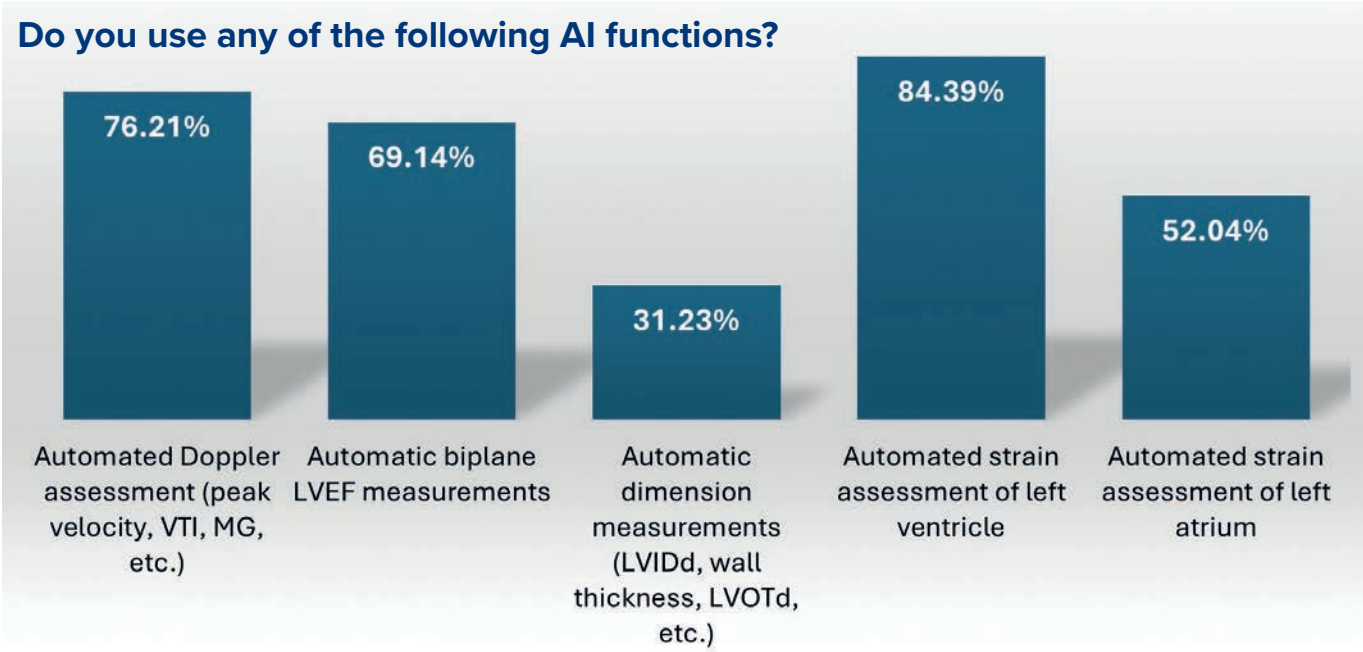


Fig 2. Reported use of Automation / AI functionality reported by survey respondents.

Preference for manual methods

Values do not auto populate	"More time efficient to perform manually"	"Variable quality of results, especially with suboptimal image quality"	"Do not know how to use functions"	"Departmental practice not to use"

Fig 3. Quotes from respondents regarding preference for manual methods over automation / AI functions.

Future direction and potential applications

The survey asked respondents to identify the future directions and potential applications of AI within echocardiography. Since the possible applications are extensive, this was presented as a closed question with predefined options, the distribution of responses is shown in Figure 4.

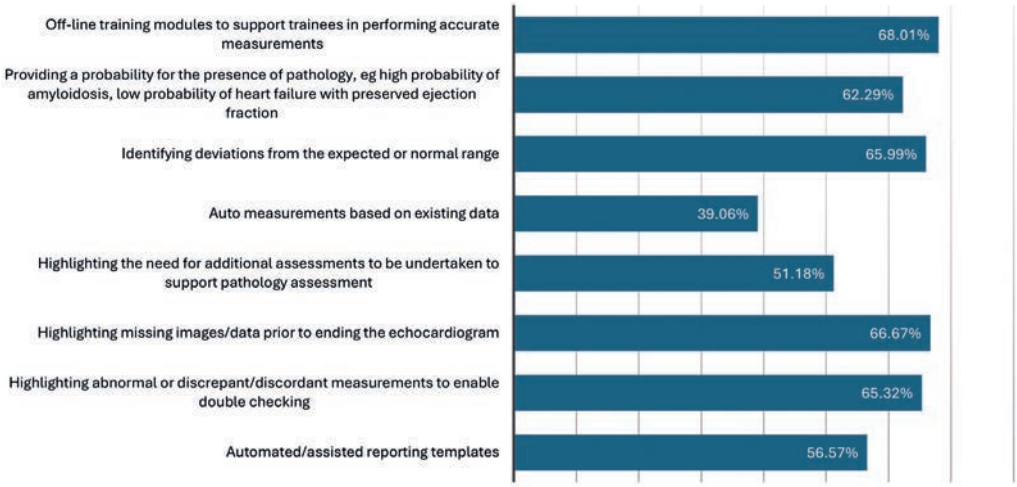


Fig 4. Prioritisation of future AI direction / application within echocardiography

The survey also asked respondents where they felt AI would offer the greatest benefit within echocardiography. The highest rated predefined options included diagnostic accuracy of reports (66.8%), standardised reporting (64.1%) and reduced scanning time (58.5%). Other perceived benefits included education and training (32.2%), triage (25.9%) and patient management (17.9%). Lower perceived benefits included patient communication (4.3%) and did not attend-avoidance (7.0%).

Anticipated challenges for integrating AI into routine echocardiography practice

Survey and virtual discussion findings show strong recognition of AI's potential to improve quality, efficiency, and consistency across the echocardiography pathway, alongside clear concerns about how safely and equitably it can be implemented. While many respondents agreed that "AI is here to stay and can be a force for good if used effectively," they also highlighted risks and challenges. Overall, six themes summarise the challenges facing the integration of AI within echocardiography which include:

1. AI integration into echocardiography
2. Use of AI to enhance quality and standards in practice
3. Validation of AI tools/equipment
4. Infrastructure disparities
5. Workforce development
6. Education and training

The AI integration appears to be uneven: some echocardiographers report clear benefits for early detection, workflow efficiency, and quality assurance, while others express mistrust in AI or work in departments that restrict automated / AI functions being implemented. Additionally, there are concerns that the perceived "time saving of AI will lead to an expectation of shorter appointment times". Quality assurance and standardisation were widely viewed as areas of high potential, with 85% of respondents believing AI could support quality assurance and 64% identifying standardised reporting as a key benefit, though concerns were raised about inconsistent practice and opaque training datasets. Validation emerged as a critical issue, with respondents emphasising the need for "robust testing on appropriate populations" and cautioning against "black box tools with unclear regulatory status". Infrastructure disparities were also prominent; 39% reported lacking the systems needed for meaningful AI integration, citing "variability in machine capability", "poor interoperability", and "financial constraints". Workforce concerns centred on deskilling (60%) and job security (23%), reinforcing the need for clear boundaries around appropriate use and continued expert echocardiographer oversight. Finally, education and training were seen as both essential but challenging, particularly the difficulty of keeping up to date in a rapidly evolving field.

Taken together, this survey paints a picture of an echocardiography workforce that is neither resistant nor naïve. Echocardiographers recognise AI's potential to improve diagnostic accuracy, standardisation, and efficiency within echocardiography. It appears that echocardiographers want tools that support, not replace, their expertise. And they are clear about the safeguards required: rigorous validation, transparent regulation, robust training, and a commitment to preserving clinical skill.

Unmasking the silent giant: Hugely dilated coronary sinus driven by valvular disease and left-sided superior vena cava


Mirza Mohtassam Baig


Sophia Englezos


Nithin Lalu

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Sophia Englezos, Nithin Lalu, *Cardiac Physiologists, Aneurin Bevan University Health Board.*

Abstract

Background

A dilated coronary sinus on transthoracic echocardiogram (TTE) often suggests venous anomalies like persistent left superior vena cava (PLSVC), especially in the absence of significant cardiac shunt. PLSVC occurs in about 0.3–0.5% of the general population and ~5% in patients with congenital heart disease[1]. First described by Edwards et al[2], it can be effectively detected via TTE. We present a case of a significantly dilated coronary sinus attributed to both PLSVC and significant mitral and tricuspid valve regurgitation, without a haemodynamically significant intracardiac shunt.

A 74-year-old man with white ethnic background and known atrial fibrillation was referred to cardiology for exertional breathlessness. He was fully independent, and had normal routine blood tests at the time of referral. Echocardiography revealed a 7.6 cm dilated coronary sinus, severe biatrial enlargement, mild LV dysfunction with ejection fraction of 45–50%, moderate mitral regurgitation, and severe tricuspid regurgitation with elevated pulmonary pressures. Contrast TTE confirmed PLSVC draining into the coronary sinus. CT chest and cardiac MRI confirmed the PLSVC with no bridging vein, and no associated septal defects or anomalous venous return. Multidisciplinary assessment concluded that coronary sinus dilation was predominantly due to severe tricuspid regurgitation rather than the PLSVC itself. Minimal interatrial communication likely represented a stretched patent foramen ovale (PFO) with no significant shunt. The patient underwent successful

mitral valve repair, tricuspid annuloplasty, PFO closure, and left atrial appendage occlusion. Postoperative echocardiogram showed improvement in ventricular function (EF 50%), reduced regurgitation to mild mitral and mild tricuspid regurgitation, and persistent but stable atrial and coronary sinus dilation.

Conclusions

Persistent left superior vena cava while often incidental, holds clinical relevance in cardiovascular diagnostics and interventions. Early recognition, especially via transthoracic echo, is key for guiding further investigation. In this case, severe tricuspid and mitral valve regurgitation significantly contributed to coronary sinus dilation alongside PLSVC. Thorough imaging and multidisciplinary evaluation ensured appropriate surgical management and patient recovery. Coronary sinus enlargement should prompt comprehensive evaluation, not solely attributed to PLSVC.

Keywords

Persistent left-sided superior vena cava, dilated coronary sinus, tricuspid regurgitation, mitral regurgitation, mitral valve repair, tricuspid valve repair.

Case presentation

Persistent left-sided superior vena cava (PLSVC) is the most common thoracic venous anomaly and may coexist with complex congenital cardiac pathologies. While often asymptomatic, its presence can have significant implications for diagnosis, procedural planning, and management, particularly when associated with other structural abnormalities. Coronary sinus dilatation may be a key echocardiographic clue to underlying anomalies, warranting further investigation.

A 74-year-old Caucasian male with a history of long-standing atrial fibrillation was referred to cardiology by his general practitioner. He was commenced on anticoagulation and beta-blocker therapy. Routine blood investigations were within normal limits. Functionally, he was independent, mobile, and asymptomatic at the time of referral.

Transthoracic echocardiography (TTE) revealed a markedly dilated coronary sinus measuring approximately 7.6 cm (figure 1 TTE), a severely dilated left atrium (indexed volume 93.14 ml/m2), and a severely dilated right atrium (area: 70 cm^2) figure 2. Additional findings included mild left ventricular systolic dysfunction (ejection fraction: 45–50%), normal LV size LVDd 42mm, LVEDV 71ml/m2 and LVESV 42ml/m2a dilated right ventricle with reduced radial function, anterior mitral valve leaflet bowing resulting in moderate eccentric posteriorly directed mitral regurgitation, and severe functional tricuspid regurgitation extending to the roof of the right atrium, with normal tricuspid valve anatomy. Estimated pulmonary artery systolic pressure was 31 mmHg plus right atrial pressure (an underestimate due to the severe nature of the TR jet causing rapid equalisation between the RV and RA pressures). Overall, the echo findings were consistent with a high probability of pulmonary hypertension. Heart failure therapy was initiated, including diuretics, SGLT2 inhibitors, and beta-blockers.

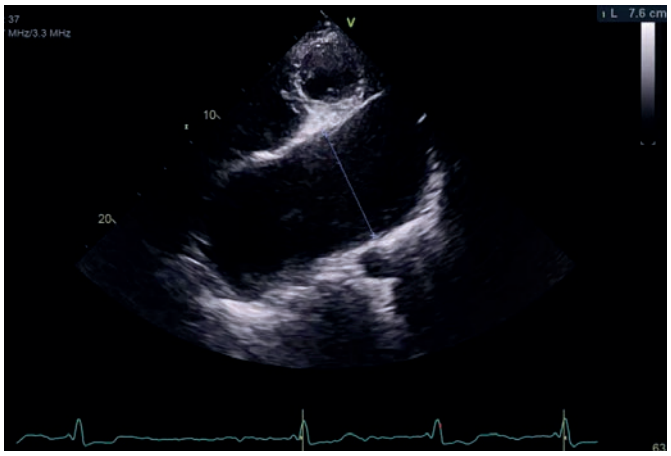

Fig 1. TTE PLAX View coronary sinus

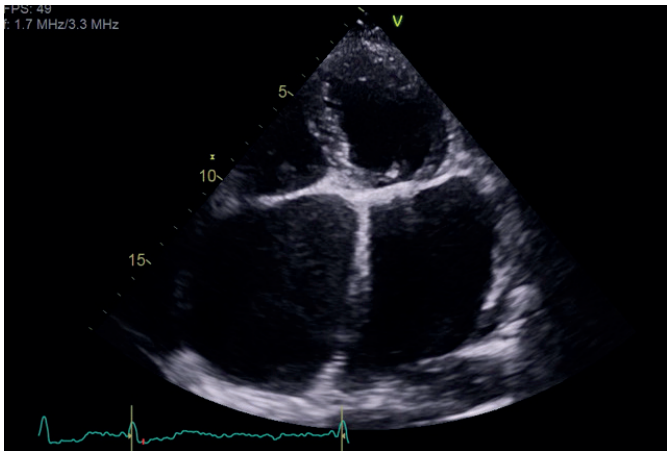

Fig 2. TTE Four chamber view

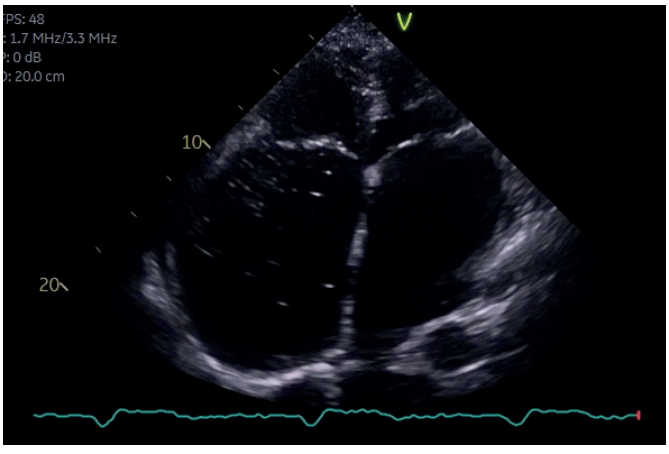

Fig 3. Video 3 Contrast TTE

Contrast-enhanced TTE (video 3) with agitated saline injected via the left antecubital vein demonstrated opacification of the dilated coronary sinus followed by opacification of the right ventricle, confirming the presence of a PLSVC.

The patient was counselled regarding these findings and the need for further evaluation to exclude associated congenital anomalies. A chest computed tomography (CT) scan confirmed the presence of a persistent left-sided superior vena cava (Figure 4,5 CT chest).

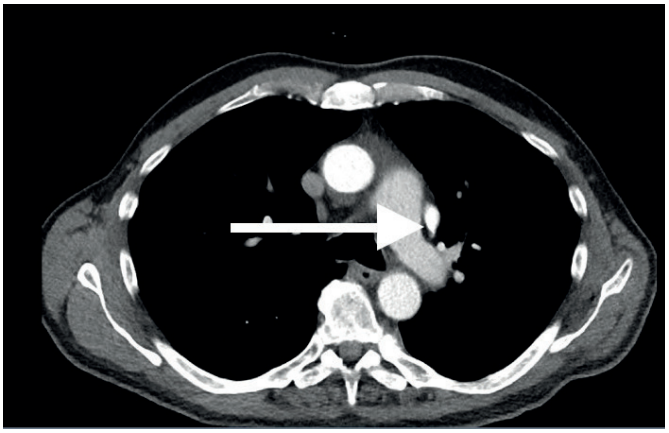

Fig 4. CT Chest reveals PLSVC

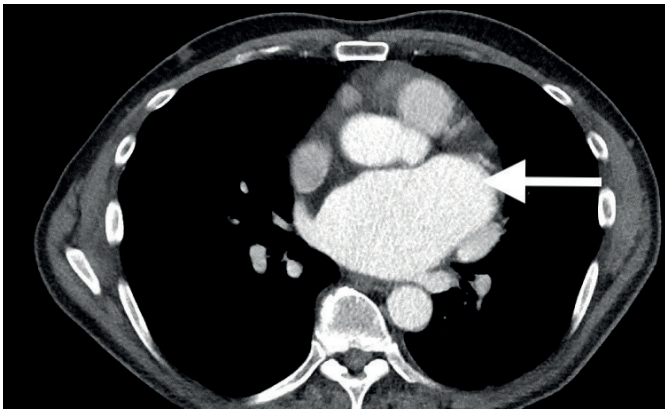

Fig 5. CT Chest reveals dilated coronary sinus

While awaiting cardiac magnetic resonance imaging (CMRI), the patient was admitted with systemic symptoms and pyrexia. Blood cultures were positive for Staphylococcus aureus. Transoesophageal echocardiography (TOE, Figure/video 6-9) was performed to exclude infective endocarditis. TOE ruled out endocarditis but confirmed a markedly dilated coronary sinus (~7 cm) and findings consistent with the initial TTE. The patient responded well to intravenous antibiotics and was discharged.

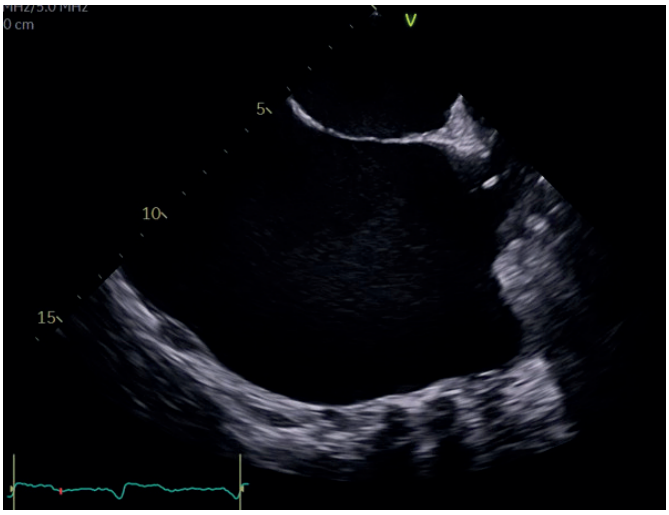

Fig 6. TOE reveals dilated coronary sinus

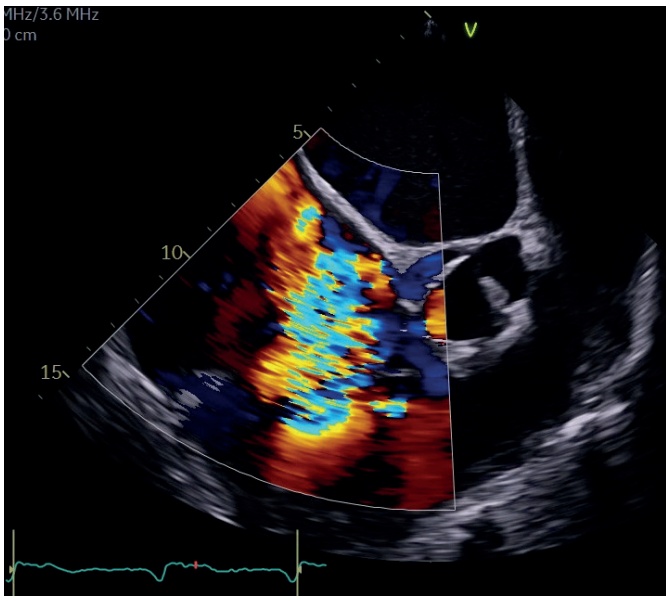

Fig 7. TOE suggestive of severe tricuspid regurgitation TR

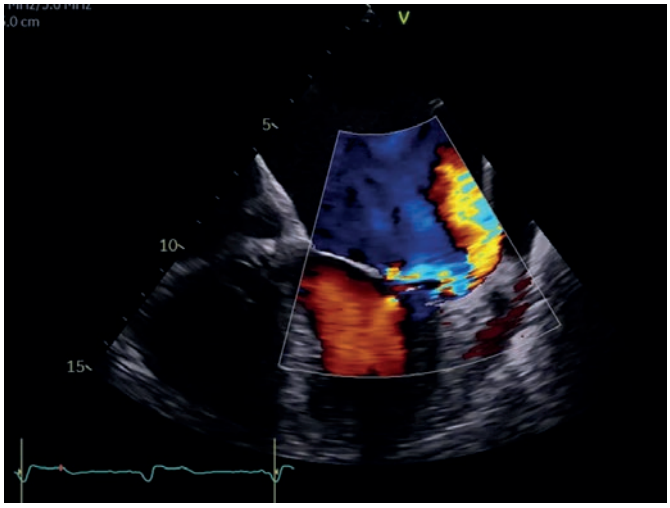

Fig 8. TOE suggestive of eccentric up to moderate mitral regurgitation MR

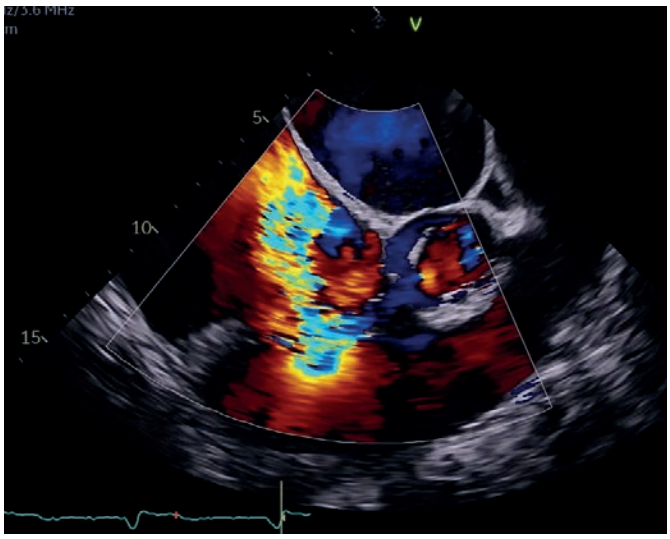

Fig 9. Video - TOE Tricuspid regurgitation TR

Cardiac MRI (CMRI) revealed a left aortic arch with normal branching and bilateral superior vena cava of similar calibre, with no bridging vein. Mild left ventricular systolic dysfunction (ejection fraction: 41%) was noted, along with a severely volume-loaded and dilated right ventricle with impaired systolic function. Severe biatrial enlargement was present (figure 10), including a markedly dilated right atrium (area: 90 cm^2). The persistent left-sided SVC drained into the dilated coronary sinus (figure 11), while the right SVC was normal. The tricuspid valve annulus was dilated with severe tricuspid regurgitation. No evidence of secundum or sinus venosus atrial septal defect, unroofed coronary sinus, anomalous pulmonary venous return, or late gadolinium enhancement was observed.

The case was discussed in a congenital multidisciplinary team (MDT) meeting. It was concluded that the coronary sinus dilatation was primarily attributable to severe tricuspid regurgitation rather than the presence of a PLSVC, as the left-sided SVC was relatively small compared to the coronary sinus. Additionally, mitral regurgitation may have contributed to right-sided chamber dilatation and subsequent tricuspid regurgitation. A small atrial septal defect located at the patent foramen ovale (PFO) position was likely a stretched PFO secondary to atrial enlargement and was deemed haemodynamically insignificant. No other congenital abnormalities were identified apart from the PLSVC. The patient was considered a suitable candidate for surgical intervention targeting the mitral and tricuspid valves.

Elective cardiac surgery was performed, including mitral valve repair using a 34 mm Edwards Physio II ring and Gore-Tex Neo chords supporting the A2 scallop, tricuspid annuloplasty with a 36 mm Edwards MC3 ring, left atrial appendage occlusion using a 40 mm Atriclip for atrial fibrillation, and PFO closure. Postoperatively, the patient made a satisfactory recovery and remains under long-term cardiology follow-up. Postoperative echocardiography demonstrated a left ventricular ejection fraction of approximately 50%, with mild residual mitral and tricuspid regurgitation. Both atria and the coronary sinus remained dilated.

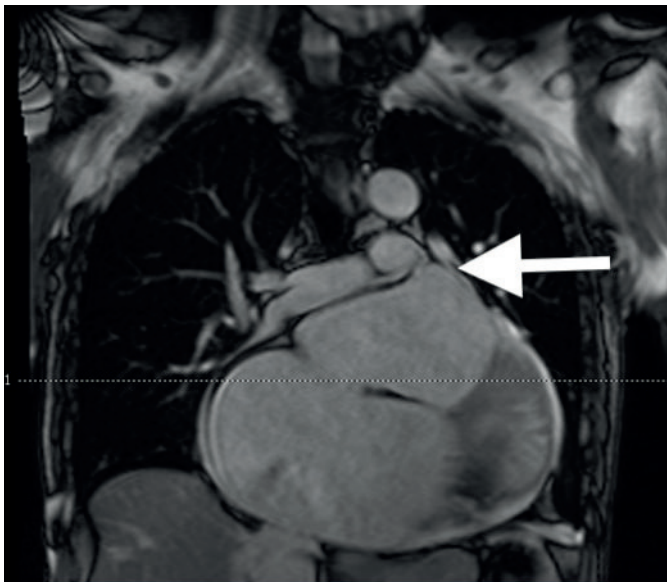

Fig 10. CMRI reveals biatrial enlargement with PLSCV

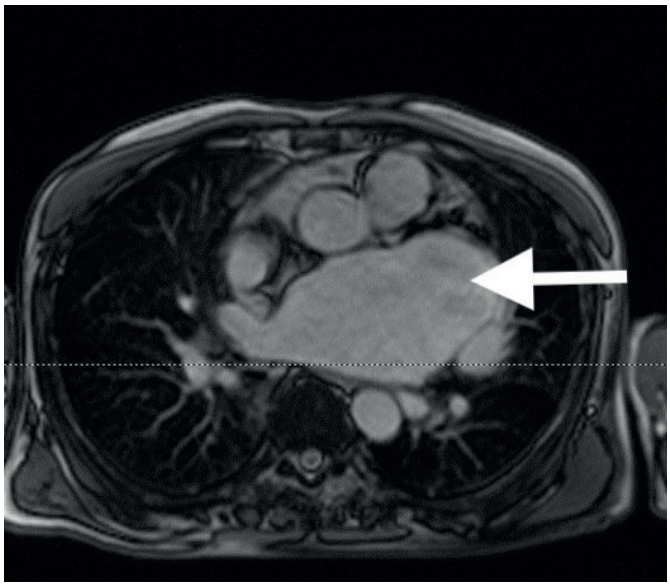

Fig 11. CMRI reveals dilated coronary sinus

Discussion

PLSVC is the most common thoracic venous anomaly and may be associated with a spectrum of congenital cardiac abnormalities[3]. Although frequently asymptomatic, its presence can complicate procedures such as central venous catheter placement, cardiac pacemaker implantation, and cardiac surgery. Recognition of PLSVC is therefore essential for procedural planning and optimal patient management.

In this case, coronary sinus dilatation was initially identified on routine echocardiography, prompting a comprehensive multimodal imaging workup. While PLSVC was confirmed, the coronary sinus enlargement was not solely attributable to this anomaly. Severe tricuspid and mitral regurgitation, along with atrial myopathy in the context of longstanding AF, were significant contributors to the observed dilatation. This highlights the importance of considering multiple pathophysiological mechanisms when evaluating coronary sinus enlargement.

Echocardiography remains a cornerstone in the initial assessment of cardiac structure and function. TTE is a non-invasive and widely available modality that can provide early clues to underlying anomalies. In this case, echocardiographic findings guided further imaging and MDT discussion, ultimately leading to a successful surgical outcome.

Conclusions

This case underscores the diagnostic value of echocardiography in identifying coronary sinus dilatation and guiding further investigation. While PLSVC was present, the primary drivers of coronary sinus enlargement were severe atrioventricular valve regurgitation and atrial myopathy. Multimodality imaging and multidisciplinary collaboration were essential in establishing a comprehensive management plan. Recognition of PLSVC and its implications remains critical in the context of structural heart disease.

List of abbreviations

- Transthoracic echocardiogram (TTE)
- Persistent left superior vena cava (PLSVC)
- CT scan computed tomography scan (CT)
- Cardiac magnetic resonance imaging (CMRI)
- Transoesophageal echocardiography (TOE)
- End diastolic volume (EDV)
- End systolic volume (ESV)

Declarations

- Ethics approval and consent to participate – Not applicable
- Consent for publication – Patient consent has been taken for this case report publication
- Availability of data and materials – Not applicable
- Competing interests – Nil
- Funding – self

Authors' contributions

Mirza Baig

Conceptualised the case report, performed the initial literature review, and drafted the manuscript, collected relevant data, and contributed to manuscript revisions, approved the final version for submission.

Nithin Lalu

Images collection and provided radiological insights for the case discussion, critically reviewed the manuscript, approved the final version for submission.

Sophia Englezos

Images collection and provided radiological insights for the case discussion, critically reviewed the manuscript, approved the final version for submission.

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2. Nithin Lalu – Cardiac physiologist
3. Sophia Englezos – Cardiac physiologist

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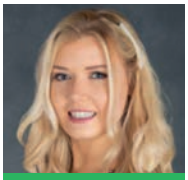
Unexplained troponin rise in a young patient: Exploring the mechanisms of ischaemia in aortic papillary fibroelastoma



Amy Martin

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Background

A papillary fibroelastoma (PFE) is a primary cardiac tumour[1]. Characteristically a small, pedunculated mass, size can range between 2 mm to 40 mm, although benign, these tumours are independently mobile and pose risk of embolisation[2]. PFEs are relatively rare, incidence is estimated to range from 0.0017 to 0.33%[2, 3]. However, they are considered the most frequent primary cardiac tumour originating from the valvular endocardium. Based on evidence from autopsy data, PFEs are most associated with the aortic valve[3].

PFE was first documented as a 'nonatherosclerotic embolic complication causing myocardial infarction (MI)' in 1975, with numerous reports of PFE embolism thereafter[3,4,5]. In present day, due to the advancements in quality and resolution of cardiac imaging modalities PFEs are increasingly recognised[5,6,7]. This case report outlines the discovery of an aortic papillary fibroelastoma, in the investigation of a young patient presenting with suspected acute coronary syndrome (ACS).

Case presentation

A 39-year-old female, body mass index (BMI) 48 kg/m^2 with no significant past medical history presented with troponin positive chest pain for the second time in a 24-month period. During the first admission, troponin T measured 34 to 76 ng/ml. The normal reference range is < 14 ng/L, 14-52 ng/L is considered borderline, and >52 ng/L elevated. Consequently, an array of cardiac investigations were conducted, this included electrocardiogram (ECG), echocardiogram, coronary angiogram and cardiac MRI. All results of which were unremarkable. The patient's chest pain at this time was treated as coronary artery spasm. She was prescribed with diltiazem 180 mg OD, aspirin 75 mg OD and GTN spray as required. The second admission owing to symptoms of severe left-sided chest pain which radiated to the neck, jaw and left arm with minimal relief by means of GTN spray. Serial troponin measured 12, 21 to 27 ng/ml a 12-lead ECG was performed, this showed sinus bradycardia 55 bpm with no significant abnormalities.

On retrospective questioning, the patient reported intermittent chest pain between the two admissions, sometimes relieved with GTN spray and not always associated with exertion.

Subsequent echocardiography was then performed; although imaging was known to be sub-optimal, this showed normal LV systolic function, ejection fraction visually estimated greater than 55% with no regional wall motion abnormalities. However, this echocardiogram revealed a 9 mm x 9 mm spherical mass attached to the aortic side of the aortic valve (Fig 1, 2), between the commissure of the right and non-coronary cusp (Fig 3), suspected to be a papillary fibroelastoma.

The aortic valve was otherwise structurally normal, there was no obstruction or regurgitation.

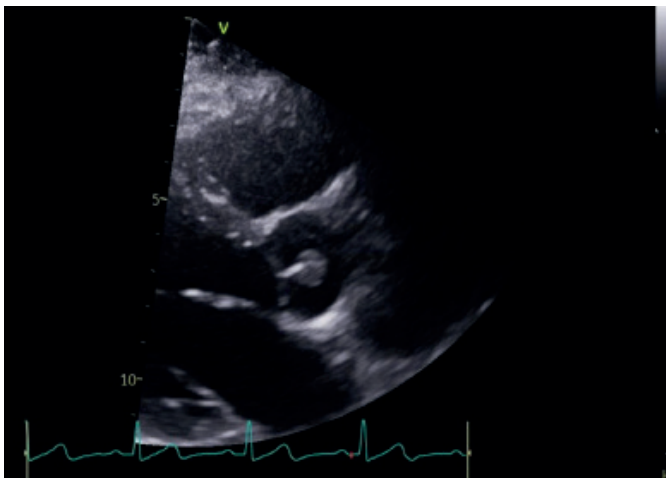

Fig 1. Transthoracic echocardiography (TTE) Parasternal long-axis view demonstrating a mass attached to the aortic valve.

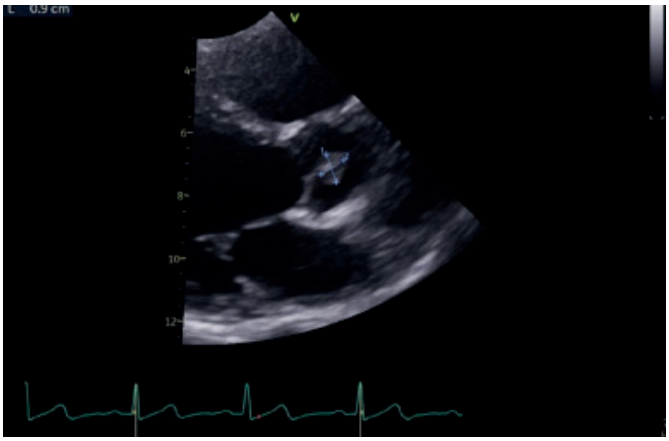

Fig 2. TTE Parasternal long-axis view demonstrating a mass attached to the aortic valve, measuring 9mm x 9mm.

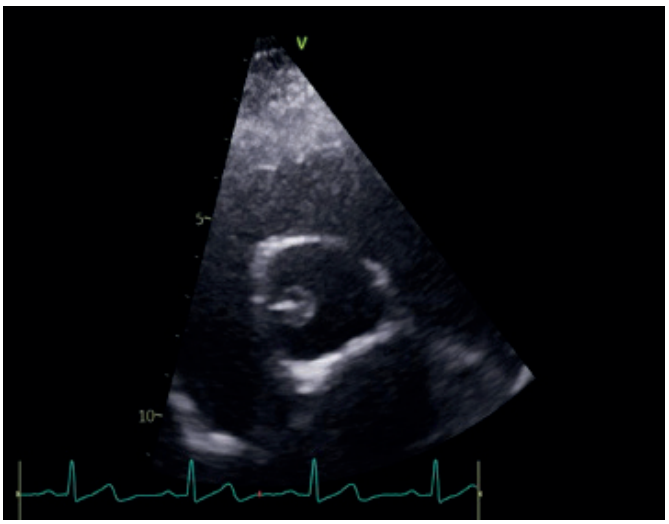

Fig 3. TTE Parasternal short-axis view, aortic valve level showing the mass which appears to be attached between the aortic valves right and non-coronary cusp.

The case was discussed at the echocardiography multi-disciplinary team (MDT) meeting, all agreed the mass was most likely a PFE. There was no clinical evidence to suggest a differential of infective endocarditis. The working diagnosis was now PFE embolism. Although there was no absolute evidence of MI, the case was listed for discussion at the surgical MDT. CTCA was the preferred modality to investigate coronary arteries in the work-up for surgery given the PFE location and risk of invasive coronary angiography. CTCA reported a 9 mm x 7 mm x 9 mm soft tissue ovoid lesion centred on the junction of the non-coronary and right-coronary aortic cusps (Fig 4), no extension into any of the coronary vessels. Normal calibre aortic root. Normal appearance of the remaining cardiac chambers, myocardium, pericardium and pulmonary veins.

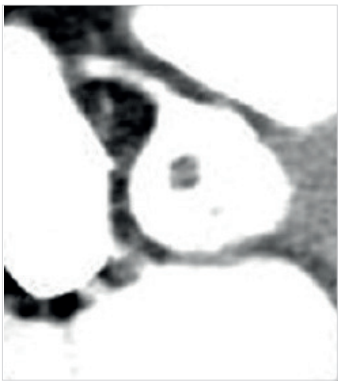

Fig 4. Computed tomography coronary angiogram (CTCA) demonstrating the mass attached at the junction of the right and non-coronary cusps.

Normal anatomical origin of the coronary arteries; right dominant system with no evidence of atheroma or occlusive disease in any vessels and no sinister extra cardiac abnormalities.

Management

The surgical review must assess patients' individual fitness for cardiac surgery, especially for a possible valve replacement. Preoperative conversation must also include the type of the valve prosthesis to be used in the event valve replacement is required. The goal of surgery is complete removal of the mass without compromising the usually, otherwise well-functioning, native valve. Nonsurgical candidates are medically managed with antiplatelets and/or anticoagulation, however, it remains unclear if this reduces embolic risk[7,8]. This patient was accepted for surgical resection. The surgical centre ordered Magnetic Resonance Imaging (MRI), which is the gold-standard modality for confirming diagnosis in a multitude of cardiac disease processes. However, the PFE in this case could not be detected using MRI. Subsequently, transoesophageal echocardiography (TOE) was performed (Fig 5), thus confirming the presence of a mobile mass as previously described on the TTE and CTCA.

TOE provides a superior image resolution when compared with TTE and plays a pivotal role in the diagnosis and management of cardiac masses.

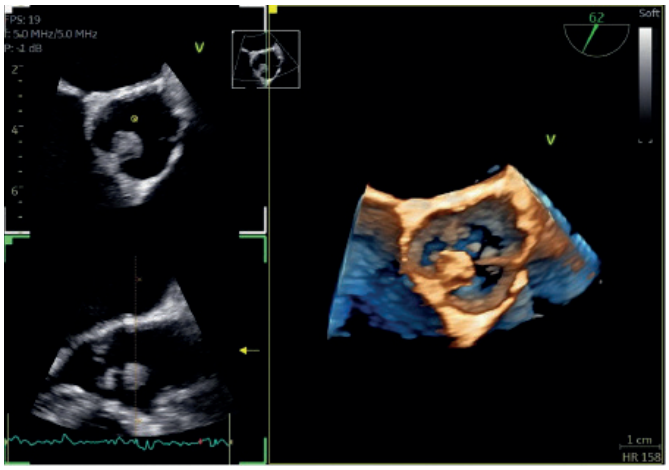

Fig 5. 3-D Transoesophageal Echocardiography (TOE) imaging confirming the presence of the aortic mass.

Thereafter, the patient underwent general anaesthesia with TOE insertion. A right upper J sternotomy was performed to the 4th intercostal space with all central cannulations. This provided an appropriate view of the aortic area. After cross-clamping the aorta was opened and the aortic valve was exposed from transverse aortotomy. The mass was identified and carefully removed with scissors. The valve was water tested and appeared well functioning. The aorta was subsequently closed and the patient weaned off cardiopulmonary bypass. The TOE confirmed good native valve coaptation, no perforation or any residual mass on the non-coronary leaflet. Patient made an uncomplicated recovery and was discharged home after 4 days. Postoperative DOAC therapy was started for three months, lifelong ASA therapy was also recommended.

Discussion

Differential diagnosis of a valvular mass should be broken down based on clinical presentation. The most obvious would include infective endocarditis, however in the case presented there were no signs of infection to suspect a vegetation. PFEs can embolise because of tumour dislodgment resulting in embolisation or adherent thrombus embolism[8]. There is also a conceivable alternative theory of intermittent ostial occlusion which could potentially produce symptoms of chest pain, although there is a lack of literature surrounding this mechanical theory. In the presented case, given the adjacent proximity of the right-coronary ostium and without evidence of embolism; the possibility of intermittent, temporary ostial occlusion as a mechanism for symptoms is plausible.

Despite the fact there was no absolute evidence of coronary embolism, given the risk and recurrent chest pain admissions, surgical excision was the recommended treatment for this patient. There is variability within the literature concerning PFE recurrence rates. Although recurrence is generally considered as rare, with an overall recurrence rate reported to be between 1.6% - 3.3%[9,10]. A 12-year retrospective study specifically investigating the excision of aortic PFE's, concluded a 10-year recurrence rate of 15.8%[11].

Surgical intervention is the recommended treatment for aortic valve papillary fibroelastomas due to the coherent risk of embolisation. Minimal access operations are thought to be a superior option, even more so if a redo operation was needed. In recent times, minimally invasive techniques have been introduced such as percutaneous mechanical aspiration and

robotic techniques. It is unclear in the event of recurrence if a further excision would be done or if valve replacement is then justified[12,13,14].

In conclusion, PFE's are relatively rare, there are no clear guidelines and management strategies differ. In this case following histology confirmation of papillary fibroelastoma, annual echo surveillance for life was recommended for this patient.

Acknowledgements

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Echo in the balance: Why the backlog won't fix itself, and what we need to do about it

Felix Williams

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Evolution Associate

Key themes and directives

- The backlog in echo services is structural, not circumstantial – it won't self-correct without deliberate intervention
- An inability to share and interpret previous studies across systems is driving repeat testing at significant cost to patients, staff, and the NHS
- Pathway management is a neglected but fixable drag on every echo service – from referral to result
- Specialist echo tooling has an essential place; enterprise radiology infrastructure is the right vehicle for storage and sharing
- Diagnostics Digital Capability Programme (DDC) funding can reset the landscape – but only if echo coalesces around a clear, standards-based digital strategy before bidding
- National leadership must set the guardrails; networks must align to them and bid with purpose

Introduction: A discovery that became a diagnosis

In 2025, Evolution Digital Health (Evolution) was commissioned to map echocardiography services across the south-west physiological sciences network. Ultimately, the project was funded by the DDC. DDC is a significant funding and transformation programme for diagnostics, which has materially improved radiology and pathology network maturity over the last few years and is now committed to doing the same in endoscopy and physiological sciences.

The brief was discovery: understand the digital landscape, catalogue the systems in use, and describe how echo services operate across the region. What emerged was rather more than that. The team – deployed across multiple trusts and sites – produced one of the most comprehensive accounts of a regional echo estate that exists: a live systems catalogue, per-trust workflow schematics, and a digital maturity assessment adapted for the report against criteria developed by the national physiological sciences and Midlands diagnostic teams. That alone would have justified the exercise, but the work didn't stop at description. It surfaced a set of findings clear-eyed enough to carry national implications – and firm enough to warrant recommendations that go well beyond the south-west.

This article draws on that report. It makes the case that the problems identified – in backlog management, in sharing infrastructure, in pathway mechanics, and in governance – aren't regional idiosyncrasies. They are structural features of echo services nationally. And it argues that the combination of finance availability, maturing radiology infrastructure, and growing clinical urgency makes this, genuinely, echo's moment. The question is whether we're organised enough to take it.

Evolution is now being commissioned to develop a broader blueprint for cardiology services to support DDC funding bids – the south-west work is its foundation.

The problem: Persistent, structural, and predictable

A backlog that was never going to recover on its own

The numbers aren't new, but they warrant repeating. Pre-pandemic, echo activity was growing steadily – as it should, given an ageing population and echo's central role in an expanding range of diagnostic pathways. The pandemic interrupted that trajectory sharply. By July 2021, when activity had returned to pre-pandemic levels, an estimated backlog of 515,000 studies had accumulated. That figure alone would have been challenging to address. In the period after July 2021, with demand continuing to rise and activity broadly flat, a further 530,000 scans were added, leading to a peak estimated backlog exceeding one million.

The instinct – understandable but mistaken – is to treat this as a temporary overhang from an exceptional event. It isn't. The backlog was a latent feature of the service before COVID-19; the pandemic made it visible. The drivers are structural: ever-rising demand, a stretched workforce, and a set of operational inefficiencies that compound each other at every stage of the pathway.

The clinical stakes are not abstract. Consider heart failure, one of the most time-sensitive pathways in medicine. NICE guidance from 2010 recommended echocardiography within two weeks for high-risk patients (NT-proBNP above 2,000 ng/l) and within six weeks for those in the moderate-risk range. In practice, 2021/22 data shows median delays of 55 days and 90 days respectively. Around 80% of heart failure patients are currently diagnosed during an emergency admission – not because they presented acutely, but because the diagnostic pathway failed them before that point. Echo delayed is, in these cases, harm delivered.

The repeat testing trap

One of the more costly and least-discussed features of the backlog is the volume of repeat testing, driven by the inability to access or reliably interpret previous studies. A patient scanned at one trust, referred to another, or seen by a clinician whose system cannot read the images from the originating platform, is a patient who will be scanned again. This often isn't a clinical decision – it's a technical failure.

The roots of that failure are two-fold. First, many cardiology systems handle image storage and sharing in proprietary or 'semi-proprietary' formats. DICOM is the standard, but vendors frequently extend or 'bend' it – which means images can technically be transferred while measurements, annotations, and structured data are lost or unreadable in the receiving system. Second, measurement conventions vary across platforms in ways that are not always transparent to the clinician. An ejection fraction calculated on one system may not be directly comparable to the same measurement from another – a quiet source of clinical risk as well as operational waste.

Building cardiology-specific sharing infrastructure to address this is not the answer. It's neither affordable nor strategically coherent. The NHS has made significant investment in upgrading the radiology estate – enterprise PACS and order communications, integration engines, and a maturing National Imaging Registry (NIR) that has just emerged from beta testing, including in two pilot sites within the south-west physiological sciences network geography. The infrastructure exists. It's being battle-hardened. And it's precisely what echo needs for storage and cross-boundary sharing.

The pathway mechanics problem

There's a third category of dysfunction that's perhaps the least glamorous but, in aggregate, among the most expensive: the 'administrative machinery' of echo services. The south-west work found that the overhead of managing echo requests is enormous, largely manual, and almost entirely unnecessary with the right tools and standards in place.

Electronic order communications – the baseline requirement for any modern diagnostic pathway – are far from universal across echo services. Where they are absent, referral is often paper-based or driven by email, with no structured clinical data attached. Triage, where it exists, is inconsistently managed. Worklists to echo machines are handled differently site to site. Reports are produced on multiple platforms, frequently require manual copying, and are distributed through processes that add delay and error risk.

Beyond the purely administrative, pathway management tooling available to echo services is weak in several important ways. Clinical decision support – the ability to embed evidence-based referral criteria directly into the requesting workflow, so inappropriate requests are caught before they reach the service – is not present. Cross-modality scheduling remains largely unsolved: most tools are modality-specific, with poor integration to electronic patient records and – for active waiting list management – little support for the kind of asynchronous MDT working that complex cardiac pathways require. Appointment booking, where it's been digitised at all, sits in silos.

This matters for echo specifically because the pathway is rarely a single step. Patients move through referral, triage, examination, reporting, and onward action – often across organisational boundaries and involving multiple specialties. Each manual handoff is a potential failure point. NHS England/DDC has commissioned work to define shared, so-called 'capabilities' to support pathway optimisation across modalities. Borrowing the vocabulary from that workstream, echo – and cardiology more generally – lacks the 'managing diagnostic demand' capabilities to shape and validate demand intelligently at referral, the 'optimising capacity and workload' tools to manage capacity dynamically, and the 'coordinating diagnostic pathways' infrastructure to support seamless cross-site working. These are not aspirational capabilities. They are the precondition for a service that can sustainably clear its backlog.

What the south-west showed and what has to change

Variation is the dominant finding

If there's a single word that characterises the south-west echo landscape, it's variation. Not variation in clinical quality – the region has skilled, committed practitioners – but variation in systems, in how those systems are configured and integrated, in workflow design, in referral management, in report structure, and in how echo relates to wider diagnostic infrastructure. Some of this variation reflects genuine local need, but most of it is accidental: the accumulated residue of independent procurement decisions, system shortcomings patched by workarounds, and a service that's never been systematically designed as a network.

Unmanaged variation is expensive. It means lots of 'point' integration solutions. It increases training overhead as staff move between sites. It blocks staff-sharing and (home) reporting arrangements. It makes regional capacity management impossible. It increases capital and support costs by sustaining a patchwork of systems that each need individual maintenance and licence management. And it creates the fragmentation that makes sharing – of images, reports, and data more generally – technically fraught.

The strategic fulcrum: Cardiology tooling and radiology infrastructure are not in competition

The report surfaced a strategic question that every echo network in the country will have to answer: should storage and sharing be centred on the cardiology estate, or should it leverage radiology infrastructure?

The answer, bluntly, is the latter – but that framing and the emotional response it may provoke risks obscuring the point. This isn't a choice between cardiology and radiology. Specialist echo tooling – the workstation software, the modality-specific measurement and reporting platforms, the AI and ambient voice capabilities that are beginning to enter the market – is essential. It must stay. What changes is where images and reports are stored and how they are shared.

The case for radiology PACS as the system of record for echo storage is well-founded on several grounds. Enterprise PACS are designed for exactly this: long-term, secure, cross-boundary storage and sharing at scale. They carry mature federation capabilities, robust disaster recovery, and proven integration with RIS, EPRs, and national systems including the NIR. Standards compliance – genuine DICOM, HL7, and IHE profile compliance, rather than the proprietary extensions that cardiology vendors sometimes deploy – is better established in the radiology world. And the NHS has just paid for these systems to be upgraded.

To rebuild equivalent infrastructure within the cardiology estate; to maintain parallel, cardiology-specific sharing mechanisms; or to continue to rely on existing image exchange mechanisms, is to duplicate cost and complexity for no clinical advantage. The argument for convergence is not ideological – it's financial, operational, technical.

For networks where investment has gone in a different direction, the design principle above doesn't mandate a specific vendor or require ripping out systems that are working well. It requires a decision about where the 'system of record' sits, and a commitment to storing images in open, standards-compliant formats – raw DICOM – that can be retrieved and rendered by specialist cardiology workstations regardless of where they physically reside. That's a procurement and governance decision, and not a radical one. No blowing up the Enterprise.

The five themes as a sequence

The south-west report organises its recommendations around five themes: Organise, Simplify, Modernise, Leverage, and Standardise. These aren't a checklist; they're a sequence.

Organise first: without a network-level governance function – with real decision-making authority, clear roles, and a mandate to act collectively – none of the rest lands. The south-west proposal is a three-tier model: working groups that develop proposals, a design authority that evaluates them against national and network principles, and a steering group that owns the strategy. Built from existing teams and meetings, not new bureaucracy for the sake of it.

Simplify and modernise are next: strip out the manual steps, get electronic order communications in place, standardise digital triage and worklist management. Not particularly glamorous, but foundational – and simplification is where immediate cost savings lie.

Leverage and standardise are in parallel: connect to radiology PACS for storage; engage with the NIR, which is actively recruiting for additional imaging modalities; insist on genuine standards compliance from suppliers; and begin the process of estate rationalisation: fewer systems, simpler integration, better supported, more strategically aligned.

Getting fighting fit: What we need from the centre

The DDC funding landscape represents a genuine opportunity to reset echo services – possibly the best opportunity in a decade. But the window is not indefinite, and it will be wasted if networks arrive at it with fragmented, unaligned bids that reflect local preferences rather than coherent national strategy.

The role of national leadership – DDC, NHS England, the BSE, and the wider echo community – is to set the strategic framework within which networks bid. Not to mandate vendors or specify technical solutions in detail, but to define the guardrails: what standards compliance means and how it will be enforced through procurement; what shared infrastructure principles apply (storage, sharing, NIR participation); what 'good' looks like for pathway management, from electronic requesting through to cross-modality scheduling. And then to hold those lines.

This distinction – between over-specificity and genuine technical agnosticism – matters. This isn't a call for uniformity. Different networks will make different choices about reporting platforms, workstation vendors, and the pace of transition. Variation within guardrails is acceptable – healthy even. Variation that undermines interoperability, locks services into proprietary formats, or fragments the sharing infrastructure is not. The centre's job is to make the distinction 'crystal clear and consequential'.

Building on the work that acts as a source for this article, NHS England through Evolution is creating a wider cardiology blueprint. This is designed to give networks something concrete to align to as they build their DDC business cases. The south-west work will act as an empirical foundation and this combination of a clear national strategy and a practical implementation reference is what will convert goodwill into funded action.

Capabilities as compass: Shaping / measuring the work

One of the risks in any programme of this kind is that success gets measured by system implementation rather than outcomes. A trust that has deployed electronic order communications hasn't necessarily improved its pathway – it has installed a tool. The real question is whether the right people, with the right skills, supported by the right processes, data, and technology, are now reliably performing a function they couldn't before. That's the capability lens, and it's a more demanding – and more useful – test.

A capability model provides a structured vocabulary for exactly that assessment. Each capability comprises five components: the roles and skills required; the operational processes that govern how the work is done; the applications that enable it; the data consumed and curated in the process; and the standards that ensure it remains interoperable and auditable. Not all capabilities will apply directly to echo – but the point is that there's a technology-agnostic framework against which networks can measure outcome against intent, regardless of which systems they've chosen.

Using that framework to shape echo improvement projects has two immediate benefits. First, it broadens the question beyond 'have we bought the right system?' to ask whether all five components are genuinely in place. Second, it provides a language that travels across modalities. Echo is not the only diagnostic specialty grappling with these challenges, and a capability assessment conducted in the same vocabulary as radiology, pathology, or genomics opens the door to shared solutions and genuine cross-pathway improvement.

Two connected initiatives support this approach: the capability model being developed by the DDC programme around pathways optimisation, due for release as a whitepaper; and the Evolution-led blueprint for cardiology services. Both centre capabilities as the unit of currency – using them to support network design, to give DDC a technology-agnostic yardstick for evaluating proposals, and to form the basis of measurable outcomes.

Since echo's most pressing challenges, beyond storage and sharing, lie in pathway mechanics, the optimising pathways capabilities work is directly pertinent. Its themes – Connected System, Intelligent Data, Smart Operations, and People-Centred – map squarely onto what the south-west work exposed. These capabilities include big ticket items such as 'managing diagnostic demand' (clinical decision support embedded into referral workflows – under Smart Operations); 'delivering cross-site reporting' (Connected System); and 'defining diagnostic data standards' (Intelligent Data) – ensuring measurements and metadata are consistent across platforms.

The cardiology blueprint approaches the same territory through a maturity lens: what changes must networks make to improve services, and how can progress be tracked over time? Pegging progress to capabilities rather than systems is what makes the measurement durable. As technology evolves and new solutions emerge, capabilities remain constant – a fixed point against which we can honestly assess whether we're moving forward or just... moving.

The size of the opportunity – and the cost of doing nothing

Done well, the transformation described above is not just a backlog reduction programme – it's a platform.

When images are stored in open, standards-compliant formats on shared infrastructure, they become accessible: to reporting clinicians, to specialists and pathways in other networks, to the NIR. Home reporting for echocardiography becomes operationally viable – extending capacity without requiring additional physical presence. Cross-network access to prior studies reduces repeat scanning. The workflow time recovered from eliminating manual steps returns to clinical use.

When data is consistently coded and structured, it becomes analytically valuable. Regional repositories of standards-based data, stored on cross-modality infrastructure, create the structured population health intelligence that research and AI require. The ambient voice and AI tools beginning to enter the market for echo reporting – capable of meaningfully reducing

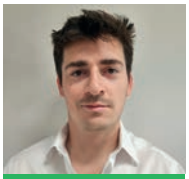
the time from examination to authorised report – only work reliably when the data foundations beneath them are sound. The infrastructure investment and the innovation dividend are inseparable.

The alternative is to continue as we are. The backlog deepens. The workforce absorbs manual overhead that technology should be carrying. Repeat testing persists because sharing is unreliable. DDC funding is dispersed across uncoordinated bids that move every network slightly forward but none of them far enough. And in five years, we have this conversation again – with a larger backlog, a more exhausted workforce, and less goodwill left in the system.

Echo has the clinical case, the technical foundations, and now the evidence from the south-west to build on. The question is whether the community – practitioners, networks, national leadership – can act collectively, and quickly enough, to take the opportunity. The ingredients are ready and the door is open – what's needed is the nerve to march through it in lockstep.

This article draws on the South-West Echocardiography Mapping Report (2025), commissioned by the south-west physiological sciences network and delivered by Evolution Digital Health (evolutionjobs.com/uk/digital-health). The national capability framework referenced is being developed under NHS England Diagnostics Digital Capability Programme, Workstream 10.

Hidden in plain sight: Dynamic intra-ventricular obstruction in critical care – a clinical review of why it matters



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Dynamic left ventricular outflow tract obstruction (LVOTO) is well described in the setting of hypertrophic cardiomyopathy (HCM), but dynamic intra-ventricular obstruction (IVO) - encompassing both dynamic LVOT and mid-cavity obstruction - may be under-diagnosed in critically ill patients[1]. IVO is vital to identify because it can occur in apparently structurally normal hearts under specific physiological conditions that often occur in critical illness, with an associated increase in mortality[1]. Echocardiography is an essential diagnostic investigation, and the condition will not necessarily be identified by focused echocardiography protocols, e.g. the British Society of Echocardiography Level 1. Dynamic IVO requires management strategies for presenting pulmonary oedema and labile hypotension that are diametrically opposed to conventional treatments.

IVO may become an increasingly important diagnosis as interest grows in the early use of inotropes and vasopressors in sepsis[2,3] (and likely extrapolated to other causes of distributive shock). The prevalence of putative risk factors such as advancing age and hypertension is also increasing in the intensive care unit (ICU) population[4,5]. Additionally, many patients at risk of dynamic IVO are managed outside of specialist cardiac units where its relevance may be underappreciated. It is therefore of great importance when scanning to be vigilant to the presence of IVO, and when reporting, to highlight the presence and significance of dynamic IVO to requesting clinicians.

Clinical significance

Dynamic IVO is not uncommon in the ICU setting; in one study, 22% of patients presenting to the ICU with septic shock had demonstrable IVO[1], though this probably underestimates the true incidence given the transient nature of the condition. Even in healthy individuals during dobutamine stress echocardiography (DSE), small studies suggest that inducible IVO occurs in 20-25%. One DSE study in healthy participants found 21% had inducible IVO, 3/12 with systolic anterior motion (SAM) of the anterior mitral valve leaflet and 9/12 with mid-cavity or apical obstruction[6]. Similarly, 22% of a cohort experiencing exercise induced chest tightness or dyspnoea developed IVO during DSE, even after exclusion of patients with myocardial infarction, hypertrophic cardiomyopathy or hypertension[7].

Importantly for critical care patients, the presence of an IVO has been associated with increased mortality, even when adjusted for illness severity (55% vs 33%)[1].

Factors associated with an intra-ventricular obstruction

IVO in the ICU occurs dynamically and is typically associated with pre-disposing anatomical factors combined with the appropriate pathophysiological circumstances. Beyond the setting of HCM, IVO has been associated with a range of pre-disposing patient-related factors. Cha et al[8] have outlined geometric LV changes that were associated specifically with inducible LVOTO in some healthy patients referred for outpatient echocardiography, including:

- basal septal hypertrophy
- sigmoid septum
- prominent papillary muscles
- small LV-cavity size
- concentric remodelling
- increasing angle to the ascending aorta.

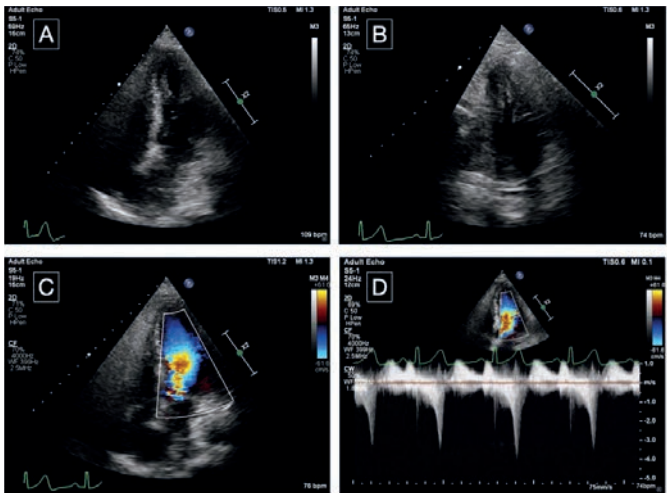

Fig 1. Intra-ventricular obstruction in post-extubation stridor treated with adrenaline. A, B – mid-cavity obliteration in apical views. C – Colour flow Doppler showing Doppler aliasing in the mid-cavity due to turbulent flow D – Spectral Doppler showing the characteristic late-peaking 'dagger' shaped Doppler envelope.

All of these findings tend to reduce the effective volume of the LV. An association between LVOTO and female gender and hypertension has also been demonstrated in multiple studies[4,5], which could also be explained by an indirect effect on LV cavity size. However, some patients without these geometric changes develop dynamic IVO under physiological stress [6,9].

A relationship between age and propensity to dynamic IVO is not clearly established. Whilst Cha et al found an association with increasing age[8], other research has found a higher incidence of LVOTO in younger patients (without HCM)[10].

Beyond anatomical factors, a variety of pathophysiological circumstances that are common in the ICU can lead to a 'perfect storm' and generation of an intra-ventricular gradient with clinically relevant obstruction[5]. This has been best described in the context of sepsis where hypovolaemia, low left ventricular afterload, hyperdynamic LV function, and catecholamine administration combine to induce IVO[1]. Increasing interest in conservative fluid resuscitation and early vasopressor use in sepsis[2,3] may have the unintended consequence of increasing the number of patients exposed to the 'second hits' required to induce an IVO.

Dynamic IVO has also been noted in the presence of apical-ballooning syndrome (classical Takotsubo cardiomyopathy) and anterior MI, due to compensatory hyper-contractile function of the basal segments[11]. Other situations that have been implicated in dynamic IVO include the post-operative phase of aortic valve surgery where the sudden drop in LV afterload precipitates a hyper-contractile state[12]. Excessive tachycardia, profound dehydration and bleeding, and treatment of cerebral vasospasm using catecholamines to achieve supra-normal systemic blood pressure have also been linked to IVO, as well as the peri-operative period, even in non-cardiac surgery[5,13–16].

Pathological respiratory mechanics can also affect heart-lung interactions that generate clinically significant intra-ventricular obstruction. This could be acutely via ventilator dys-synchrony or increased work of breathing with highly negative intra-thoracic pressures, preferential RV filling and reduced LV volume. Acute respiratory distress is often accompanied by endogenous catecholamine release and may be empirically treated with beta-agonists, further increasing LV contractility with worsening outflow or mid-cavity gradients[11]. (The images above were taken from a patient with a previously normal echocardiogram who developed post-extubation stridor and was treated with nebulised adrenaline). Similarly, chronic respiratory disease with RV overload can cause shift of the inter-ventricular septum towards the LV, reducing LV size and filling, and affecting LVOT dynamics.[11]

Presentation

Clinicians should be alert to the possibility of an IVO in any patient presenting with unexplained hypotension, particularly in the presence of an aortic or mitral systolic murmur. Breathlessness, chest discomfort and light-headedness in awake patients are also common symptoms[5]. Unexpected hypoxia with pulmonary oedema (clinically or on imaging), particularly in the absence of LV dysfunction, should also prompt suspicion.

Diagnosis

Echocardiography is the essential tool for making this diagnosis, as there are no clinical features, biomarkers, or ECG findings specific to the phenomenon.

Two-dimensional echocardiography in the parasternal long axis and apical 4-chamber views may reveal SAM of the anterior mitral valve leaflet, and imaging of the LV can reveal a mid-cavity obliteration with near-complete papillary apposition (Image 1A,1B). Colour flow Doppler can also be used to demonstrate flow acceleration in the outflow tract or mid-cavity (Image 1C). The definitive diagnosis is made with spectral Doppler, where a continuous wave Doppler is directed along the LVOT in the apical 5-chamber and/or apical 3-chamber views (for LVOT gradients), and along the long axis of the LV in the apical 4-chamber (for mid-cavity gradients). This reveals the characteristic systolic, late-peaking, 'dagger'-shaped Doppler envelopes (Image 1D). Identification of this phenomenon requires well-aligned Doppler beams and appropriate image interpretation[11]. Differentiation of these Doppler traces from mitral regurgitation is covered in detail in the BSE HCM guidelines[17].

Assessment for intra-ventricular gradients should be performed routinely by echocardiographers scanning critically ill patients, particularly in those with risk factors and those with preserved LV systolic function. This should also be included in comprehensive echocardiograms performed during ventilatory weaning (where the effects of withdrawal of ventilatory support may be unpredictable for a given patient), as well as emergency studies in patients with pulmonary oedema and labile hypotension. At present there are no consensus threshold values beyond which an observed intra-cavity gradient is likely to cause clinically significant obstruction, and the overall impact of any IVO will be highly variable, depending on many other patient and (patho)physiological factors. Patients with limited reserve are least likely to tolerate additional haemodynamic disturbance.

Focused echo protocols, which are increasingly used in acute medicine and critical care, do not incorporate specific routine assessment for IVO. This includes the British Society of Echocardiography's own Level 1 protocol as well as FUSIC-Heart (Focused Ultrasound in Intensive Care – Heart), a bedside echo protocol and accreditation pathway developed by the Intensive Care Society. FUSIC-HD (Focused Ultrasound in Intensive Care – Haemodynamics), the Intensive Care Society's extended echo protocol for haemodynamic assessment, does include evaluation for SAM but does not explicitly assess for mid-cavity obstruction[18]. These protocols may need to be supplemented with a comprehensive scan if IVO is a differential for the clinical picture.

Focused protocols using colour Doppler in the apical 5-chamber view can demonstrate areas of flow acceleration, which could alert to the possibility of LVOTO. This use of the view is a valuable teaching point for trainers mentoring candidates for Level 1 and other focused echo accreditations.

The relevance of dynamic intra-ventricular obstruction may be less appreciated in non-cardiac settings, including general ICU and acute medicine / HDU areas. In these settings the possibility of an IVO may not always be a prominent question in scan requests – so should still be considered by the echocardiographer.

Treatment

In most circumstances, management of pulmonary oedema and hypotension involves use of diuretics, and inotropes / vasopressors respectively. Diuretics are also often used to prepare patients for liberation from mechanical ventilation. When hypotension and pulmonary oedema occur in conjunction with an IVO, these treatments can initiate a spiral of deleterious inotrope, vasopressor, and diuretic use with further exacerbation of the obstruction and potential for haemodynamic collapse[11]. After careful assessment and identification of an IVO, judicious fluid resuscitation and cessation of inotropic treatment can lead to resolution, despite these treatments being dichotomous to conventional management of cardiogenic pulmonary oedema[1]. Beta-blockade has been employed successfully to reduce inotropy and chronotropy in the setting of IVO[19], although it is unlikely to be a panacea given the complex haemodynamics seen across the spectrum of critical illness. When vasopressor treatment is required, drugs without inotropic activity (e.g. a pure alpha-agonist like phenylephrine or non-catecholamine such as vasopressin) may provide a favourable haemodynamic profile compared to those with beta-adrenergic activity, including noradrenaline[5]. Serial echocardiography to assess gradients can be helpful when combined with clinical assessment.

Ultimately, treatment of IVO is challenging. Close monitoring of the patient's clinical condition and serial echocardiographic parameters in response to treatment can facilitate stabilisation of their haemodynamics and resolution of obstruction, leading to improved patient outcomes.

Conclusion

Dynamic IVO is not uncommon in critical care and is associated with a variety of pre-disposing anatomical factors and pathophysiological states. Echocardiographic assessment is key to the identification of these patients and serial studies can be used to guide appropriate management at the bedside.

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Prominent crista terminalis mimicking a right atrial mass following ASD closure and tricuspid valve repair


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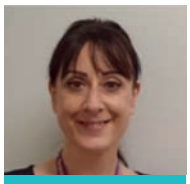
Stephen Qadir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Abstract

We report a case of a 68-year-old man in whom a right atrial mass was suspected on postoperative echocardiography following surgical atrial septal defect (ASD) closure and tricuspid valve repair. The echogenic structure was ultimately identified as a prominent crista terminalis, a benign anatomical variant. This case highlights the importance of recognising anatomical mimics of pathology to avoid unnecessary investigations or clinical concern.

Clinical History

A 68-year-old man underwent elective surgical repair for a known secundum ASD with associated moderate tricuspid regurgitation. Postoperative recovery was uneventful, and routine transthoracic echocardiography (TTE) was performed to assess surgical results.

Echocardiographic findings

Preoperative TTE (Figure 1) showed no evidence of any mass or abnormal structure in the right atrium. However, the postoperative echocardiogram revealed an echogenic ridge within the right atrium at the junction of the superior vena cava (SVC), raising suspicion of a pathological mass (Figure 2 and Figure 3). The structure was fixed, non-mobile, and followed the typical course of the crista terminalis from the SVC to the inferior vena cava (IVC).

The imaging characteristics, fixed position, and lack of hemodynamic disturbance were all consistent with a prominent crista terminalis rather than thrombus or neoplasm.

Transesophageal echocardiography (TOE) was subsequently performed and confirmed a fixed ridge with typical anatomical course of the crista terminalis, with no features suggestive of thrombus or neoplastic mass.

Discussion

The crista terminalis is a normal anatomical structure in the right atrium, representing a fibromuscular ridge that marks the junction between the smooth posterior wall (derived from the embryological sinus venosus) and the trabeculated anterior wall (from the primitive atrium). While often inconspicuous on routine transthoracic echocardiography, it may become more prominent in certain individuals, especially in the context of chronic atrial dilation or post-surgical alterations in atrial geometry.

Following ASD closure and tricuspid valve repair, changes in right atrial loading conditions, including reduced right atrial volume and pressure, may lead to altered atrial geometry (Attie et al., 2001; Baumgartner et al., 2010). Improved imaging angles following surgery may also make previously inconspicuous anatomical structures more apparent. In addition, postoperative tissue oedema or fibrosis may further accentuate its appearance. These factors can result in the crista terminalis mimicking a pathological intracardiac mass, particularly when visualised obliquely on apical or subcostal views.

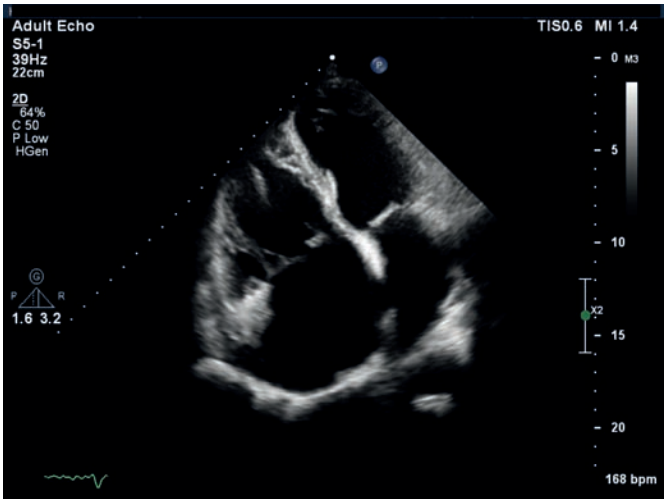

Fig 1. Preoperative apical 4-chamber view showing no visible right atrial mass.

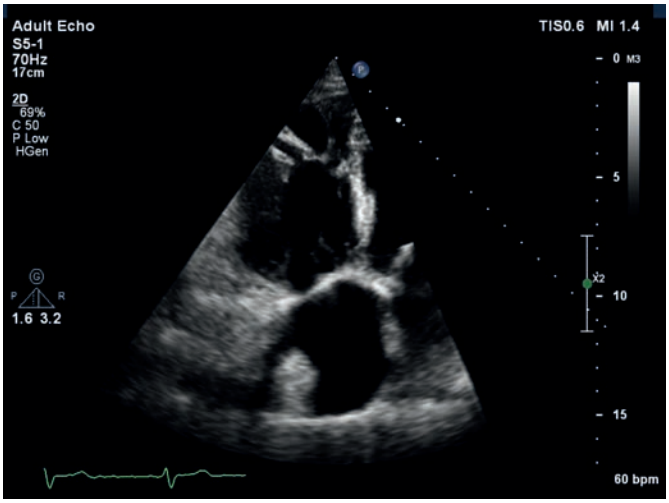

Fig 2. Postoperative view confirming fixed, non-mobile ridge consistent with crista terminalis.

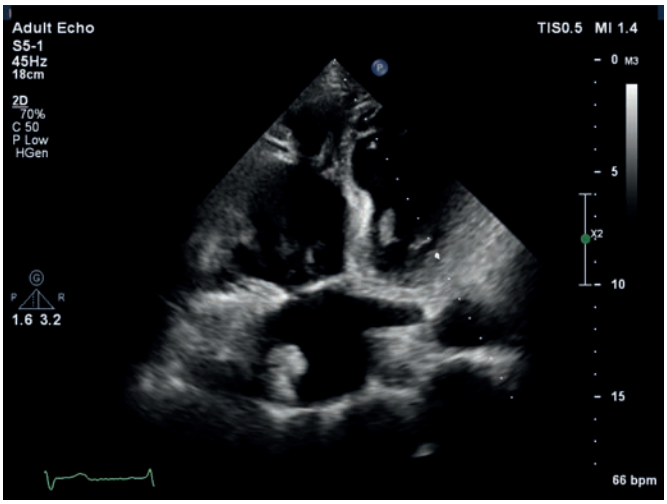

Fig 3. Postoperative apical view showing echogenic ridge at the RA–SVC junction simulating a mass.

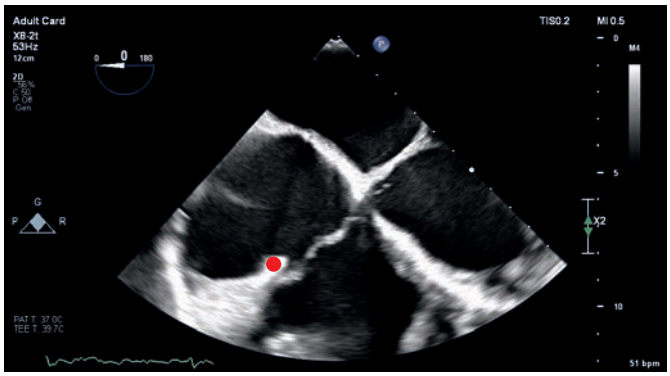

Fig 4. Transoesophageal echocardiography (TOE) image demonstrating a prominent ridge along the posterolateral right atrial wall (red dot) consistent with a crista terminalis. The structure is fixed and non-mobile, with no features suggestive of thrombus or mass.

TOE was particularly helpful in confirming the diagnosis by demonstrating the fixed nature and characteristic anatomical course of the structure.

This diagnostic pitfall has been described in the literature. A notable case was reported by Adademir et al. (2013) in the Anatolian Journal of Cardiology, where a young woman following tricuspid valve repair presented with a prominent crista terminalis that closely mimicked a right atrial mass. In both that case and ours, the echocardiographic appearance raised suspicion of thrombus or neoplasm, leading to concern for serious pathology.

Recognising the typical anatomical course of the crista terminalis—from the SVC to the IVC along the posterolateral right atrial wall—and its fixed, non-mobile characteristics without flow disturbance is key to making the correct diagnosis and avoiding unnecessary further investigations.

Clinical significance and pitfalls

1. **Diagnostic pitfall:** A prominent crista terminalis may mimic thrombus, tumour, vegetation, or retained surgical material on TTE, especially in altered post-surgical anatomy.
2. **Electrophysiology implications:** The crista terminalis contains specialised conduction fibres. It is a known site for focal atrial tachycardias and may complicate mapping and ablation during EP procedures.
3. **Arrhythmogenic potential:** Its location near the SVC is clinically relevant in the context of atrial flutter and atrial fibrillation, particularly in post-operative and post-ablation patients.
4. **Measurement distortion:** It may distort right atrial volume and area assessments on 2D echocardiography if not recognised.

Conclusion

This case emphasises the importance of understanding normal anatomical variants on echocardiography. Recognition of a prominent crista terminalis—particularly in postoperative patients—can prevent misdiagnosis of right atrial pathology. Increased awareness among echocardiographers and cardiologists is essential to avoid unnecessary referrals and investigations.

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Incomplete Shone complex in adulthood


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Background

Shone complex is a rare congenital heart defect that consists of a constellation of left-sided, embeded, usually obstructive lesions.

Case presentation

A case of a 51-year-old lady with hypertension is described. Baseline examination revealed an ejection systolic murmur across the precordium, a continuous murmur under the left scapula and reduced femoral pulsations bilaterally.

Subsequent multimodality imaging revealed severe symptomatic aortic stenosis, in addition to complete aortic interruption and parachute mitral valve suggestive of partial Shone complex.

Conclusions

Patients with hypertension should undergo a complete head-to-toe examination looking for potential secondary causes. Echocardiography and cross-sectional imaging should be performed in all cases of congenital aortic stenosis to investigate for co-existing aortic pathology, and in the case of hypertension where aortic pathology is suspected.

Shone syndrome is a rare condition seen in adulthood; individualised management in adulthood is key in treating this heterogenous group of conditions.

Key words

Interrupted aortic arch, Shone's complex, Shone's syndrome.

Background

Shone complex is a rare congenital heart defect of serial obstructive left-sided lesions. The complex makes up less than 0.7%[1] of the adult congenital heart disease population.

To be classified as complete Shone complex the following 4 lesions need to be present:

- Left atrial supra-valvular membrane or ring
- Parachute mitral valve
- Subaortic stenosis
- Aortic coarctation.

Most patients (71%) with Shone complex also have a bicuspid aortic valve[2]. Incomplete Shone complex is seen when 2 or 3 left-sided obstructive lesions co-exist.

The majority of cases of complete Shone complex are diagnosed in infancy or early childhood due to the significant haemodynamic burden these anomalies place on the heart[3]. However, patients with the incomplete complex or those with compensated anatomy can survive into adulthood without surgical management. This case report describes the presentation, diagnosis and management of a 51-year-old with incomplete Shone's complex providing insights into the challenges of managing this condition as an adult.

Case presentation

A 51-year-old female was referred to the Emergency Department by her GP following an at home blood pressure reading of 210/ 90mmHg. Her past medical history was unremarkable and there was no family history of heart disease.

She had an active lifestyle and was a retired semi-professional football player. Subsequent referral to cardiology for investigation of hypertension revealed a systolic murmur across the precordium, a continuous murmur in the left scapula region and reduced femoral pulsations bilaterally.

The ECG demonstrated left ventricular hypertrophy with strain pattern (Fig.1).

NT Pro-BNP was elevated at 1344pg/ml. Chest X-ray demonstrated lack of aortic knuckle and rib notching (Fig.2.1).

A transthoracic and transoesophageal echocardiogram confirmed a congenitally abnormal aortic valve with severely reduced leaflet opening in keeping with severe aortic stenosis (Vmax 4.7m/s and mean pressure gradient 51mmHg) (Fig 3.2).

Left ventricular function was preserved and there was evidence of concentric left ventricular hypertrophy (Fig. 3.1).

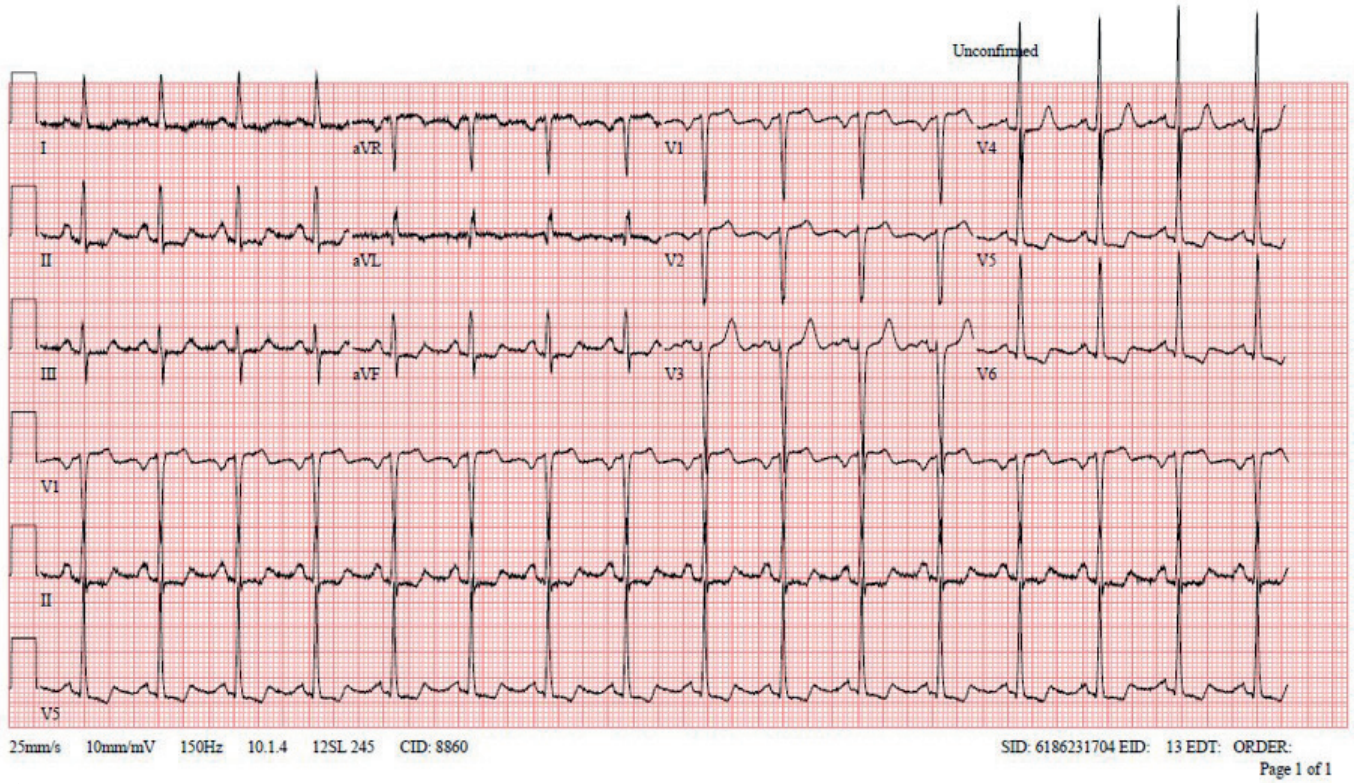


Fig 1. Electrocardiogram

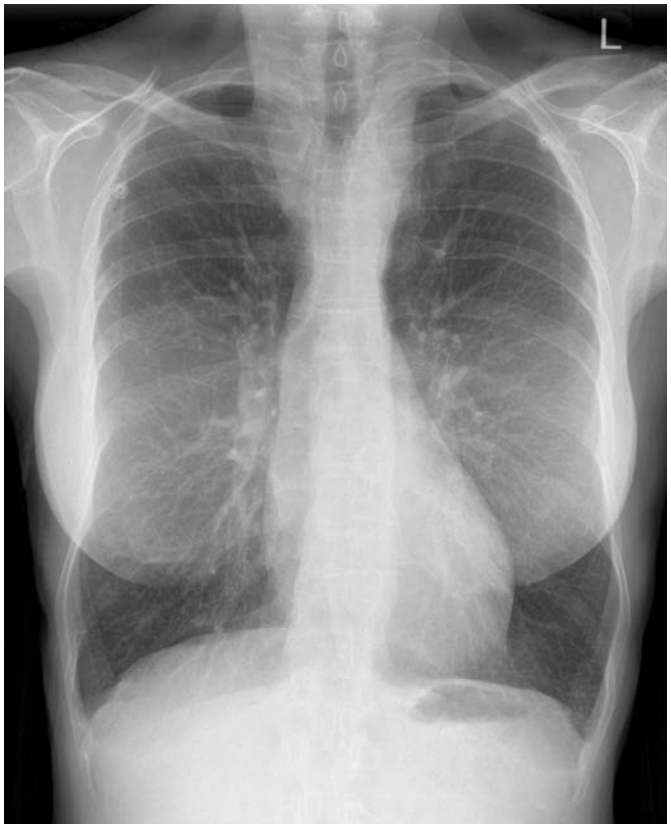


Fig 2.1. CXR showing lack of aortic knuckle and rib notching secondary to collateralised blood flow through intercostal arteries.

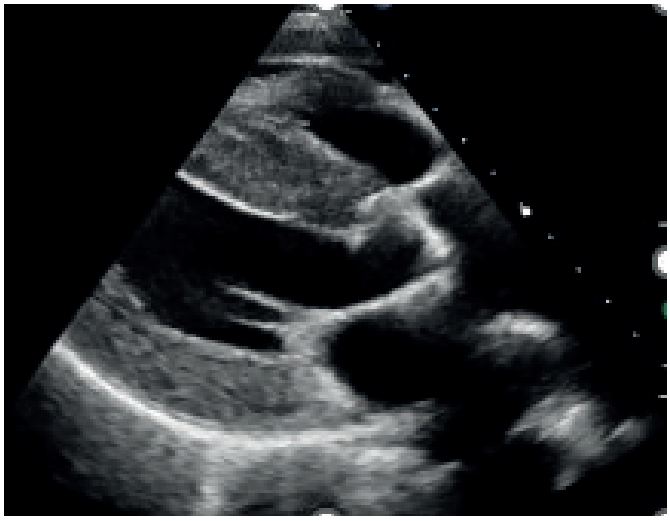


Fig 3.1. Transthoracic echocardiogram showing left ventricular hypertrophy

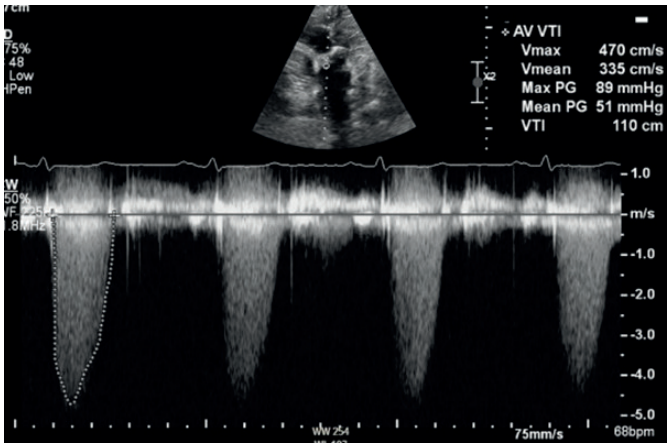
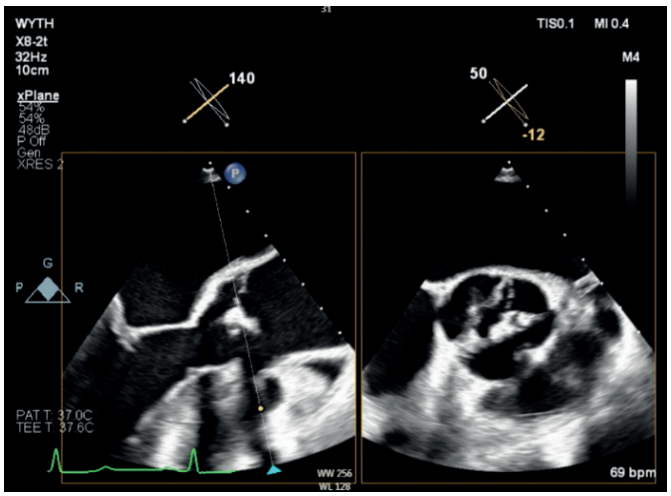


Fig 3.2. Aortic valve peak velocity 4.7m/sec



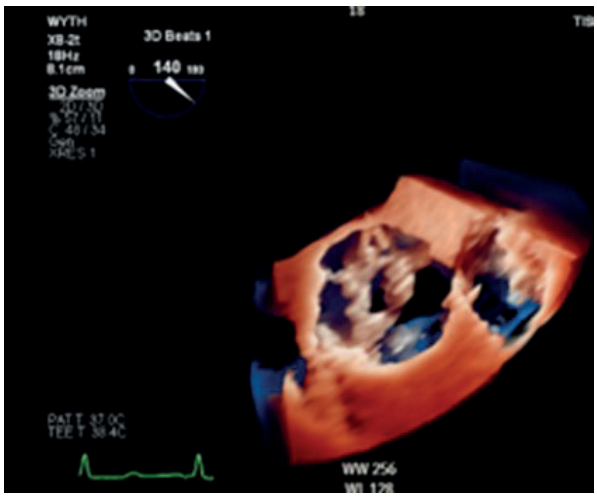
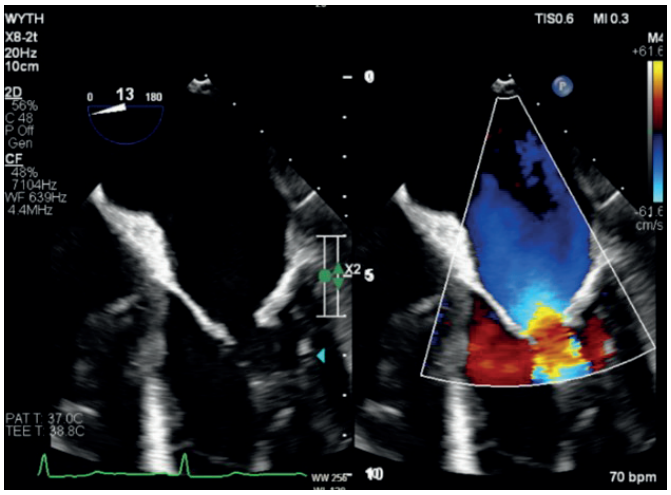


Fig 3.3. Transoesophageal images showing bicuspid aortic valve with reduced leaflet excursion. Right, 3D image of the AV

Moderate mitral stenosis was demonstrated with a mean pressure gradient of 5mmHg. MVA 1.7cm2 by 2D and 3D planimetry

The leaflets appeared structurally abnormal with thickened leaflets and restricted motion (Fig 4).



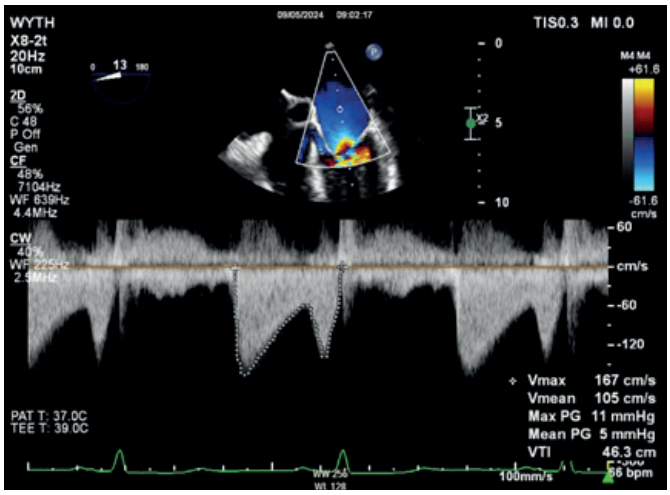


Fig 4. TOE images showing moderate mitral stenosis

Papillary muscle anatomy was not clearly defined on this study. The aortic arch views were grossly abnormal suggesting complete interruption of the arch after the origin of the left subclavian artery (Fig 5).

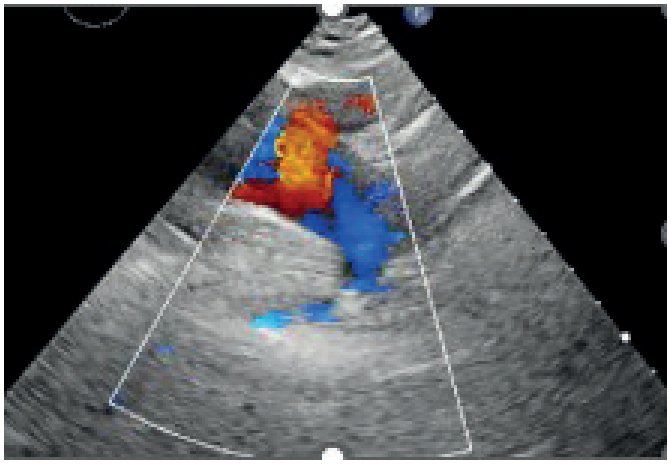


Fig 5. Suprasternal view of the aortic arch

Based on these findings a cardiac MRI was requested.

Cardiac magnetic resonance imaging (Fig 6) confirmed interruption of the descending thoracic aorta over a span of 2cm with hypoplasia of the distal thoracic aorta, alongside the other findings already described by echocardiography.

Gated computed tomography of the aorta confirmed interrupted aortic arch with large calibre posterior mediastinal collaterals and massively dilated intercostal arteries, bronchial arteries and internal mammary arteries.

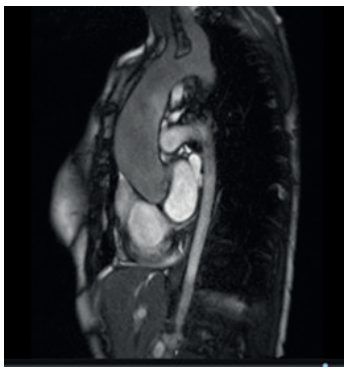


Fig 6.1

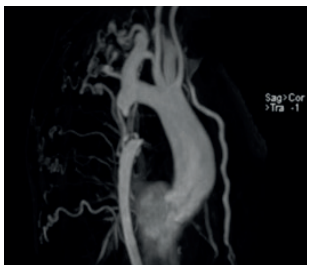


Fig 6.2.

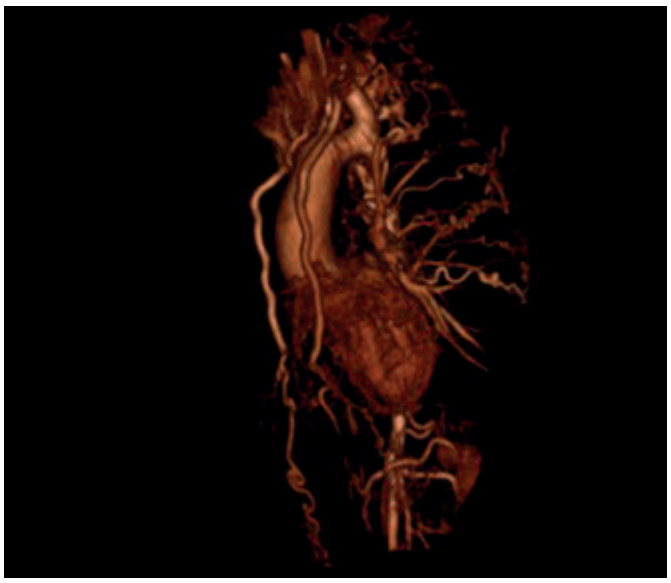


Fig 6.3. Reconstructed 3D model from cross sectional imaging

The patient was commenced on anti-hypertensive medication with subsequent normalisation of blood pressure.

Bike stress echocardiography revealed a reduced exercise performance, managing 6 mins of a 25-Watt ramp protocol and terminating the test due to shortness of breath. There was a normal biventricular response to exercise with no inducible regional hypokinesis.

A diagnosis was made of symptomatic severe aortic stenosis due to a congenitally abnormal aortic valve alongside secondary hypertension due to aortic interruption. Given the parachute mitral valve and aortic interruption, she was deemed to have a partial Shone complex.

After a regional multidisciplinary meeting the consensus was to offer the patient an isolated aortic valve replacement.

Her blood pressure was now well controlled, and she had residual moderate mitral stenosis for which she would continue under specialist follow-up.

There were concerns expressed from the surgical team surrounding potential complex descending aortic surgery in the context of the distal aortic atresia, as well as risk of compromise to the well-developed collateral arterial supply and significant risk of intra/post-operative compromise of spinal arterial blood supply.

Discussion

The case highlights the importance of careful examination in patients presenting with hypertension and the need for aortic cross-sectional imaging in all patients with congenital aortic stenosis prior to surgical intervention due to the association with aortic abnormalities. (ESC 2020 ACHD guidelines).

Most patients with Shone complex and aortic interruption present in childhood. Our patient presented during adulthood due to an incidental finding of hypertension. She had a history of participating in high level sporting activities without any physical limitation suggesting that her body had physiologically adapted to the congenital aortic interruption by developing a well-established collateral circulation.

There is a paucity of data regarding long-term outcomes in adults with Shone complex. The current literature mainly reflects management of infants presenting with complete Shone's complex. During infancy, multiple operations are essential to correct left ventricular inflow and outflow obstructive lesions.[5] Shone's complex remains a rare diagnosis in adulthood and is associated with a sequelae of heart failure related hospitalisation, heart transplant, progressive ventricular dysfunction and arrhythmias[2].

Variability in presentation and severity of individual lesions have made management of the disease challenging. Increased awareness of this condition and associated complications may allow for more tailored follow-up with specialist team input. The management of patients with partial Shone's complex should be individualised and tailored to the degree of physiological compensation that is already present and clinical symptoms experienced by the patient.

Declarations

No competing interests/or funding to be declared for this publication

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images

List of abbreviations

GP	General practitioner
CADSRAD Data	Coronary Artery Disease Reporting and System
IAA	Interrupted aortic arch
LVH	Left ventricular hypertrophy
Vmax	Maximum velocity
ESC	European Society of Cardiology
ACHD	Adult congenital heart disease

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Aortic root abscess unmasked by troponin elevation: A fatal case of Staphylococcus aureus endocarditis in a dialysis patient


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Background

Aortic root abscess is a devastating complication of infective endocarditis (IE), often underdiagnosed in critically ill patients due to overlapping clinical symptoms with septic shock and organ dysfunction. Staphylococcus aureus is a particularly aggressive pathogen, with a high propensity for rapid perivalvular extension, root destruction, and embolic phenomena.

Case summary

We describe the case of a 24-year-old immunosuppressed male with end-stage renal disease (ESRD) on long-term dialysis, who presented with acute confusion, fever, and signs of systemic infection. Initial assessment suggested sepsis of unclear origin. Blood cultures grew Methicillin-Susceptible Staphylococcus aureus (MSSA). Despite transient haemodynamic improvement, the patient developed rising troponin levels and cardiovascular collapse. Serial echocardiography revealed torrential aortic regurgitation, a flail right coronary cusp, and a pseudoaneurysm of the aortic root with abscess. CT confirmed a 22 × 17 × 22 mm pseudoaneurysm with pericardial effusion. Despite emergency surgery and aggressive ICU management, the patient died from refractory right ventricular (RV) failure.

Discussion

This case underscores the importance of high clinical suspicion for aortic root abscess in patients with Staphylococcus aureus bacteraemia and unexplained haemodynamic deterioration. Transoesophageal echocardiography (TOE) remains the diagnostic gold standard. Troponin elevation, even in the absence of coronary artery disease, should prompt evaluation for structural cardiac involvement. Early surgical referral and multidisciplinary care are essential.

Key learning points

- Aortic root abscess should be suspected in patients with Staphylococcus aureus bacteraemia and unexplained haemodynamic instability or conduction disturbances.
- Troponin elevation without coronary artery disease may signal myocardial extension or perivalvular abscess.
- Transoesophageal echocardiography (TOE) provides superior detection of perivalvular complications and should be performed early in deteriorating patients.
- Multidisciplinary ICU and surgical collaboration are vital to managing complex endocarditis with structural complications.

Case Presentation

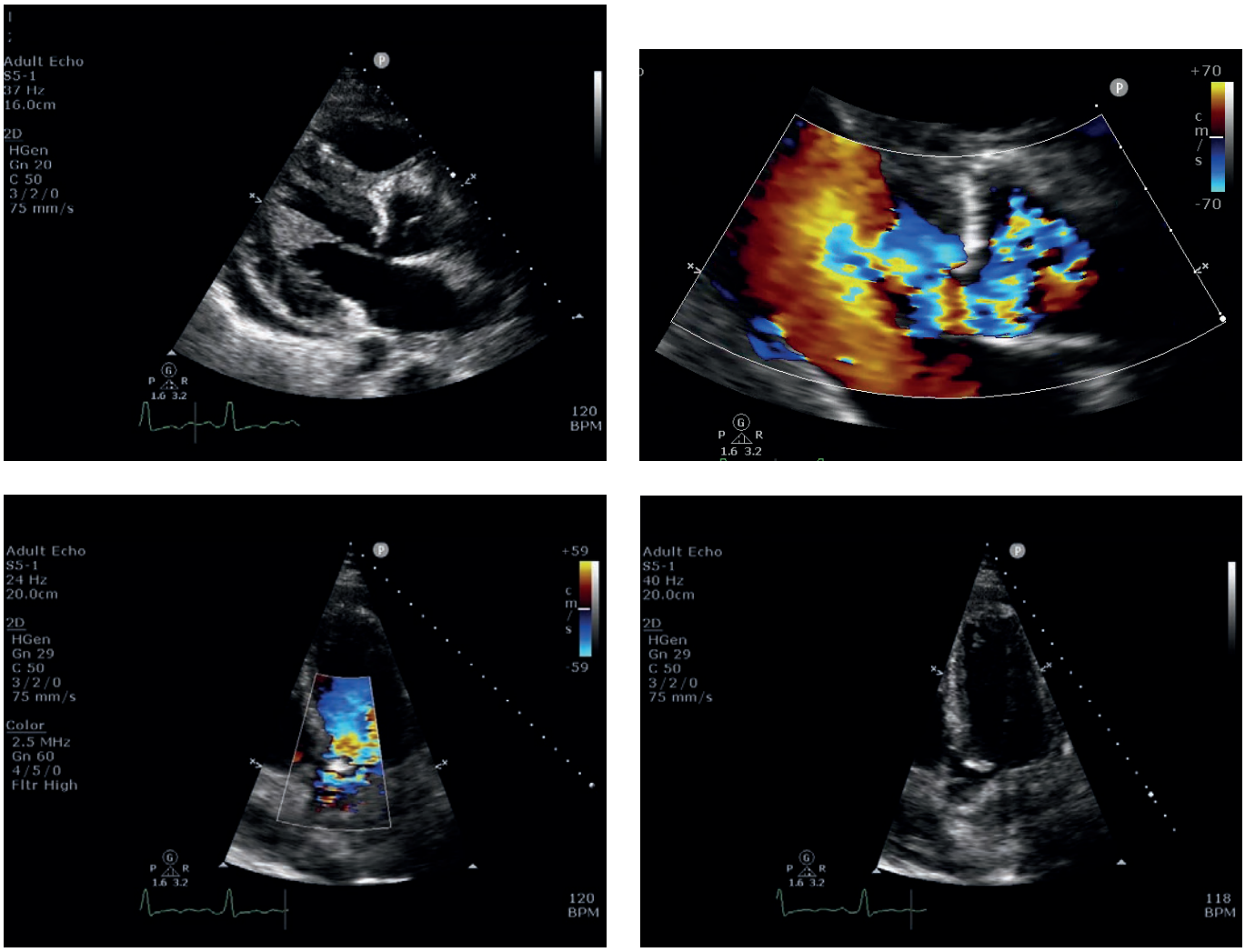
A 24-year-old male with End-Stage Renal Disease (ESRD) secondary to reflux nephropathy presented with fever, vomiting, arthralgia, and confusion. He was anuric and reliant on thrice-weekly dialysis via a left AV fistula. He had undergone a failed renal transplant in 2018 and was maintained on tacrolimus.

On admission, he was febrile, hypertensive, and encephalopathic. Neurological differentials included meningoencephalitis and Posterior Reversible Encephalopathy Syndrome (PRES). Initial CT imaging was unremarkable. He was started on intravenous ceftriaxone and acyclovir and admitted to ICU for monitoring and Continuous Renal Replacement Therapy (CRRT).

He became increasingly agitated, necessitating intubation. Cerebrospinal fluid (CSF) analysis, obtained via lumbar puncture, was negative. Blood cultures yielded Methicillin-Susceptible Staphylococcus aureus (MSSA). Antibiotics were escalated to cefazolin, and noradrenaline was started for septic shock.

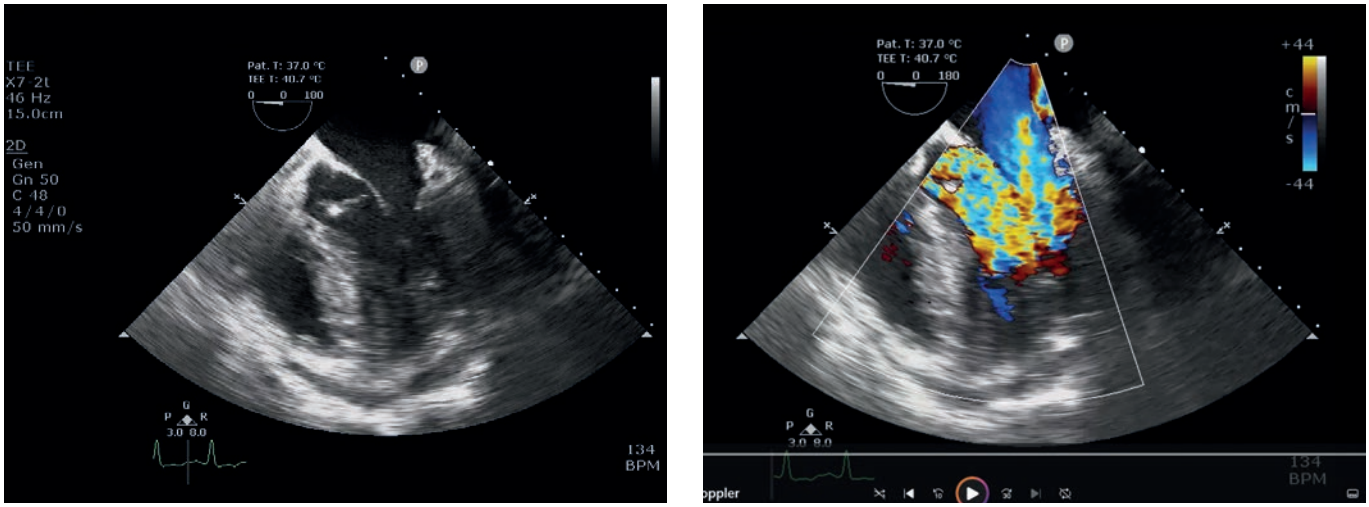
After initial improvement, he was extubated four days later but soon deteriorated with hypotension and sinus tachycardia, requiring immediate reintubation. Troponin rose sharply (from 1,370 to >5,000 ng/L), and ECG showed diffuse T-wave inversions in the inferior and lateral leads with a PR interval of 135 ms (within normal limits). A repeat TTE, performed three days after an initial study which had demonstrated mild LV dilation (LVIDd 5.8 cm) with normal RV size and function (TAPSE 2.44 cm, RV peak S' velocity 23.2 cm/s), now showed torrential aortic regurgitation, progressive LV dilation, and hyperdynamic function.

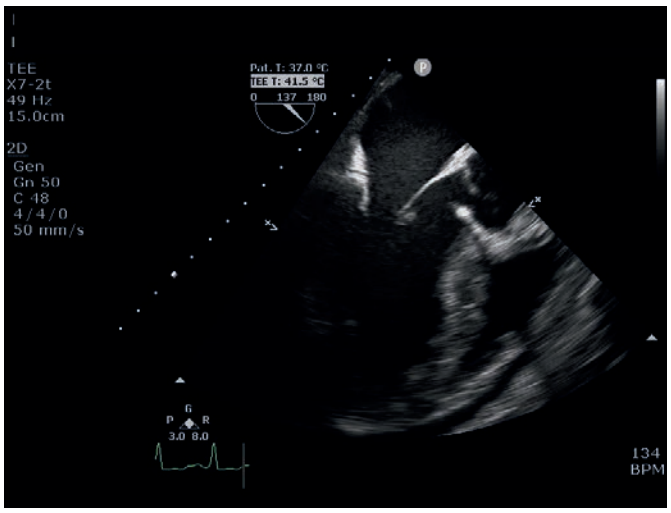
Fig 1. TTE – Parasternal long-axis and apical 5 chamber views showing severe aortic regurgitation with left ventricular dilatation

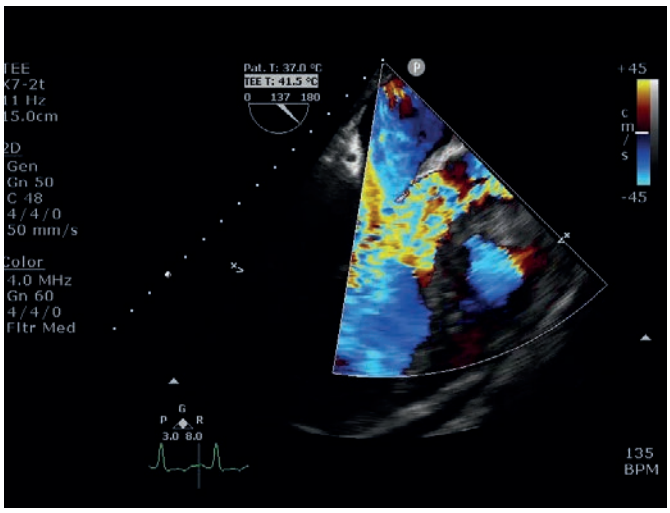


TOE demonstrated a flail right coronary cusp with large vegetation, a pseudoaneurysm of the right coronary sinus, and signs of aortic root abscess.

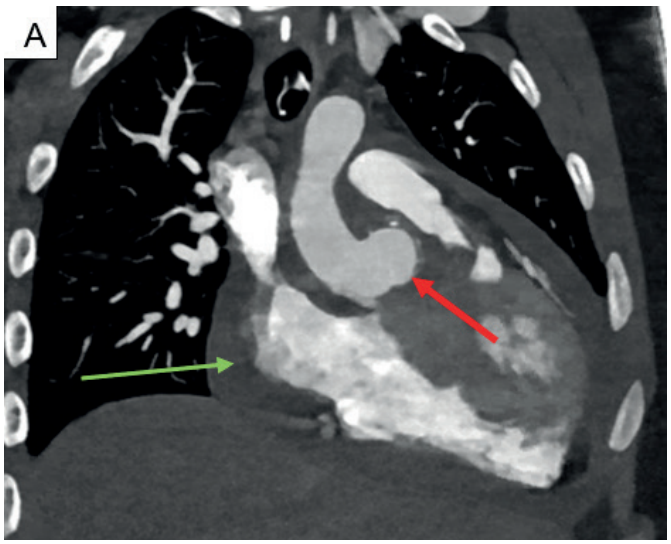
Fig 2. TOE mid-oesophageal 5 chamber (bottom) and long-axis (top right) views showing flail right coronary cusp prolapsing into the LVOT with vegetation with torrential AR







CT angiography confirmed a 22 × 17 × 22 mm pseudoaneurysm with active contrast leak and large haemopericardium. Bilateral pleural effusions were also noted.



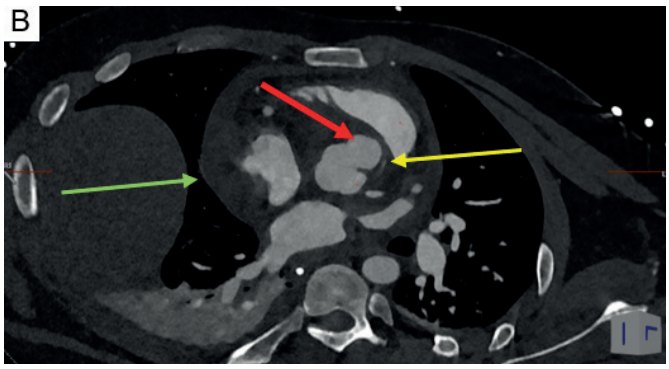


Fig 3A & B. are modified coronal and axial reconstructions from a gated CT Angiogram. These demonstrate a ruptured mycotic aortic root pseudoaneurysm in a patient with aortic valve endocarditis. The pseudoaneurysm arises from the right aortic sinus and measures 22 mm x 17 mm x 22 mm (red arrows). There is a sliver of contrast lateral to the aortic root (yellow arrow) alongside large volume hemopericardium (green arrows) in keeping with an active bleed.

Urgent surgery was performed. Intraoperatively, the right coronary cusp was destroyed, with a large root abscess and purulent pericardial effusion. A mechanical aortic valve replacement (AVR) and tricuspid annuloplasty were performed. Post-bypass TOE confirmed a well-seated AVR with no paravalvular leak and satisfactory trans-aortic gradient. Moderate mitral regurgitation, moderate-to-severe tricuspid regurgitation, moderate LV impairment, and severe RV dysfunction were noted.

Despite maximal support (adrenaline, noradrenaline, milrinone, inhaled nitric oxide), the patient progressed to refractory right heart failure and died within 48 hours.

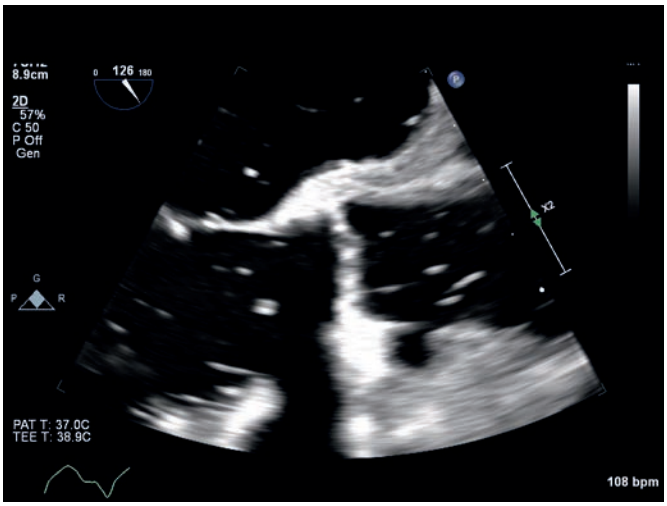


Fig 4. Postoperative TEE – Well-seated mechanical aortic prosthesis

Literature review and discussion

Epidemiology and pathophysiology

Aortic root abscess is a severe complication of infective endocarditis (IE), occurring in up to 30–40% of cases, particularly with prosthetic valves (10–37%).[1] IE itself has an increasing incidence of 1.5–11.6 cases per 100,000 person-years due to rising healthcare interventions and immunosuppression.[2,3]

Aortic root abscess arises from infection extending beyond the valve annulus, leading to abscess, pseudoaneurysm, and potential rupture. Staphylococcus aureus, due to its invasive nature, is the most aggressive pathogen, often causing rapid tissue destruction.[3,4,7]

Risk factors include prosthetic valves, bicuspid aortic valve, immunosuppression, and intravenous drug use.[8]

Clinical recognition

Classic signs of IE include fever, new murmurs, and signs of embolism. Aortic root abscess specifically may present with persistent bacteraemia, heart block, or acute heart failure.

PR prolongation or complete AV block suggests perivalvular extension.[9]

Our patient's isolated troponin rise, initially attributed to sepsis, was later understood as a sign of myocardial extension. Troponin elevation in IE reflects myocardial involvement or systemic inflammation.[13,14]

Diagnostic strategies

TOE is the diagnostic gold standard for detecting perivalvular abscess, with a sensitivity of 80–100% and specificity of approximately 95%, significantly outperforming TTE (sensitivity 28–36%, specificity 99%).[5,12] Compared to TTE, TOE provides clearer views of the aortic root, sinus, and paravalvular areas.[5]

In critically ill patients, repeat or serial echocardiography is crucial, especially when deterioration occurs. CT may be adjunctive for identifying pseudoaneurysm and evaluating surgical anatomy.

Staphylococcus aureus bacteraemia (SAB) in ICU

SAB is a major cause of endocarditis and sepsis. It has a population incidence of 20–40/100,000 person-years but is more common in dialysis and ICU patients.[7] Of note, IE complicates approximately 10–25% of all SAB cases, rising to 38% in patients with prosthetic valves or cardiac implantable devices — a figure of particular relevance to the echocardiography community.[8,10,15] SAB-related IE has higher rates of perivalvular extension (up to 40%) and poorer prognosis.[8,10]

ICU mortality in SAB-related aortic root abscess ranges from 30–50%.[11] Surgical mortality can reach 25–30%.[1]

Treatment and outcomes

Surgical intervention is mandatory for aortic root abscess with haemodynamic compromise or uncontrolled infection.[1] Mechanical valve replacement and debridement are standard.

Despite surgery, outcomes remain guarded. Multidisciplinary care — including infectious disease, ICU, cardiology, and cardiothoracic surgery — is essential.[9,11]

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Registration for echocardiographers: What are the options?

In the December 2024 edition of ECHO Journal, Mr Shaun Robinson, Vice President, and Professor Dan Augustine, President, articulated the strong case for all echocardiographers to be registered.

An important element of the BSE's three-year strategy is to establish easier routes to registration for physiologists. In order to facilitate this, we have established a number of workstreams:

- Working with the Academy for Healthcare Science (AHCS) on streamlining the equivalence process
- Supporting the equivalence process by recruiting more assessors
- Our new network of mentors to support people going through STP equivalence
- Highlighting registration options for those not wishing to go through equivalence

Independently, the AHCS have been doing a huge amount of work themselves to ensure as many echocardiographers as possible can access Professional Standards Authority (PSA) accredited registers, or, at the very least, a voluntary register maintained to the same high standards.

The AHCS recently put together some comprehensive information for cardiac physiologists looking to become registered. Some of this was shared by Professor Augustine at BSEcho 2025 but you can find the full text below.

Joining the AHCS Register: A guide for cardiac physiology professionals

Introduction

The Academy for Healthcare Science (AHCS) offers several pathways for cardiac physiology professionals to join its registers. These pathways ensure that practitioners meet nationally recognised standards and can demonstrate their competence, education, and experience.

This article summarises the three main registration options: the Practitioner Training Programme (PTP), the Certificate of Equivalence, and the Specialist Echocardiographer Register. Each route supports professionals in demonstrating their competence against national standards, regardless of their training pathway.

1. Practitioner Training Programme (PTP) – Accredited Programme Route

The Healthcare Science Practitioner Register includes clinical physiologists and healthcare science practitioners. Professionals in cardiac physiology may be eligible if they live and work in the UK and have completed an approved education programme.

Approved UK universities include:

- City St George's, University of London
- University of Leeds
- Manchester Metropolitan University
- University of Plymouth
- Middlesex University
- University of Southampton
- Sheffield Hallam University
- University of Sunderland
- Swansea University
- University of the West of England
- Ulster University
- University of Wolverhampton, and historical programmes such as Anglia Ruskin

2. Certificate of equivalence

Understanding equivalence

Equivalence means your qualifications and experience meet the same standards as those from an accredited programme, even if the route was different.

The AHCS offers equivalence assessments for:

- Healthcare Science Practitioners
- Scientists
- Higher Specialist Scientists

This process is ideal for professionals with substantial experience or alternative qualifications who wish to demonstrate they meet national standards.

What is equivalence?

Equivalence exists when the outcomes of two processes are directly comparable even though the paths to achieving them are different. When equivalence is shown to exist between a new qualification and the qualification or experience an individual already has, repeated education or training becomes unnecessary.

The AHCS has developed equivalence assessment processes for individuals who have undertaken training, hold qualifications and/or have considerable professional experience, and who wish to show that these are equivalent to the relevant practitioner, scientist or higher specialist science programmes accredited by the National School of Healthcare Science. There is also an equivalence assessment process for those working in the following roles: anatomical pathology technologist, genetic technologist, ophthalmic science practitioner and tissue bank technologist via the Certificate of Competence. Further guidance is available on the equivalence guidance page.

Do I need equivalence?

The government said in its response to the House of Commons Select Committee Report of Session 2014/15: Accountability hearing with the Health and Care Professions Council (HCPC) that *'the Academy for Healthcare Science Voluntary Register offers assurance that is appropriate and proportionate to the risks presented to public safety.'*

Subsequently, the AHCS received accreditation for its register from the Professional Standards Authority (PSA). This means that the Academy has met the PSA's demanding standards of governance. These include standards setting, education and training, management of the register, provision of information and complaints handling.

Thousands of people have applied for equivalence through one of the AHCS' programmes. Reasons for you to apply for the AHCS' equivalence programmes may include:

- Wishing to appear on an accredited Healthcare Science Register in order to show your commitment to maintaining standards of education, competence and conduct and providing assurance for employers, patients and the public
- As an alternative route to registration, rather than attending a formal NSHCS training programme; having trained before the current system of accredited training programmes for Healthcare Science began, and needing recognition of your training for further career progression
- Having significant experience as a scientist, but not in a health setting and wanting to undertake a Healthcare Science role
- Having trained in a country without accredited Healthcare Science education and training, and wishing to practise in the UK

How do I demonstrate equivalence?

To demonstrate equivalence, you need to provide evidence that you have the knowledge, skills and behaviours represented by the core standards in Good Scientific Practice (GSP), the relevant Standards of Proficiency where available, and the relevant NSHCS accredited healthcare science curriculum learning outcomes. When an individual is assessed as meeting these criteria, they are issued with a Certificate of Equivalence. Applying for equivalence and submitting evidence is all undertaken via our online system.

The equivalence process varies depending on the level of equivalence being applied for. For example, not all the assessment processes include an interview. For more information, and to apply, visit the AHCS website.

What do I achieve when I successfully demonstrate equivalence?

The Certificate of Equivalence confers eligibility to apply for appropriate registration:

- For individuals applying at practitioner programme level equivalence (PTPE), it provides eligibility to apply to join the AHCS register;
- For individuals applying at scientist programme level equivalence (STPE), it provides eligibility to apply for statutory regulation with the Health and Care Professions Council (HCPC) as a Clinical Scientist – a legally-protected title;
- For individuals applying at higher specialist scientist programme level equivalence (HSSE), it provides eligibility to apply to join the AHCS Register.

The Certificate of Competence provides anatomical pathology technologists, genetic technologists, ophthalmic science technologists and tissue bank technologists with the eligibility to apply to join the AHCS Register.

- If you qualified outside of the United Kingdom, then you need to apply via the **AHCS Equivalence Practitioner Pathway (PTP equivalence)**

3. Specialist Echocardiographer Register

This register is for professionals who have completed the Echocardiography Training Programme delivered by the National School of Healthcare Science (NSHCS) in collaboration with SCST and the BSE.

Although not currently PSA-accredited, this register is managed to the same high standards. Applicants must submit evidence of programme completion and commit to Good Scientific Practice and the Standards of Proficiency.

Benefits of registration
Across all routes, being registered with the AHCS demonstrates:

- Commitment to high standards
- Ongoing competence
- Assurance to employers, patients, and the public
- Alignment with national standards

Access to professional resources like:

- Registrants' Newsletter
- Training opportunities
- AHCS Leadership Journal

Frequently asked questions (FAQs)

We've identified some of the most relevant FAQs for our members approaching registration.

Q: Who is eligible to join the AHCS Practitioner Register?
A: Professionals who live and work in the UK and have completed an AHCS-approved education programme or pathway.

Q: What if my course is not listed?
A: If your UK course is not approved, you may still be eligible via the Certificate of Equivalence pathway. You can also contact registration@ahcs.ac.uk for guidance.

Q: What if my course is not listed?
A: If your UK course is not approved, you may still be eligible via the Certificate of Equivalence pathway. You can also contact registration@ahcs.ac.uk for guidance.

Q: How do I apply for the Specialist Echocardiographer Register?
A: You must create an account via the AHCS website, submit evidence of completing the NSHCS Echocardiography Training Programme, and agree to the relevant professional standards.

Q: Is the Specialist Echocardiographer Register PSA-accredited?
A: Not currently, but it is managed to the same high standards as PSA-accredited registers.

Q: What are the main benefits of registration?
A: Professional recognition, alignment with national standards, access to training opportunities, newsletters, and the AHCS Leadership Journal.

Access the full equivalence FAQs:
ahcs.ac.uk/equivalence/equivalence-faqs

We hope that this information will be of use to any member approaching registration. If you need more support with equivalence specifically, check out our new mentor programme (more information on page 5).

Have you captured an image which is particularly interesting this year?

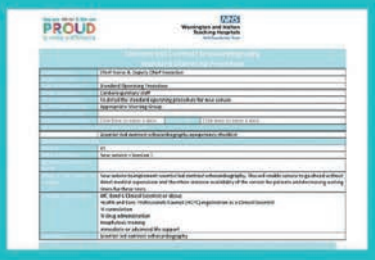
We are delighted to announce that the Image of the Year competition is returning in 2026. Your image could be of a rare pathology, have comedy value, or provide an usual perspective! The top four submitted images will be printed in the conference programme for BSEcho 2026 and will be on the front covers of ECHO. The winner will be presented on stage at BSEcho 2026*.

Submit now at bsecho.org/ImOTY

**all entries require written patient consent*

Top 5 resources on the BSE Resource Hub

Position statement: The role profile of echo specialist physiologists



Contrast echocardiography SOP

Position statement: Guidance for transoesophageal echocardiography probe cleaning and disinfection

echoresearch and practice

A high-impact, international open access journal

Prevalence, characteristics and clinical impact of work-related musculoskeletal pain in echo

Position statement: Echo surveillance for childhood, teenage and young adult cancer survivors

Find all of these and more by visiting the Resource Hub at bsecho.org/ResourceHub

British Society of Echocardiography

Recently Accredited Members List

Level 1 Echo Accreditation

Munzir Malik Wrexham Maelor Hospital
Mohamed Badr Royal Oldham Hospital
Pela McDougall King's College Hospital
Arun Raja Thangavel St Thomas' Hospital
Simon Stallworthy St Thomas' Hospital
Abdurahman Tarmal University Hospital Hairmyres
Arungandhi Pachaiappan Nobles Hospital, Manx Care, Isle of Man
Lee Cutler Doncaster & Bassetlaw Teaching Hospitals
Ben Griffiths East Surrey Hospital
Alena Bentley East Surrey Hospital
Surag Khadka East Surrey Hospital
Anya Fryer East Surrey Hospital
Samuel Gorf East Surrey Hospital
Ashli Antoine University College London
Brian Wang Jersey General Hospital
Ruth O'Leary Beaumont Hospital, Dublin
Saada Al Adawi University College London
Tarek Hassan University Hospital Birmingham
Ashli Antoine University College London
Jake Roberts Royal Berkshire Hospital
David Clarke John Radcliffe Hospital

Transoesophageal Accreditation

Maria Mahmood Queen Elizabeth Hospital, Birmingham
Syed Rizwan Ali Queen Elizabeth Hospital, Birmingham
Christopher Orsborne Wythenshawe Hospital
Rajesh Varma University Hospital Southampton

Congenital Accreditation

Sarah-Jane Turner Manchester Royal Infirmary
Nelisa Sagrado Musgrove Park Hospital
Amy Szewiel Musgrove Park Hospital
Sarah Butcher James Paget University Hospital
Juan Restrepo Royal Brompton & Harefield Hospitals
Sarah Butcher James Paget University Hospital

Critical Care Accreditation

Joshua Thia Oxford University Hospital

Transthoracic Accreditation

Assia Issa Nottingham University Hospital
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Olivia Holmes Sheffield Teaching Hospitals
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Sarah Lyman Sheffield Teaching Hospitals
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Claire Earl Northampton General Hospital
Thomas Eccles Rotherham Hospital
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Rintu Tomy Hereford County Hospital
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Nicola Cook Cambridge University Hospitals
Abdul Qadeer Kakepota North Middlesex Hospital
Laiba Khan North Middlesex Hospital
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Mohammed Nasheef Inhealth
Harrison Popple Basildon Hospital
Jack Blanchard Isle of Wight NHS Trust
Mariana Contins Pires King's College Hospital
Bethany Crockford Isle of Wight NHS Trust
Eddie Imarayiosa University Hospitals Dorset NHS Foundation Trust
Maria Kholkina University Hospitals Dorset NHS Foundation Trust
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Thomas Stephens-Fouracre Great Western Hospital
Amitha Sunny Northwick Park Hospital
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Alison Mc Meel Mater University Hospital
Gopinadh Pyla South West Acute Hospital
Thomas Oswald University Hospitals Sussex NHS Foundation Trust
Amy O'Connor King's College Hospital

Endorsed Courses

Course: Edwards Lifesciences - Bristol Advanced Imaging Day, **Date:** 17 July 2026
BSE points awarded: 3 BSE points **Location:** Bristol

Course: King's College London - Advanced Echocardiography Course and Workshop **Date:** 27 - 30 June 2026
BSE points awarded: 12 BSE points (3 per day) **Location:** London

Have you considered BSE Fellowship?

Join the ranks of our esteemed Fellows and Honorary Fellows and boost your career in 2026

The British Society of Echocardiography's Fellowship scheme recognises the outstanding contribution of our members to the field of echocardiography.

Launched in 2018, the scheme honours esteemed members who have led the charge in the advancement of echocardiography. Over 50 fellowships and honorary fellowships have subsequently been awarded.

Applications open until Wednesday 1 July 2026

Open to all members of the BSE who are in good standing, have been an accredited member for a minimum of five years (undergoing at least one reaccreditation cycle) and who meet the eligibility criteria, this is an opportunity to become part of a group of professionals whose high standing is recognised by their peers.

Find out more at bsecho.org/fellowship

British Society
of Echocardiography

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