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### Dr James Shambrook, BSCI/BSCCT President

As challenging as 2021 has been for all of us, I am delighted that the Society has been able to continue engaging with members and advocating for cardiovascular imaging. This culminated in September with the hugely successful Oxford meeting organised by Andrew Kelion, Jamie Kitt and our immediate past president Russell Bull. Everybody spoke so highly of the venue, course program and particularly the opportunity to meet face to face with friends and colleagues once again.

As we move forward into 2022, we have several activities on the horizon. The first of which is our new online learning platform created and organised by Michelle Williams; this site will contain educational content from a variety sources, bespoke content as well as talks from previous meetings and webinars. This will help members to access appropriate CPD for ongoing learning and accreditation.

We also plan to reinstate our monthly webinar program starting on Wednesday, 19 January with an interactive imaging case review meeting, focusing on learning from good imaging reads through to reporting discrepancies - an important practice for all imaging reporters to be involved in.

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Despite guidelines, we are aware that there are many challenges to initiate ECG gated images of the thoracic aorta in the acute setting. In the coming year led by Gareth Morgan Hughes we are looking at ways to help expand this practice to all acute trusts. Please do get in contact with the committee if you feel you can assist with this.

I am also delighted to confirm that Ben Hudson and Jonathan Rodrigues have kindly agreed to host the BSCI / BSCCT 2022 annual conference in Bath at the Bath Assembly Rooms on the 22nd and 23rd of September, with a pre-conference day on the 21st September - please save the date. I am sure it will be a fantastic event. Specific details regarding program content and booking your place will become available on our website in the New Year.

Finally, I want to take this opportunity to wish you all a very Merry Christmas and a Happy New Year. Please all stay safe, and I look forward to seeing you in 2022.

## Image of the month: CT simulation of the anatomical result post transcatheter repair of a sinus venosus defect and partial anomalous pulmonary venous drainage

Dr C. Mahon, Dr A. Kempny, and Dr T.Semple, Royal Brompton and Harefield Hospital

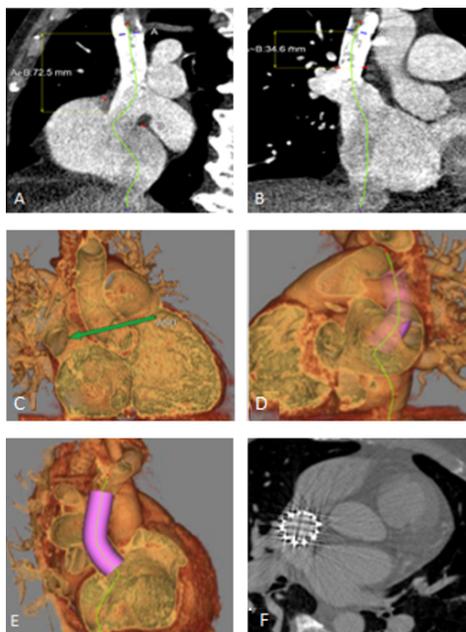
A seventy-year-old male with dyspnoea on exertion and new onset pedal oedema was referred for further management of a SVASD. He had presented 10 years prior with atrial fibrillation while undergoing pre-assessment for an elective knee replacement. Echocardiography at the time revealed a SVASD. The patient declined open cardiac surgical repair at the time. He had an uneventful knee replacement and was managed medically from a cardiac perspective. He was referred to our centre for consideration of novel transcatheter repair.

On examination his oxygen saturations were 98% on room air. His body mass index was 29kg/m<sup>2</sup>, blood pressure 125/80 mmHg, resting heart rate 79 beats per minute and irregularly irregular. His jugular venous pressure was elevated with prominent C-V waves. Chest auscultation revealed a grade 2/6 pansystolic murmur and clear lungs. He had a right ventricular heave. An ECG demonstrated atrial fibrillation at a rate of 72bpm with right bundle branch block and P-pulmonale in leads II, III and AVF.

Repeat transthoracic echocardiography demonstrated a 14 x 20mm SVASD with a left-to-right shunt at rest, severe right ventricle dilation with preserved function and a dilated inferior vena cava with <50% inspiratory collapse. A right heart catheter carried out confirmed left-to-right shunt. Cardiac output was calculated using Fick's indirect method. The transpulmonary blood flow (Q<sub>p</sub>) was 9.7L/min, the transsystemic blood flow (Q<sub>s</sub>) was 4.5 L/min and the Q<sub>p</sub>/Q<sub>s</sub> was 2.2. The PVR was normal on invasive assessment at 2.1 woods units.

A single-phase ECG triggered high pitch dual source spiral CT acquisition was performed using a weight-based CT angiography protocol. Images were reconstructed at 0.75mm slice thickness at an interval of 0.5mm, and reformatted using Aquarius iNtuition, Terarecon, Durham NC. In addition to the SVASD, the CT revealed two PVs anomalously draining to the SVC. The right upper pulmonary vein (RUPV) drained into the SVC immediately above the right atrium (RA) junction. The right middle pulmonary vein (RMPV) drained below the RUPV directly to the RA. The right lower PV and all left PVs drained to the left atrium (LA) (Figure 1 a-b). Curved planar reformats suggested that a 7 cm long stent could be used to redirect pulmonary venous return also demonstrated via virtual implantation of a stent (Figure 1 c-e).

A balloon test was performed prior to stent insertion. SVC balloon inflation with RUPV and RMPV angiogram was performed to confirm SVASD occlusion, and re-routing of the PVs without obstruction. The patient underwent successful closure of the SVASD and rerouting of the RUPV and RMPV to the LA (figure 1 f).



**Figure 1** a-b shows a curved planar reformat of the SVC from the level of the azygous to the RA with the SVASD and PAPVD; c shows the three-dimensional volume rendered image of the SVASD; d-e shows the virtual stent and f shows the actual anatomical result post SVASD stent insertion.

## Discussion

ASD is a common congenital heart defect with the prevalence of an isolated defect ranging from 0.5 to 2.5 cases per 1,000 live births (1). The resulting shunt depends on the type and size of the defect, the pressures in the RA and LA, the function of the atrioventricular valves and the diastolic properties of the ventricles (2). Many patients are asymptomatic at presentation with an ASD (2).

Closure of an ASD with signs of a significant shunt is associated with improved clinical outcomes as compared to conservative therapy, regardless of age (3). Signs of a significant shunt include right heart dilation or a documented increased  $Q_p/Q_s > 1.5$ . There is increasing evidence to support early ASD closure to improve morbidity (2, 4). The additional volume load from the shunt may lead to right heart dilation and associated progressive tricuspid regurgitation, increased risk of arrhythmia, and right ventricle dysfunction if untreated (2). In rare cases Eisenmenger's may occur (2). Our patient was a candidate for intervention with a  $Q_p/Q_s$  of 2.2. He had right heart dilation with preserved function, severe tricuspid regurgitation, and atrial fibrillation in the absence of increased pulmonary vascular resistance on invasive assessment.

Surgical correction is the standard of care and, until recently, was the only treatment option (5,6). The incidences of complications are low with surgical intervention and include the general morbidity of sternotomy and cardiopulmonary bypass as well as specific complications, such as sinus node dysfunction, pulmonary venous obstruction, and occlusion of the SVC (7). Our patient was reluctant for open cardiac surgical intervention, and the novel minimally invasive approach was considered appropriate. The transcatheter approach using a covered stent deployed in the SVC-RA junction was first published by Garg et al in 2014 (8). Since then the technique has been adapted and modified by others (9, 10, 11). The covered stent replaces the deficient posterior wall of the SVC, thereby closing the SVASD redirecting any anomalous PVs into the LA behind the stent (10).

SVASD is well known to be associated with PAPVD (10). PAPVD can be more complex than a single RUPV or RMPV anomaly entering near the SVC-RA junction or within the RA itself (12). Multiple anomalous PVs or accessory PVs may be present and anomalous PVs on the left side may drain to other locations (7,12). Careful selection of patients before transcatheter SVASD closure involves meticulous assessment of the size and position of the PVs relative to the azygous vein and the SVASD prior to stent deployment (7). Both CT and cardiac magnetic resonance imaging can provide a 3-D dataset of the PV anatomy. CT acquisition is quicker with a better spatial resolution and is currently the preferred modality.

The anomalous PVs need to be directed behind the covered stent to the LA without the stent obstructing the pulmonary venous pathway. Where the junction of the anomalous PV is adjacent to the SVASD, a compromise may be needed between complete closure of the SVASD accompanied by narrowing of the pulmonary venous pathway; leaving a clinically negligible shunt with a widely patent PV; or reconsidering surgery (7). Anomalous PVs that enter high into the SVC may need to remain draining to the SVC. A similar approach is often taken during surgical correction (7). If re-routing is necessary, and/or the risk of PV obstruction is high with stent deployment, then surgery should be considered. In the case presented the CT revealed two anomalous PVs and offered a clear delineation of the PV insertion and anatomic relationship to the SVASD near the RA junction. Superimposition of the stent suggested closure of the SVASD and re-routing of the PAPVD would not cause PV obstruction and could successfully re-route the PVs to the LA. This CT reconstruction with the stent simulation can provide useful information in the decision pathway as to whether to proceed with a transcatheter approach, but cannot replace the requirement for balloon interrogation. The test occlusion will continue to be performed prior to stent deployment, and where there is suggestion of PV obstruction during balloon interrogation of the defect a decision needs to be made whether to continue or abandon the procedure (7).

## Conclusion

Careful patient selection before transcatheter SVASD closure and meticulous assessment of the PVs is critical to a successful outcome without complication. CT 3D volume rendered images allow simulation of the stent anchoring positions, aiding decision making for whether to proceed with the transcatheter intervention.

References can be found [here](#).

If you have any interesting cases, please see more details [here](#) on how to submit it to our Image of the Month and stand the chance to have your case published in EHJ Case reports.



## Impact of the COVID-19 pandemic on cardiac diagnostic testing

Dr Michelle Williams

The coronavirus disease 2019 (COVID-19) pandemic has had a dramatic impact on healthcare around the world. In early 2020 the International Atomic Energy Agency organised an international survey on the impact of the COVID-19 on cardiac diagnostic testing around the world, which many BSCI/BSCCT members participated in.

The IAEA Noninvasive Cardiology Protocols Study of COVID-19 (INCAPS COVID) survey found that between March 2019 and March 2020 there was a 47% reduction in procedure volumes around the world. Data on procedure volumes was collected from 845 centres, 241 of which were in Europe. There was a greater reduction in cardiac procedures in Europe compared to the rest of the world in March 2020 (45% vs 41%  $p=0.003$ ), but by April 2020 this was similar in Europe and the rest of the world (69% vs 63%,  $p=0.261$ ). In March 2020 location in Southern Europe was the only independent predictor of the reduction in procedure volumes, but in April 2020 lower gross domestic product and higher COVID-19 deaths were both independent predictors.

We eagerly await the results of the INCAPS COVID 2 survey which assessed changes in cardiac diagnostic testing in 2021. Thank you to all of the BSCI/BSCCT members who participated in INCAPS COVID and INCAPS COVID 2 survey.

Open access

Health care delivery, economics and global health care

## **openheart** Impact of COVID-19 on the imaging diagnosis of cardiac disease in Europe



## Research Committee Update

Dr Jonathan Weir-McCall

& Dr Jason Tarkin



In October myself and Jason Tarkin had the great pleasure of taking on the mantle of the research committee from Michelle Williams and Matthias Schmitt. Last year we saw the society pool together to complete a Delphi survey to help guide future research agendas in cardiovascular imaging (available open access at: <https://bit.ly/3yviRss>).

It is now the goal for myself and Jason to help work with the members of the society to enable you to tackle these key issues, making cardiovascular research as approachable and attainable as possible for its members. We have taken one step in this direction through the engagement and representation of the society in the BHF Clinical Research Collaborative. This is a multi-societal collaboration led by the BHF to improve cardiovascular research within the UK. We will provide a voice for the essential role that cardiovascular imaging undoubtedly plays in modern clinical medicine, which will only continue to grow. In 2021 we will also look to creating a database of research-interested and research-active cardiovascular imagers, such that if someone wished to recruit investigators at other centres for multi-centre trial work, they could refer to this list and directly reach out to all those who have a similar interest.

In 2020 we saw the beginnings of the highly successful BSCI webinar series. The 2022 webinar series will commence in January, with the first talk from James Shambrook speaking on discrepancies and errors in cardiovascular reporting. These educational lectures will be interspersed with some research focused talks bringing together talks from cutting edge researchers, and 'how to' sessions covering statistics, R&D, ethics and funding. Please do not hesitate to reach out to us directly ([jw2079@cam.ac.uk](mailto:jw2079@cam.ac.uk)) if either you have an idea for a talk or even to volunteer to speak at one of these events.



## September's BSCI/BSCCT conference

Dr Andrew Kellion

After two and a half years of planning, cancelling and rebooking, it seems hardly possible that the BSCI Conference at Keble has finally happened. I hope that you agree with me that it was worth the wait.

Keble was a beautiful setting, and the conference facilities were just right for a meeting of our size. The College bedrooms were clean and functional, and certainly better than anything I ever inhabited as a student. It may not have been the Randolph, but there was the distinct advantage that you could roll out of bed in the morning, have breakfast and plunge straight into the Conference.



Every session turned out pretty much as we had hoped, with a great balance of education and entertainment. The parallel read-with-the-experts sessions worked well, with a good number of attendees but not so many that the main lecture theatre felt empty. The debates were fun, the Quiz was fantastic, the keynote lectures were excellent, the trainee presentations were slick, and my knowledge of imaging babies, the dead and especially dogs and cats has increased dramatically. The national audit, infiltrative heart disease and top-5-papers-in sessions were of international quality also.



Of course there were one or two technical glitches. I will not easily forget the steam coming out of James Shambrook’s ears when the Terarecon laptop arrived late for his ACHD session, or Virginia Luis Fuentes’ amazing ability to keep talking and answering questions about veterinary cardiology despite the worst that Powerpoint could throw at her! However, all-in-all it went pretty well to plan and - with thanks to our chairs - to time.

The drinks reception followed by dinner in Hall on the Monday evening was a particular highlight, and the College left the bar open till late afterwards. More than anything, it was a treat to see everyone face-to-face, and have a few drinks with some new friends as well as old ones.

Special thanks must go to Jamie Kitt and his colleagues on the BSCI Juniors’ Committee, and to Senan Simmons and his staff at Keble for making this such a memorable meeting.



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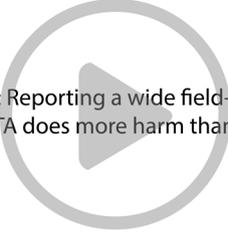
The Future of Cardiovascular CT  
Eric Williamson, MD





Debate: Most PCI in patients with  
stable CAD is an unnecessary mistake





Debate: Reporting a wide field-of-view  
in CCTA does more harm than good



