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Advanced Imaging Day 8  
Friday 17th April 2015  
Royal Society of Medicine, London

Provisional Programme

Please note this programme is subject to change.
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- Clinical morphology of RV outflow tract
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- Diagnostic work up - Role of echocardiography in pulmonary valve disease and TOF
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- Surgical pulmonary valve replacement - Indications, type of prosthesis and procedure
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- Clinical presentaion, natural history and management considerations
- Role of echocardiography in diagnosis and risk stratification
- Cardiac MRI in ARVC
- Intervention in ARVC - indications for AICD and VT ablation
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The registration fee for this meeting is £65 per delegate.

Registration will take place via the Royal Society of Medicine website

5 BSE re-accreditation points are awarded to this meeting. CPD points applied for.
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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, Docklands Business Centre, 10-16 Tiller Road, Docklands, London E14 8PX, Tel. 020 7345 5185, Fax 020 7345 5186 Email ingrid@bsecho.org. Members of the society are invited to submit articles, case reports or letter correspondence. Submissions should be to ‘The Editor’, ECHO and forwarded by email to: editor@bsecho.org and copied to ingrid@bsecho.org. The format should be text as a normal word document and images supplied as high resolution 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 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Submissions to ECHO are currently not peer reviewed but may soon become so, changes will be advised. The Editor has discretion on acceptance. Patient consent is required for case reports. It should be noted that opinions expressed in articles or letters are the opinions of the author(s) and not of the council of the British Society of Echocardiography (BSE). Official BSE council views or statements will be identified as such. Information in respect of advertisements can be obtained from ingrid@bsecho.org.
It is now almost a quarter of a century since the foundation of the British Society of Echocardiography and the ambitions of those who set out the aims of the charity remain as important today. Our Society was established for the ‘advancement of education and training, and the promotion of best practice in echocardiography’ ...and to encourage ‘high standards of professional competence in echocardiography for the benefit and protection of the public’. Over the years, the Society has developed accreditation, revalidation, departmental standards, protocols, guidelines, meetings and many other undertakings, all with the aim of optimising standards. Each of these activities require a commitment of time and energy from those engaged in the process, yet sometimes I have heard the complaint that the same faces appear on Council and Committees that have represented the membership for many years. So it was with interest that the Office recently sent out a membership survey on the issue of engagement with the Society, and the most frequent replies are understandable. The main reasons highlighted for not putting oneself forward were: lack of support in the workplace; lack of time; and nothing to offer. These are reasons that strike close to home for many, with two elected Council members attending meetings regularly and committing to Accreditation and Secretarial duties only by taking annual leave. With clinical demands on echocardiography increasing on a yearly basis, this situation will become more commonplace, and the Society will need to think of ways to combat this reluctance on the part of employers to support quality improvement. Lack of time is a common complaint from almost anyone I meet, whether at work or elsewhere – we are all ‘time-poor’ but again, some Council members are among the busiest people I meet, so this presumably is an issue of priority. Then comes the question of having something to offer. I have met very few people who, when asked, do not have an opinion on some aspect of the work the Society does, whether it be the programme for the annual meeting, the quality of the social event, a question regarding the right point in the cardiac cycle when to measure the sinus and aortic root dimensions. If you have an opinion, you have something to offer. So one of the issues that I would most like to approach is how we can encourage more people to get more active within the BSE – the higher the level of engagement, the more we can do to improve what we and others do with echocardiography. This engagement, I hope, comes in a number of ways.

Firstly, for those interested and wish to consider involvement, both the Council and Committees encourage and will welcome visitors to our meetings. The dates are planned well in advance, and we hope you would consider contacting the Office to put your name forward to visit, without needing to commit yourself but to have a look at the issues discussed. The facilities that we use do not have a lot of spare room, so we could not have a lot of members attending any one meeting but we will try to come up with times that suit you. If you do not feel you have enough time, we plan to give you the opportunity to contact each person by e-mail, following short piece in each edition of Echo that carries a summary of what we do and what we are currently involved in, followed by our e-mail.

Secondly, all our members need to think about the issue of engaging others who are carrying out echocardiography. The arrival of ever smaller, more portable machines at lower cost means that echocardiography is becoming commonplace outside the Cardiology department. Our Society is an echocardiography society, not one restricted to cardiologists or physiologists. We each may have issues with the quality of studies performed elsewhere or by those with limited training – but I would argue the way forward is not to follow King Canute, standing before the rising tide but to consider the comment of William Yeats ‘Education is not the filling of a pail but the lighting of a fire’. If our members (busy as we all are) engage with those coming from intensive care, acute care, and emergency medicine, we have an opportunity to light the fire of engagement that goes far beyond FEEL, FATE, FICE and other limited studies. In order to try to engage all other groups coming to echo, the BSE has set up accreditation processes in ICU/CC but we are planning further engagement, by encouraging mutual meetings and educational events relevant to the sub-specialities. When the next person comes down to your unit, do not send them packing but set out your requirements – regular attendance over 2 years and a personal commitment to a formal process of accreditation.

Thirdly, we are seeking involvement across the UK and Ireland, from all our members wherever they are – all of us can help with images (contact Jim Newton), articles (contact Gordon Williams and Jane Allen), learning modules (contact Will Bradlow) and in many other ways through the net. I have heard the comment that the BSE ‘does nothing for us in our region’ but we hope to encourage engagement across all our members wherever they may be by delivering local events. This is at a planning stage, and we are trying to avoid the old format of ‘regional representatives’ which in some locations was perceived as divisive. Tim Griffiths is one of the newest representatives on Council and has bravely taken this big task on, so I urge you to contact him, if you have an opinion.

I would like to end my first Presidents’ message with reflection on the work of the last President, in whose steps I fear to tread. Guy Lloyd has achieved a huge amount, pushing through the registration of clinical scientists and arguing hard on the side of the BSE both in this and in the accreditation process IQIPS, encouraging the development of the website, the national survey, publications on contrast and many other items on behalf of the Society. One achievement that I know lies close to his heart is the establishment of formal process of accreditation.

One achievement that I know lies close to his heart is the establishment of accreditation as a process. The formal process of accreditation, accreditation, revalidation, departmental standards, protocols, guidelines, meetings and many other undertakings, all with the aim of optimising standards. Each of these activities require a commitment of time and energy from those engaged in the process, yet sometimes I have heard the complaint that the same faces appear on Council and Committees that have represented the membership for many years. So it was with interest that the Office recently sent out a membership survey on the issue of engagement with the Society, and the most frequent replies are understandable. The main reasons highlighted for not putting oneself forward were: lack of support in the workplace; lack of time; and nothing to offer. These are reasons that strike close to home for many, with two elected Council members attending meetings regularly and committing to Accreditation and Secretarial duties only by taking annual leave. With clinical demands on echocardiography increasing on a yearly basis, this situation will become more commonplace, and the Society will need to think of ways to combat this reluctance on the part of employers to support quality improvement. Lack of time is a common complaint from almost anyone I meet, whether at work or elsewhere – we are all ‘time-poor’ but again, some Council members are among the busiest people I meet, so this presumably is an issue of priority. Then comes the question of having something to offer. I have met very few people who, when asked, do not have an opinion on some aspect of the work the Society does, whether it be the programme for the annual meeting, the quality of the social event, a question regarding the right point in the cardiac cycle when to measure the sinus and aortic root dimensions. If you have an opinion, you have something to offer. So one of the issues that I would most like to approach is how we can encourage more people to get more active within the BSE – the higher the level of engagement, the more we can do to improve what we and others do with echocardiography. This engagement, I hope, comes in a number of ways.

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How Would Rigorously Using the ASE Appropriateness of Echocardiography Impact on Echo Requests at a District General Hospital?

Background

Echocardiography is a vital imaging modality for contemporary clinical cardiology and internal medicine. However, not all scans are necessary or appropriate. To assist clinicians in decision-making, the American College of Cardiology Foundation (ACCF) and the American Society of Echocardiography (ASE) collaborated to produce appropriateness of use criteria (AUC) for transthoracic echocardiography (TTE). We applied these criteria to our practice in a District General Hospital, to understand how their use might affect referral for TTE.

Methods

TTE requests were collected over a two-week period. Information was recorded on patient demographics, request location, referrer details, previous echocardiography history, and the indication for scanning. The 2011 AUC were used to classify requests as being Appropriate (A), Inappropriate (I) or Uncertain (U).

Results

219 requests were analysed, with a patient age range of 16 to 95 years (Mean = 67.9 years). Requests were made from outpatients (40.45%, n = 89), inpatients (36.82%, n = 81) and primary care referrals (22.27%, n = 49). Of inpatient referrals, 56.4% (n = 124) were from a cardiologist. Overall, 65.30% (n = 143) of all requests were appropriate, 34.25% (n = 75) were inappropriate, and 0.46% (n = 1) were uncertain. Inappropriate requests represented 39.33% (n=35) of outpatient requests, 25.93% (n=21) of inpatient requests and 38.78% (n=19) of requests from primary care referral. 59.86% (n = 74) of requests by cardiologists were appropriate compared to 71.88% (n = 69) of requests by non-cardiologists. 36.82% (n = 81) had evidence of a previous scan. Of the 75 inappropriate requests, 53.33% (n = 40) had evidence of a previous scan, with the majority of these (65%, n=26) being in the previous 12 months.

Conclusion

This retrospective analysis adds to findings of previous studies in suggesting that many echocardiography requests do not meet the ASE appropriateness criteria and in particular ensuring that many are repeated often inappropriately. Rigidly following the AUC could avoid up to 33% of scans being performed.

Background

Echocardiography is a vitally important cardiac imaging modality, the use of which has increased exponentially in recent years (Alqarqaz et al. 2012). Guidelines for most (but not all) cardiac diseases incorporate some structural or functional aspect of heart disease that can be gleaned from echocardiography. The increased use of imaging is a significant contributor to the general rise in healthcare costs due to its low risks but high potential benefits for patients (Fonseca & Marwick 2014). It is likely that the inappropriate use is increasing too, with studies showing that at least 1 in 10 scans could be avoided (Gurzun & Ionescu 2014). This is an increasing problem within acute medicine, many resultant Holter monitors and Echocardiograms are normal, suggesting that these may not be the most appropriate investigations for many patients (Garg, Saha & Clark 2006). The increased use of Echocardiography has cost implications for those commissioning healthcare services and, due to increased demand on services patients suffer due to increasing waiting times (Alqarqaz et al. 2012, Gurzun & Ionescu 2014).

In order to better direct its usage, The American College of Cardiology Foundation (ACCF) and the American Society of Echocardiography (ASE) met to produce criteria to guide the use of Echocardiography. Their Appropriate Use Criteria (AUC) was published in 2007 (Martin et al 2007) and revised in 2011 with more clinical scenarios (Douglas et al 2011, Patil et al 2012). The criteria suggest that the uses of echocardiography were to: a) make an initial diagnosis, b) guide therapy/management (regardless of symptom status), c) evaluate a change in clinical status or cardiac exam, or d) follow-up without change in clinical status. These were then mapped to clinical indications and a taskforce assessed the best available evidence and determined a consensus viewpoint on the usage of Echocardiography in these scenarios being Appropriate (A), Inappropriate (I), or Uncertain (U).

Fig. 1. Echocardiography AUC by indication (Reproduced from Douglas et al 2011)

One of the criticisms of the AUC is that there are many requests deemed inappropriate in which others would argue the scans were appropriate. The taskforce have acknowledged that there is often insufficient trial data available to make a consensus decision, and have suggested that clinicians continue to review decisions on a case-by-case basis (Martin et al 2007).

It has been shown that the AUC can be used to allow better targeting of limited resources in America (Hendel 2008). The drivers to perform and availability of echocardiography in the
In total 220 requests were received, with 1 request being inappropriate (I), or uncertain (U), and the outcome was recorded as being appropriate (A). The appropriateness score was discarded if multiple indications for a study were documented on the paper and verified by an experienced independent cardiologist. If indications, and high scores (7–9) designate appropriate indications, medium scores (4 – 6) identifying uncertain indications, and low scores (1 – 3) denoting inappropriate indications. The appropriateness score was discarded if multiple indications for a study were documented on the paper and verified by an experienced independent cardiologist. If indications, and high scores (7–9) designate appropriate indications, medium scores (4 – 6) identifying uncertain indications, and low scores (1 – 3) denoting inappropriate indications. This assessment was made by a cardiologist registrar and verified by an experienced independent cardiologist. If multiple indications for a study were documented on the paper request form, the indication that best described the clinical situation was selected. The appropriateness score was discarded and the outcome was recorded as being appropriate (A), inappropriate (I), or uncertain (U).

Methods

Existing Processes

TTE requests are sent to the department on paper request forms for both in-patient and outpatient investigations. In patients are triaged by either a member of the medical or cardiology team. Out-patient requests are triaged initially at a clerical level, to look for evidence of previous scanning within the last 12 months, and then, those not from a consultant cardiologist, are triaged by physiological staff. Compliance with the process is not routinely monitored.

Data Collection and Analysis

ECHO Request forms were analysed from all studies from 7th January 2013 to 19th January 2013 at Eastbourne District General Hospital. These requests came from a diverse group of referrers from inpatients, outpatients and referrals from GPs (these primary care referrals were initially screened by consultant cardiologists). Patient age, request location, referrer information, previous Echocardiography history, and the indication for scanning were determined for all patients. For Echocardiography history, whether patients had previously had scans, and the year of the latest scan was recorded. The request location was recorded as being Inpatient (IP), Outpatient (OP), or from General Practice referrals (GP). All referring clinicians were categorized as being either cardiologists or non-cardiologists. Because of the retrospective nature of the exercise, no data was available on request forms triaged away from an echo study at source.

 Appropriateness of use criteria

Data was collected and inputted on Microsoft Excel®, and Echocardiography studies were classified using the 2011 AUC (Douglas et al 2011). The indications for Echocardiography are graded from 1 to 9, with lowest scores (1 – 3) denoting inappropriate indications, medium scores (4 – 6) identifying uncertain indications, and high scores (7–9) designating appropriate indications. This assessment was made by a cardiologist registrar and verified by an experienced independent cardiologist. If multiple indications for a study were documented on the paper request form, the indication that best described the clinical situation was selected. The appropriateness score was discarded and the outcome was recorded as being appropriate (A), inappropriate (I), or uncertain (U).

Results

In total 220 requests were received, with 1 request being excluded due to lack of information on the request form, leaving a final sample size of 219. The requests were for a variety of indications, with the three most common being for the investigation of arrhythmias (15.28%), shortness of breath (12.96%), chest pain (11.57%) and heart failure (10.19%). The patient age ranged from 16 to 95, with a mean of 67.9 years.

We found that 40.45% of requests (n = 89) were from outpatients, 36.82% (n = 81) from inpatients and the remaining 22.27% (n = 49) were requested from General Practice referral. Of the outpatient requests, 56.4% (n = 124) were from a cardiology with 43.6% of requests (n = 96) coming from other clinicians.

Using the AUC as described in our method, we found that 65.30% (n = 143) of all requests were appropriate, 34.25% (n = 75) were inappropriate, and 0.46% (n = 1) were uncertain. We found that inappropriate requests represented 39.33% (n=35) of outpatient requests, 25.93% (n=21) of inpatient requests and 38.78% (n=19) of requests from GP referrals to a cardiologist. The AUC were envisaged as a way to protect resources and the cost savings/capacity increase that would result from their incorporation into the routine triage process.

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<td>Uncertain</td>
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Fig. 2. Table showing AUC classification in different clinical settings

Of the 219 total scan requests, 36.82% (n = 81) were reported to have had a previous scan. Of the 75 inappropriate requests, 53.33% (n = 40) had evidence of a previous scan, with the majority of these (65%, n=26) being in the previous 12 months.

Discussion

This study demonstrates that if AUC were rigidly applied then one third of all scans undertaken would not be performed. This could represent a major cost saving or efficiency increase leading to shorter waits. Furthermore the level of inappropriate requests was more common from cardiology, which generally undergo lighter triage and scrutiny, than from the emergency department. This was particularly true of primary GP referrals that were triaged by consultant cardiologists, suggesting that echocardiography in these cases may have formed part of a ‘general cardiac screen’ type approach. These findings occurred despite a departmental triage policy being in place.

 Appropriateness of Use Criteria

The AUC were envisaged as a way to protect resources and direct the use of Echocardiography (Martin et al 2007). However, some authors question whether we should be using AUC at all. For example, Fonseca and Marwick note that the limitations of the AUC are that it is determined by a consensus view and poor evidence and does not include all indications for Echocardiography (2014). However, the 2011 guidelines incorporate several indications that were not incorporated into the original version (eg: pre- and post- transplant scans), albeit often as ‘unclear’ indications (Alqarqaz et al 2012, Mansour et al 2012). Our study adds to the bulk of literature that promotes the use of AUC to target TTE to those who most benefit from the investigation.

The overall aim was to audit our practice and to identify potential service improvements. The percentage of appropriate...
requests was 65.30% (n=143), which is lower than recent studies (Alqarqaz et al. 2012), but higher than the 56% reported by Kirkpatrick et al (2009). Improving the percentage of appropriate studies focuses on those that are more likely to have an impact on patient management and show new/significant changes (Alqarqaz et al 2012, Ballo et al 2012, Mansour et al 2012). This was not addressed in our study, as we did not assess scan findings to determine their impact on patient management. Some authors have suggested acute medicine departments in particular as inappropriate requesters of scans because a high percentage of these scans are normal. For example, one study found that 44.8% of the TTE requests to assess left ventricular function were normal (Garg, Saha & Clark 2006). However, this is a controversial issue because other studies have found no correlation between the AUC classification and significant scan findings (Kirkpatrick et al 2009). Therefore, clinicians should be cautious in applying the AUC without discretion to target which patient to scan.

Source of referrals

Our referrals came from a variety of sources that we grouped into inpatients, outpatients and primary care; a similar variety to previous UK studies (Gurzun & Ionescu 2014, Vijayan, Khanji & Ionescu 2011). In line with previous studies, we confirmed that inpatient requests were more likely to be appropriate compared with those from outpatients and primary care (Gurzun & Ionescu 2014).

It might be assumed that Cardiologists would be better than other clinicians at ordering appropriate scans. However, our study suggested that Cardiologists ordered a greater percentage of inappropriate scans than other clinicians. This repeats findings in a UK tertiary cardiology centre which suggested that major reductions in the number of scans undertaken could be made by rejecting inappropriate requests from cardiothoracic surgeons and tertiary cardiologists (Vijayan, Khanji and Ionescu 2011). This however is a contentious area for discussion as Gurzun & Ionescu suggested that more requests should come from Cardiologists in order to increase the "yield and effectiveness of ECHO" (2014).

In our study, requests generated from cardiology came from a variety of sources, including junior and senior clinicians. There is significant concern at present over training of cardiologists in Echocardiography, and we believe that this may be feeding into the level of inappropriate requests we have observed. In December 2013, The British Society of Echocardiography (BSE) and the British Junior Cardiologist’s Association (BJCA) met to discuss concerns over the poor state of training in Echocardiography in the UK (Kydd et al 2014). Without proper training, the trend of inappropriate requests from Cardiologists is likely to increase.

Service Improvements

We found that over a third of patients in our study (36.82%, n = 81) had evidence of a previous scan. This finding replicates those of Gurzun & Ionescu, who suggested that the use of the AUC criteria could prevent 1 in 10 scans (2014); our study has suggested that this figure could be even higher (more than 3 in 10 scans). This is an example of how the AUC can be used to audit practice and to drive local service improvements. In this instance, by reducing the number of inappropriate studies we could reduce demand on the service. However, there are certain indications that, if applying AUC strictly, are inappropriate but many clinicians would see the benefit of doing the scan.

In our study, the most common requests were for the investigation of arrhythmias, shortness of breath, chest pain and heart failure. As we have discussed already, many of these requests are inappropriate according to the AUC. Without further clinical information, such as prior scans and cardiac diagnoses, it is difficult to assess these scan requests against AUC. A theme of the AUC is that repeat scans are not considered appropriate unless there is a change in patients’ clinical status (Martin et al 2007, Douglas et al 2011). Ballo et al found that many studies were inappropriate because patients had a cardiac diagnosis but had no changes in their clinical signs and symptoms (2012). In addition to this, other studies have shown that the most commonly ordered inappropriate investigation was “routine surveillance without change in clinical status”, often ordered for heart failure patients (Patil et al 2012). Clearly the re-evaluation of heart failure patients is an area for future discussion as this is a frequent cause of inappropriate requests (Fonseca & Marwick 2014). Other common inappropriate requests include initial evaluation of patients with no other evidence of valvular or structural heart disease (Gurzun & Ionescu 2014).

Whilst we have used the AUC to audit and improve our service there are many ways this can be used. Of note, American studies have shown that web-based decision-support applications that use the AUC are a rapid, feasible, and accurate method to determine if a scan is appropriate at the point of service. The authors suggest that applications like this can be used in echocardiography laboratories with minimal disruption in clinical workflow, allowing clinicians to spend more time with patients and provides an opportunity for clinical audit (Bhave et al 2011).

There is a bulk of research that demonstrates the role that point-of-order decision-support applications have in reducing the inappropriate use of radiology procedures (Vartanian 2010). It has been theorised that these applications educate clinicians regarding inappropriate test indications or force them to think critically about it the test is indicated and/or necessary (Hendel 2008). However, other authors feel that clinicians would find ways around this ‘gatekeeper’ system and the AUC are best used for audit and to direct clinician education by identifying trends (Fonseca & Marwick 2014).

Limitations

Our study has several limitations. Firstly, our sample size (n = 219) is small and therefore may not be representative. This sample also represents only 12 days of referrals and so this snapshot may not be representative of our practice. Additionally, the clinical indication for Echocardiography was extracted from a free-text box on a paper request form without access to the medical records. Whilst every attempt was made to record the indication that best described the clinical scenario, many forms were poorly written or had multiple requests so this may not have given an ideal representation of the request. The analysis did not differentiate between junior and senior referrers nor did it analysis specific the level of triage that has been undertaken. Finally, we must remember that these guidelines are produced by Cardiology organisations in America and may not be applicable to the UK population. However, as the AUC have been extensively validated in America and trialed in Europe and Wales (Gurzun & Ionescu 2014), this is unlikely to be an issue.

PAGE 7
Recommendations

Based on these and other findings in the literature the following recommendations have been developed:

1) All TTE requests should be triaged completely and equally.
2) AUC (such as the one used in this study) should form the basis of triage
3) All requests which deviate from AUC either in terms of timing or indication of the TTE should be discussed with a senior cardiac sonographer (medical or physiological)
4) The triage process should be visible and auditable

Conclusion

We have used this opportunity to assess our practice against the AUC guidelines, and identify areas we can learn from and improve our service. If applied to our practice 36 out of every 100 scans would not be performed with huge implications for either overall cost; as each simple echocardiogram is priced at £74 per scan, this gives a total of £2664 for 36 scans (NHS National tariff payment system 2014/15). This improvement in efficiency would reduce service demand and lead to shorter waiting times. Our results complement previous studies that suggest that many ECHO requests are inappropriate. Our study has highlighted the importance of checking if patients have had recent scans, because it is often unnecessary to repeat the study, and that the completeness of this process should be the subject of periodic audit. We are concerned about the state of training for Echocardiography and BICA & BSE plans to improve training are successful and well received by trainees. AUC has a broader role to play in helping clinicians focus on eliminating unnecessary testing and promote a greater awareness of health care costs. However we also suggest that clinicians should always make decisions on a case-by-case basis in collaboration with expert echocardiographers as patients do not always mirror the clinical scenarios described in guidelines.

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References


SYSTOLIC MURMUR: QUERY CAUSE

How does this echo request make you feel? Are you challenged to find the elusive cause or frustrated that so often no cause for a murmur is found? Maybe you are despondent that it was likely made for no good clinical reason and without any audible murmur, but because the FY1 knows you can’t say no to this pre-op request.

It may come as a surprise that in the early 20th century, cardiologists largely dismissed systolic murmurs as unimportant. Instead there appears to have been an obsession with the cause and importance of heart sounds as demonstrated on phonograms. Their legacy is the pain junior doctors endure in understanding reverse splitting of the second heart sound just before their PACES exam. Just as these same doctors now regard all abnormal ECGs as “ischaemic”, now all murmurs are just “systolic”. Certainly, it is a rarity on the post-take round to find someone has picked up a diastolic murmur or made any mention of the heart sounds.

So how should we approach such a request? Firstly, it needs to be put in context. Echo requests for murmurs are usually made in the following situations:

• On examination for an unrelated condition
• Outpatient clinic/GP assessment of cardio-respiratory symptoms
• Inpatient with possibly cardio-respiratory illness
• Pre-operative screening for non-cardiac surgery

As I always tell my registrars when they see a new patient in clinic, “make sure you answer the referrer’s question”. It is not enough to simply provide a standard report. You need to consider who will read your report and how they will interpret it. The following questions are worth considering:

HAVE YOU FULLY EXCLUDED ALL POSSIBLE CAUSES FOR THE MURMUR?

Is there documented evidence that you considered more than just four valves as a cause?

You should image and document all views that interrogate the causes of murmurs. If you are unable to image a certain view (eg supra-sternal), you should document that this view is deemed technically difficult study. You need to impart on the reader how confident you are that all important causes have been sought.

DOES THE ABNORMALITY IN THIS REPORT ACTUALLY REPRESENT THE MURMUR HEARD?

Too often I have seen mild MR being labelled as the cause of the murmur. This is highly unlikely. The severity of a valve lesion usually (but not always) affects its loudness on auscultation. Furthermore, if you identify dysfunction that causes a diastolic murmur, this will not directly explain a systolic murmur (I say directly since moderate or severe AR will cause increased forward flow across an aortic valve and result in a systolic murmur that might be more readily heard than the quiet whisper of diastolic regurgitation).

WHAT WAS NOT WRITTEN ON THE REQUEST CARD?

You should also consider what the referring clinician has not asked for but is more important for the patient. It is a sad fact that not all referrals are truthful. Junior doctors are not expert in the benefits of one test over another, nor do they always have the confidence to do nothing. They are also unfamiliar with the concept of “utility cost”, how long a BSE quality echo takes to perform and report, or the average delay the request may add to the patient’s journey. Once they have decided an echo is required, they are upset if this is then refused or not prioritised as “of course, I’ll do it now”. Sometimes they are just the messenger and don’t fully understand why they were asked to make the request in the first place – they may be fearful of asking for an explanation. Doctors also learn from their seniors and peers that certain requests cannot be turned down. A pre-op systolic murmur is the equivalent of “suspected cerebral abscess” for a CT head. Thus “systolic murmur, query cause” may appear on the request form even though no murmur was heard. The original “cardiac” problem that they thought might need an echo may be palpitations or dizziness but they are unsure if this problem truly warrants an echo and fear rejection. Clearly an echo focussed on looking for causes of a murmur may not spend so much time imaging what the patient’s real problem was – such as an aneurysm in the right ventricle. This is one reason why the BSE always recommends a full standard dataset.

HOW GOOD ARE THE CLINICAL SKILLS OF THE REQUESTING DOCTOR?

So let us presume for the moment that auscultation has revealed a murmur. How likely will clinical examination point to the correct cause? In medical school, we are taught that the key characteristics of a murmur are intensity, timing, envelope, location and radiation. Whilst most contemporary murmur requests are unlikely to contain any of these basic details, occasionally you will get such data. However, if the referring doctor nails his colours to the mast, is he likely to be correct – even a Consultant Cardiologist? Given current waiting times for outpatients, it is common practice to arrange an echo before the patient is seen in clinic. Therefore the request by the Cardiologist may just repeat the GP’s clinical findings (that’s my excuse). In reality, clinical examination is a guide and the characteristics we are taught are actually only modestly discriminating.

CAUSES OF A MURMUR IN ADULTS

The following is a run through of the likely causes of a murmur (not just systolic) in an adult patient referred for an echo; the common causes will be quite different if you work in paediatrics or congenital heart disease clinics.

Aortic Regurgitation

This is relatively uncommon and often picked up for the first time on echo as the murmur is difficult to hear. It gives a high pitched sighing decrescendo early diastolic murmur at the upper left sternal edge that is louder on expiration. Moderate AR is just audible in a quiet room. Mild AR is inaudible and will not be the cause of a murmur.

Aortic Stenosis

This is the most important murmur to be excluded, especially pre-operatively. Classically, it gives a coarse ejection systolic murmur at the upper right sternal edge. Unfortunately even aortic sclerosis will cause an audible murmur so the diagnosis of stenosis is often over-called clinically. Mild AS may be confined to the base or just the apex. Moderate AS is heard over a wider area and severe AS across a “broad apical-base” area. Severe AS often has a musical quality, which may be easily heard at the apex and confused with MR (the Gallavardin
phenomenon). Severe AS prolongs the murmur but paradoxically it can be quieter, particularly if the ventricle fails – the clue to its severity is the quiet or absent second heart sound and the pulse character.

Severe AS significantly increases the peri-operative risk and this must be highlighted in any echo conclusion.

**Mitrail Regurgitation**

This is probably the commonest systolic murmur identified. Classically, it gives a pan-systolic blowing murmur at the apex, radiating to the axilla. It will be late-systolic in prolapse. Mild-moderate MR is often just heard localise to the apex. Moderate-severe is heard over a “broad apical” area and severe MR may extent to both the axilla and up to the base. Severe MR is both louder and longer.

Echocardiography is so sensitive for MR that mild-moderate MR will be faint to most ears and mild MR is definitely inaudible. Therefore mild MR is unlikely to be the cause of a murmur. Having said that, MR can be dynamic and vary with both exertion and position. One patient I knew had an MR murmur so loud you could hear it without a stethoscope sitting opposite her when she leaned forward but it was inaudible with a stethoscope and only mild on echo when she leaned back onto her side for the echo. Fortunately the astute GP did not believe the initial open-access echo report and sent her for clinical review.

Asymptomatic severe MR is surprisingly well tolerated peri-operatively but since you are not assessing symptoms, it needs highlighting in the conclusion.

**Mitral Stenosis**

This is now rare. There are very few British-born patients who had rheumatic fever and are still alive, but you will see it in younger patients from Eastern Europe, Asia or Africa. It gives a quiet low-pitched diastolic rumble at the apex. Zen-like calm and specific (and rarely performed) patient positioning are required to hear it. Mild-moderate MS is unlikely to be audible. Significant MS is a risk factor peri-operatively and, more importantly, is a significant risk for labour.

**Tricuspid Regurgitation**

This is commonly seen on echo but less often heard. Even moderate TR can be missed clinically as the pressures on the right side are low. Mild-moderate TR is unlikely to be audible. It gives a pan-systolic murmur at the left sternal edge, louder on inspiration. It does not extend to the base or apex. Its presence, in the context of peri-operative risk, is purely related to the estimated PA pressure you obtain from the flow rather than the severity of the regurgitation.

**Tricuspid Stenosis**

This is as rare as hen’s teeth in the UK. There is always associated MS due to rheumatic fever.

**Pulmonary Regurgitation**

Similar to AR, this gives a soft decrescendo sigh but heard loudest over the 3rd-4th intercostal spaces on the left sternal edge, louder on inspiration. It is rare in patients not known to have congenital disease. Even moderate PR is usually inaudible. Markedly raised PA pressures or a dilated PA will make it more audible.

**Pulmonary Stenosis**

This is usually diagnosed in childhood and, if severe, increases peri-operative and maternal risk. It is very rare. It gives an ejection systolic murmur along the left sternal edge.

**Ventricular Septal Defect**

This is usually known from childhood but is occasionally picked up later. Small VSD’s (usually peri-membranous) can give very loud harsh murmurs (pan-systolic at the left sternal edge, with no respiratory variation). Large VSDs may be quiet and signs of pulmonary hypertension may predominate.

This is one area where the stethoscope can be more useful than the echo – turbulence seen in the peri-membranous area is occasionally seen on an otherwise normal echo and ruling out a small VSD can be difficult – such a small VSD would be easily heard with a stethoscope.

**Atrial Septal Defect**

Flow through the defect itself (Figure 1) does not cause a murmur. Rather the volume overload of the right heart causes a systolic flow murmur through the pulmonary valve. The key audible finding is a fixed split S2.

![Figure 1: A large ostium secundum ASD will result in a pulmonary flow murmur](image1.png)

**Patent Ductus Arteriosus**

This gives the unusual continuous “machinery” murmur, heard in both systole and diastole at the upper left sternal edge. It sounds like the engine in the base of a ship. Unless you specifically look with colour Doppler distal to the pulmonary valve, you will miss this on echo (Figure 2 & 3).

![Figure 2: Commonly used colour flow box for pulmonary valve assessment led to a final report: “no cause for murmur found”](image2.png)
Figure 3: After the GP’s insistence of a genuine murmur, a repeat echo demonstrated the patent ductus arteriosus.

Coarctation of Aorta
This is very rare. A late systolic murmur can be heard over a large area of the back if there are significant collaterals. The murmur from the coarctation itself can be systolic or continuous (equivalent to the diastolic tail on CW of a suprasternal view). A supra-sternal view with 2D, CFM and CW interrogation will be required. Also check for co-existing bicuspid AV. It would be a very rare new diagnosis in someone over 50 years old.

Pericardial Friction Rub
Although not a traditional murmur, this can give various systolic and/or diastolic noises on auscultation (classically the sound of leather rubbing over leather). The presence of pericardial fluid does not necessarily correlate with this sign as the fluid may cushion any friction. Pericardial fluid will also dampen any valve related murmur. As well as any fluid, pericardial thickening or brightness is important to note.

Outflow Tract Obstruction
The murmur of HOCM is classically a late crescendo murmur at the apex or lower left sternal edge. Even mild obstruction may be audible but the murmur is very dynamic – about 1/3 patients with HCM have obstruction only brought out with exercise. There is generally a varying degree of MR with HOCM.

Increased Intraventricular Velocities
This is an under-appreciated cause of murmurs. In one study of referrals for “systolic murmur, query cause”, it was the sole cause of the murmur in 16.7% of patients. The “prerequisites for IIVs include vigorous LV systolic function, concentric LV hypertrophy and small systolic cavity dimensions, without segmental wall motion abnormalities”. A sigmoid septum or altered septal–LV outflow tract geometry were more commonly seen.

To identify, colour flow mapping of the LV cavity and outflow tract was performed in the three standard apical views. PW Doppler (Figure 4) was then used to identify the location of the maximum velocity and this was then confirmed on CW Doppler. Increased intraventricular velocities were defined as either:
- Peak systolic velocities >0.7 m/s within the ventricular cavity but outside the ventricular outflow tract (defined by the absence of aortic valve closure clicks) or
- Peak systolic velocities within the LV outflow tract >1.2 m/s

The murmur heard was usually grade II-III, localised to the left lower sternal border but occasional heard at the apex or base. The intensity altered with pre-load and after-load manœuvreurs. Their clinical relevance, other than the cause of a murmur, is

Figure 4: Mid-cavity gradient with characteristic curve, accentuated by a ventricular extra-systole.

their association with hypertensive heart disease. The authors point out their quoted prevalence may be higher than other centres due to the high prevalence of hypertension in their study population.

Innocent murmurs
A variety of intra-cardiac and extra-cardiac arterial and venous flows can produce audible murmurs over the precordium. They tend to be soft, early systolic murmurs. They are very common in childhood but can still be present in adults. Their origins are still debated.

Conclusion
The search for the cause of a murmur is the bread and butter of an echo department. It requires a comprehensive study in order that the common conclusion of “no cause found” is valid. A statement on any uncertainty with this conclusion is helpful. Performing a comprehensive study will also protect you from missing the real problem. It is also important that any pathology identified is put in context with the clinical question and not left for the orthopaedic registrar to correlate.

If significant pathology is found, the standard echo protocols for such disease should be followed. In the context of medical inpatients and peri-operative patients, an assessment of LV function and pulmonary pressures must be clearly stated in the conclusion.

Finally, I hope my description of murmurs will inspire you to pick up the stethoscope after your echo and hear what the murmur really sounds like.

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References
ECHOCARDIOGRAPHY IN ACUTE MEDICINE:
A SELECTION FROM THE ACUTE ASSESSMENT UNIT OF A SMALL DISTRICT GENERAL HOSPITAL

Acute Medicine is a relatively new subspecialty of General Medicine. A consultant in Acute Medicine works on the Acute Medical Unit (or Medical Assessment Unit), where he assesses and manages the acutely unwell medical patients. Specialist training rotations in Acute Medicine have been created and during these rotations the registrars have to learn a special skill, one of which can be echocardiography.

A large number of patients present to the Acute Medical Unit with cardiovascular symptoms such as breathlessness, chest pain or palpitations and on examination have a murmur, or signs of cardiac failure, an abnormal electrocardiogram or chest x-ray. In these circumstances it can be very useful, if not optimal, to use echocardiography early in the assessment of the acutely unwell patient. It is therefore no surprise that echocardiography is the most popular practical skill chosen by acute medicine trainees. Recently the first acute medicine trainees have achieved full BSE accreditation.

The following short case reports illustrate some of the cardiac conditions found in the last two years on the Acute Medical Unit and the Emergency Department in a small District General Hospital in Yorkshire, all performed by a trainee in acute medicine at the time, who obtained BSE Accreditation during his training on the West Yorkshire rotation (Echocardiography was performed with a portable device [Phillips CX 50]).

**Patient 1:**
A 18-year-old woman, who had given birth four weeks before, presented gradual onset of breathlessness, bilateral leg swelling and intermittent chest tightness. She was tachycardic, normotensive and her electrocardiogram and CXR are shown below.

**ECG:** Wide spread T-wave inversions in the antero-lateral leads

**CXR:** Cardiomegaly

Her echocardiogram showed features of a dilated cardiomyopathy and she was also found to have a left ventricular thrombus in addition to a small pericardial effusion. She was transferred to CCU, anticoagulated, and commenced on diuretics and an angiotensin II receptor blocker. She was discharged home after 10 days, awaiting an assessment for heart transplant.

**PLAX:** Severely dilated LV (6.5 cm) with large thrombus

**Patient 2:**
A 70 year old Asian lady with a history of atrial fibrillation and hypertension presented with several months gradually worsening breathlessness and increased bilateral leg swelling. On examination she had a loud first heart sound and a diastolic as well as pansystolic murmur at the apex. Surprisingly she never had had an echocardiogram before. The echocardiogram showed markedly thickened MV leaflets with severe mitral stenosis and moderate mitral regurgitation into a severely dilated left atrium.

**PLAX:** "Doming” of AMVL

**4Ch view:** Severely dilated Left Atrium

**4Ch view:** zoom colour compare of MV  CW Doppler through MV

Her diuretics and angiotensin receptor blocker were increased and she recently underwent MV replacement.
Patient 3:
A 51 year old lady, who 5 weeks ago had been visiting the USA, presented with a 10 day history of gradual worsening breathlessness and two days of dry cough, pyrexias and night sweats. On examination she had a temperature of 38.5, was tachycardic, and on auscultation there was a pericardial rub and left base pleural rub and bronchial breathing. She was normotensive and JVP was raised but there was no paradox pulse.

Her inflammatory markers very significantly elevated, as well as her LFTs and she had a mild normochromic, normocytic anaemia.

ECG: Sinustachycardia

CXR: Cardiomegaly & small left sided pleural effusion

Her echocardiogram showed a moderate sized pericardial effusion with diastolic collapse of the right ventricle, indicating cardiac tamponade. Pericardiocentesis showed straw coloured effusion, an exsudate which did not yield any bacterial or mycobacterial growth (TB) and no malignant cells. So far the working diagnosis is post-viral pericardial effusion, but a systemic inflammatory disorder is also being considered. The patient made a gradual uneventful recovery.

PLAX: Moderate pericardial effusion

Patient 4:
A 62-year-old, lifelong smoker, presented with acute breathlessness and pleuritic chest pain to the Emergency Department (ED). He was found to be tachycardic and severely hypotensive. Chest x-ray showed emphysematous changes. He was too unstable to be transferred out from the resuscitation room for investigations. The bedside echocardiogram in the Emergency Department showed a severely dilated right ventricle. There was RV hypokinesis with normal apical contractility (McConnell’s sign).1 Severe flattening of the left ventricle in systole and diastole, compatible with right ventricular volume and pressure overload was also present. The working diagnosis of pulmonary embolism was made and the patient was thrombolysed in the ED in accordance with European Society of Cardiology Guidelines from 2008.2,3 Thereafter his blood pressure improved and he underwent CT-pulmonary angiogram, which confirmed massive pulmonary embolism. He was started on warfarin and made an uneventful recovery.

ECG: Sinus tachycardia, incomplete RBBB

CXR: No changes to explain hypotension or breathlessness
Patient 5:
A 62-year-old lady presented in the afternoon with severe pleuritic chest pain and mild breathlessness. Her electrocardiogram was normal and chest x-ray showed left basal atelectasis. D-dimer was elevated and the working diagnosis of pulmonary embolism was made.

ECG: SR, no significant changes

CXR: Left basal atelectasis

Bedside echocardiography was performed to evaluate for RV dysfunction. A normal right ventricle was shown, but also a proximally dilated thoracic aorta.

The "penny" did not drop immediately that this could point to another serious pathology. During the evening she had a collapse and was transferred to HDU. The following morning, whilst awaiting a CT-pulmonary angiogram, a bedside echocardiogram was repeated (pictures shown below). Now an aortic dissection flap was clearly identified, as well as a new pericardial effusion with echogenic material, suggestive of a haemopericardium. An emergency CT aortogram was performed which confirmed an extensive aortic dissection, starting at the aortic root, down to the iliac arteries. She was transferred as an emergency to the local cardio-thoracic centre where she was operated successfully and one year after the event she is doing well.

Echocardiography in the acute medical setting can be a very exciting and satisfying investigation to perform, but as shown above, can also have its pitfalls and my learning curve felt at times certainly quite steep.

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References

Acknowledgements:
I am very grateful for all the support I received from my colleagues and especially the echocardiography technicians in Huddersfield and Calderdale Hospitals, Dewsbury Echo department, Airedale Hospital Echo department and Cardiologist Dr C Welsh, who got me started.
The cover image depicts a fenestrated secundum atrial septal defect which was discovered as part of the diagnostic work up for a 50 year old man presenting with palpitations who was found to have a dilated right heart on transthoracic echocardiography. On the image displayed there are multiple jets of colour flow crossing the aneurysmal interatrial septum from the left atrium to the right atrium. On closer interrogation of the atrial septum there were up to 8 defects present, alongside a severely dilated right atrium and right ventricle. A fenestrated atrial septal defect is a rare form of atrial septal defect usually diagnosed in adulthood upon discovery of a dilated right heart. The most effective treatment for these lesions is surgical patch closure as the aneurysmal nature of the septum and multiple holes make effective percutaneous closure challenging. Once found, the echocardiographer should be alert to the association with anomalous pulmonary venous drainage and take care to ensure that all pulmonary veins can be seen to drain into the left atrium. Successful closure should lead to a regression in right ventricular size over time and a reduced risk of future atrial arrhythmias.

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Following my request for more membership input into ECHO it is pleasing to see that this edition contains several, well written interesting case reports and articles. Indeed, we have a small number of case reports which we are unable to publish until the next edition. Reading submissions from colleagues makes publishing ECHO as a members journal rewarding for all. Please continue submitting interesting cases, educational or learning points, descriptions of how you approach or tackle various practical issues, audit projects and how they may have had a positive impact on your departmental work. Finally, remember that interesting images for the front cover with a short descriptive text are always welcome.

Gordon Williams
Editor
CASE REPORTS

1) Thrombolysis for Prosthetic Mitral Valve Thrombosis

A 73-year-old woman with a mechanical mitral valve was admitted to hospital with a severe lower gastrointestinal (GI) bleed necessitating cessation of warfarin. Following failure of conservative treatment, an expedited laparotomy with Hartmann’s procedure was performed. The case was complicated by a previous medical history of heparin induced thrombocytopenia and end stage renal failure, limiting options for bridging anticoagulation. Postoperatively the patient was found to have a thrombosed mechanical valve with increased transvalvular gradients. Through a combined multidisciplinary approach and review of the relevant literature available, the patient was successfully thrombolysed using a low dose regime on consecutive days resulting in dissolution of the thrombus and restoration of acceptable gradients across the prosthesis. In the postoperative period, reinstitution of anticoagulation and maintenance between thrombolysis was achieved using an infusion of a short acting direct thrombin inhibitor, argatroban.

Background

Complications associated with prosthetic valves include paravalvular leaks, endocarditis, haemolysis, valvular dehiscence, valve failure, and prosthetic valve thrombosis (PVT). Prosthetic valve thrombosis (PVT) is a serious complication with a mortality of approximately 10%, independent of treatment modality. The current rate of PVT is estimated to be between 0.03% and 0.13% per patient-year depending on the antithrombotic regimen used and the adherence to therapy. Suspicion of PVT warrants immediate definitive investigation and if diagnosed urgent treatment.

Case Presentation

A 73 year old woman was admitted with an ongoing lower GI bleed on a background of known sigmoid diverticular disease. Her presenting haemoglobin (Hb) was 64g/L but she was haemodynamically stable. She had a complex medical history including warfarinisation for a mechanical metallic mitral valve prosthesis (well seated on transthoracic echocardiogram prior to admission), severely impaired left ventricular systolic function, end-stage renal failure on peritoneal dialysis and a history of heparin induced thrombocytopenia (HIT).

Following admission, warfarin was stopped but not actively reversed and due to ongoing transfusion requirement she was started on tranexamic acid according to haematological advice. Flexible sigmoidoscopy confirmed diverticular disease with multiple bleeding points. Despite conservative management active bleeding continued and subsequently she underwent an emergency Hartmann’s procedure two weeks after admission. Intraoperatively she was haemodynamically compromised and was started on dobutamine and noradrenaline necessitating an admission to the Intensive Care Unit for ongoing cardiovascular and renal support.

In the immediate postoperative period, argatroban was chosen titrating to a target APTTr of 2.0 – 2.5. The alternatives danaparoid and fondaparinux were considered high risk due to a prolonged half life in patients with an eGFR <20ml/min. Renal replacement therapy was converted to haemofiltration using epoprostenol as anticoagulation in the filter circuit.

A transthoracic echocardiogram (TTE) was performed on postoperative day 1, which demonstrated a thrombosed mechanical mitral valve with a mean pressure gradient of at least 17mmHg (one measurement of 21mmHg), indicative of severe mitral stenosis. Fluoroscopy confirmed thrombosis of the right mitral leaflet. Pulmonary artery systolic pressures (PASP) were between 40-60mmHg (Figure 1). Transoesophageal echocardiography was withheld due to cardiovascular and respiratory instability. Following discussions involving cardiology, cardiothoracics, renal and ICU teams the decision was taken to continue anticoagulation with argatroban but not to thrombolysed in view of the risk of catastrophic postoperative bleeding.

Fig. 1. Demonstrates increased pulmonary artery pressures

Fig. 2. Doppler image illustrates transmitral gradient

Despite adequate anticoagulation the mean transmirtal gradient continued to increase to a maximum of 31mmHg (Figure 2) and further multi-disciplinary discussions focused on the risks of medical versus surgical management. The patient was felt to be a high-risk candidate for redo mitral valve surgery and a mortality risk in excess of 30%. This risk was unacceptable to the patient, leaving thrombolysis or palliation as the only remaining strategies. After discussion and consent, she received a bolus of tissue type Plasminogen Activator (tPA) alteplase (15mg bolus followed by infusion of 32.5mg/one hour) with no immediate complications.

TTE post initial thrombolysis did not show a significant reduction in gradient or forward flow. She deteriorated 6 days post thrombolysis, developing chest pain, dyspnoea and
evidence of worsening right ventricular function on TTE. She was again offered and declined surgical intervention. A literature search revealed that low-dose slow infusion (tPA) with repeated doses up to a total of 6 days had been a successful thrombolytic therapy for the treatment of patients with prosthetic heart valve thrombosis in pregnancy. Based on this literature and MDT discussion of the options available, the patient received thrombolysis on consecutive days with an alteplase infusion (25mg/six hours). Argatroban was withheld during tPA administration but immediately restarted post-thrombolysis on each occasion.

Following 3 doses of tPA, the patient sustained a significant sternal bleed with an Hb drop requiring cessation of the thrombolysis and anticoagulation, transfusion of three units of red blood cells and endoscopic investigation. The argatroban infusion was restarted after 12 hours following successful conservative management of the haemorrhage and no focal bleeding point having been identified. Fortunately TTE assessment prior to the 4th thrombolysis dose showed a notable improvement in mitral valve function with significant change in the mean transmural gradient from 31mmHg to 4mmHg (Figure 3) and reduction in mean PA systolic pressures. Given the improvement in valve mechanics, no further tPA was indicated. She improved clinically and was discharged to an acute medical ward for a period of rehabilitation. At this stage warfarin was reinstated in place of the argatroban infusion. She was discharged home and outpatient TTE follow up showed no change in her transmural gradients.

**Fig. 3. Doppler illustrates reduced transmural gradient**

**Discussion**

Randomised controlled trials comparing thrombolysis with surgery in this cohort of patients are limited and therefore guidelines vary with no class I recommendations for either treatment. The first line treatment recommended by the European Society of Cardiology remains surgical valve replacement regardless of clinical status, whereas the American Society of Heart Valve Disease has recommended thrombolysis as first-line therapy in all cases of PVT in the absence of a contraindication.

The TROIA (Comparison of Different TRansesophageal Echocardiography Guided thrombolytic Regimens for prosthetic valve Thrombosis) study was a prospective, non-randomised study aiming to identify the most effective and safest regimen among thrombolytic regimes. Using transesophageal echocardiography for guided thrombolytic therapy, five different thrombolysis regimes were administered to 182 patients over a sixteen-year period. These included rapid streptokinase (Group I), slow streptokinase (Group II), high-dose (100 mg) tPA (Group III), a half-dose (50 mg) and slow infusion (6 h) of tPA without bolus (Group IV), and a low dose (25 mg) and slow infusion (6 h) of tPA without bolus (Group V). The overall success rate in the whole patient cohort was 83.2% with no differences between the different regimes and an overall complication rate of 18.6%, although a significantly lower rate was noted in the group receiving low dose slow infusion of tPA (Group V). Özkan et al therefore concluded that low dose slow infusion of tPA without a bolus provides effective and safe thrombolysis in patients with PVT. This data is further validated by a further research by the same group, which showed that this particular thrombolytic regimen, with repeated doses was also an effective therapy with an excellent thrombolytic success rate in PVT in pregnant women. They felt that thrombolytic therapy should be considered first line in pregnant women with PVT. Although these studies support thrombolysis and administration of slow, low-dose t-PA, neither study included a surgical arm so this should be interpreted as preliminary data helping to form the basis for a clinical trial of fibrinolysis versus surgery.

Results of the awaited SAFE-PVT (Surgery Versus Fibrinolytic Therapy for Left-sided Prosthetic Heart Valve Thrombosis), the first randomised controlled study to compare emergency surgery versus thrombolysis in patients with left sided PVT, are expected in 2017 and this may clarify some of the current discrepancies in the management of patients with PVT.

**Conclusions**

This case report highlights the difficulties of managing patients anticoagulated for prosthetic valves who present with life threatening haemorrhage, especially those, as in this case who are deemed high risk for further surgical intervention. Cessation of anticoagulation may be indicated, but needs to be considered carefully given the significant risk of Prosthetic Valve Thrombosis. Ideally patients should be managed with bridging, short acting, and titratable forms of anticoagulation, such as UFH. Where this is not possible, for example in patients with HIT novel forms of anticoagulation may need to be considered.

Once PVT occurs there are currently no consensus guidelines, with treatment largely based on expert opinion. In this case daily, low-dose tPA was an effective and safe therapy for resolution of PVT after failure of standard dose thrombolysis. Although the patient experienced minor bleeding as a complication, the treatment avoided the need for redo mitral valve surgery and the quoted 30% mortality.

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**References**


2) Infected tissue mitral valve replacement with prosthesis obstruction

A 68 year old man presented to his GP with a 9-day history of intermittent rigors. Four year earlier he had undergone a tissue mitral valve replacement (MVR) for severe mitral regurgitation secondary to mitral valve prolapse. The procedure had been complicated by post-operative complete heart block requiring a dual chamber permanent pacemaker (PPM) insertion. Clinical examination did not identify any peripheral stigmata of infective endocarditis and he was afebrile. There were no audible murmurs and no evidence of soft tissue infection around his PPM site. Blood tests showed elevated inflammatory markers (WCC 13.2, CRP 57.7, ESR 32) and blood cultures grew Staphlococcus epidermis. A transthoracic echocardiogram showed a well seated tissue MVR with a mild transvalvular leak, as previously documented, but abnormally thickened prosthesis leaflets compared to previous scans and an increase in the mean transmitral gradient from 5mmHg on a transthoracic echo 6 months earlier to 8mmHg. A clinical diagnosis of endocarditis was made and he was commenced on intravenous antibiotics. A transoesophageal echocardiogram showed a highly abnormal prosthesis. Both leaflets were thickened with abnormal echogenicity consistent with infection and there was a large (1.6cm) mobile vegetation arising from the anterior leaflet. Colour flow Doppler interrogation of the prosthesis showed flow acceleration and confirmed the mean transmitral gradient 8mmHg. Intermittent prolapse of the vegetation in diastole was demonstrated on CW Doppler. A mobile mass, consistent with a vegetation, was also demonstrated on the atrial pacing lead.

Following discussion at the joint cardiac/cardiothoracic multi-disciplinary meeting a decision was taken for early surgery to replace the infected MVR and remove the pacing system. The patient was discharged home well after re-do surgery and a protracted course of antibiotics.

The thickened, infected prosthesis leaflets and vegetation resulted in moderate prosthesis obstruction. This did not cause haemodynamic decompensation in this case but it can result in acute pulmonary oedema.

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3) Make way – Hepatic squash

A 77 year old man was admitted with acute-on-chronic dyspnoea four months after right pneumonectomy for a pT3 pN0 pR0 squamous cell carcinoma of the right lung. Prior to admission he had been short of breath after climbing half a flight of stairs. He denied chest pain, haemoptysis, palpitations, presyncope, syncope or leg swelling or tenderness. On initial exam, O$_2$ saturation was 80% while receiving 15L O$_2$ via a non-rebreather mask, respiratory rate 40 per minute, heart rate 100 per minute and blood pressure 160/100 mmHg. Platypnea-orthodeoxia was absent. Chest Xray showed complete opacification of the right hemithorax with tracheal deviation to the right (Figure 1). A CT pulmonary angiogram showed no evidence of pulmonary embolism but showed that the liver had migrated into the right hemithorax and appeared to be extrinsically compressing the right ventricle (RV) (Figures 2a&b). The appearances were felt to be typical following right pneumonectomy. The CT findings of RV compression were confirmed by transthoracic echocardiography. Left ventricular function was normal. Continuous wave velocity flow through the tricuspid valve was elevated with a mean gradient of 5.3mmHg. There appeared to be tricuspid annular compression causing ‘pseudo’ tricuspid valve stenosis (Figure 3). Bubble contrast echocardiography confirmed a large right to left shunt at atrial level. We proceeded to device closure of the inter-atrial communication. Peri-procedural trans-oesophageal echocardiography during the procedure demonstrated a patent foramen ovale (PFO) and an aneurysmal atrial septum with right to left shunt. Right atrial (RA) pressure measured during cardiac catheterisation was 8mmHg and left atrial pressure 4mmHg. An 18mm Amplatzer sizing balloon was used to measure the size of PFO (11-14mm) and a 30 mm Gore Septal Occluder device was successfully deployed. Agitated saline contrast post procedure showed no residual shunt. The procedure led to almost complete resolution of dyspnoea and resting oxygen saturation in room air rose to 96%.

Right to left inter-atrial shunting is described rarely after pneumonectomy (<0.7% of cases) but, when it does occur, it is usually after removal of the right lung. Presentation may be with dyspnea, hypoxia, platypnea-orthodeoxia or systemic embolisation, usually within six months after operation. It is thought that the pathophysiology of right-to-left shunting may be due to preferential streaming of blood flow from the inferior vena cava through the PFO/atrial septal defect which is due to a change in atrial septal orientation. Pneumonectomy may cause an increase in pulmonary vascular resistance, an increase in RV afterload, reduction in RV compliance and an increase in RA pressure. The liver may migrate into the right hemithorax to cause compression of the right heart, which will increase RV end diastolic pressure and as described in our case – pseudo tricuspid stenosis. Irrespective of the pathophysiology, as we found for our patient, percutaneous delivery of an atrial occluder device to eliminate the acute right to left shunt is almost universally ‘curative’. We believe this is the first documented clinical description of pseudo tricuspid stenosis caused by “hepatic squash” following pneumonectomy resulting in an acute right to left shunt.
4) Unusual Left Ventricular Masses

An 87 year old female presented with shortness of breath. On examination, she had bilateral wheeze, bi-basal crepitations and recent unintentional weight loss. Electrocardiogram demonstrated sinus tachycardia with right bundle branch-block and minimal inferior ST depression. Chest X-ray showed cardiomegaly, bibasal haziness and a left hilar mass. Computerised tomography revealed malignant carcinoma, with a likely lung primary tumour. Echocardiography revealed two unusual masses attached by a stalk to the infero-lateral wall of a normal-sized, moderately dysfunctional left ventricle. Differentials of the cardiac masses include hydatid cysts, metastatic tumour or myxomas. The patient declined invasive intervention and responded well to heart failure treatment, nebulisers and steroids. Sadly, a month later, the patient suddenly passed away. Post-mortem demonstrated no evidence of any masses within the heart, suggesting that the masses may have detached and embolised.

Cardiac metastases are found in 6 - 20% of autopsies with known malignant neoplasm. Primary lung, breast and hematologic tumours, more frequently metastasise to the heart. Cardiac hydatid cysts are rare (0.5 – 2% of hydatidosis cases). Hydatid disease is a parasitic infection which can invade the cardiac myocardium. The left ventricle is the most common cardiac chamber involved (3). Benign left ventricular myxomas are also extremely rare (3 – 4% of myxoma cases). Myxomas attach to the ventricle by a pedunculated stalk. Even if the mass is benign, morbidity can occur due to haemodynamic obstruction, infiltration, arrhythmia or thromboembolism. Treatment requires surgical resection of the cysts or myxoma.

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References

5) Isolated severe pulmonary regurgitation - an incidental finding following acute myocardial infarction

These transthoracic echocardiogram (TTE) images were obtained from a 61 year old male who had presented with an anterior ST elevation MI and underwent successful primary percutaneous coronary intervention to his left anterior descending artery.

In addition to the expected impaired left ventricular (LV) function and extensive anterior wall hypokinesis (with apical thrombus) post-infarct the TTE demonstrated severe pulmonary regurgitation (PR) with diastolic leaflet prolapse. There was no pulmonary stenosis. A small mobile attachment was noted on one of the pulmonary leaflets (Fig. 1). The right ventricle (RV) was significantly dilated with mildly reduced overall contraction. The right ventricular systolic pressures (RVSP) were estimated, from tricuspid regurgitation velocity (TR v_max) to be 34mmHg above right atrial pressure, which was estimated to be 10-15mmHg. The ratio of TR v_max/ RVOT VTI was borderline at 0.21, patients with values <0.2 are likely to have low pulmonary vascular resistance (PVR). The patient had no clinical features of RV dysfunction, namely peripheral oedema, hepatomegaly or raised jugular venous pressure. Clinically there was no evidence of pulmonary disease in particular pulmonary embolism (PE) or chronic PE.

On retrospective questioning the patient revealed that 20 years ago he suffered septicaemia following a bout of pneumonia. A transoesophageal echo performed at the time for suspected endocarditis was apparently normal.

Isolated severe PR in an otherwise structurally normal heart is a rare finding. Causes may include dysplastic pulmonary valve, direct valve trauma, rheumatic or carcinoid heart disease, endocarditis and secondary changes related to pulmonary hypertension. We were unable to obtain more information regarding the investigations carried out during the patient’s admission 20 years ago.

The patients RVSP is raised but not severely raised and the PVR is unlikely to be significantly elevated making longstanding significant pulmonary hypertension unlikely. Given that there was no evidence or history compatible with other causes we feel that it is possible the patient may have suffered isolated pulmonary valve endocarditis 20 years ago or that there is an isolated abnormality of the pulmonary valve complex. The resultant severe PR has hitherto been asymptomatic.

Patients with longstanding severe PR develop progressive RV dilatation and reduced RV function. However in otherwise normal hearts severe PR can be well tolerated. Low resistance in the pulmonary vascular bed enables the RV to act as a conduit with indirect maintenance of forward pulmonary flow by the action of the left heart and right atrium.

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References

Fig. 1. Findings consistent with severe pulmonary regurgitation. A Parasternal long axis (PLAX) view of the right ventricular outflow tract (RVOT) showing the right and left pulmonary valve leaflets, which appear to prolapse. B Colour Doppler in the PLAX view of the RVOT/ main pulmonary artery (MPA) demonstrating a large broad jet of pulmonary regurgitation (PR) with holodiastolic flow reversal in the MPA and branches (image taken from a second study where 3D of the leaflets was attempted). C Parasternal short axis view with colour over the RVOT and MPA demonstrating the severe PR jet. D Colour M-Mode from the same view, which shows apparent prolapse of the leaflet with an associated PR jet. E Continuous wave Doppler recording through the pulmonary valve showing a dense, steep PR signal, pressure half time was measured at 59ms.
6) Endocarditis with aortic root abscess

Patient history
A 53 year old male presented to the emergency department, accompanied by his sister, with acute delirium and pyrexia after feeling generally unwell for a week. His history was taken from his sister due to the patient’s extreme confusion. Three weeks prior he had been kicked on the shin by a horse on the farm where he lived, which had broken the skin. There was no significant medical history, he was a non-smoker and rarely drank, never to excess, and was taking no prescribed medications. There was some uncertainty about a possible penicillin allergy.

Clinical examination
The patient was unaware of time, location, or why he was there. He was found to be pyrexic with a temperature of 39.8°C, a respiratory rate of 16 breaths per minute, a blood pressure of 96/50 mmHg, and an irregular pulse at approximately 155 bpm. His oxygen saturations were 99% on room air and the JVP was not visible. There were no abnormal heart sounds detected. There was also significant urinary retention, for which he was catheterised.

Initial tests and results
Full blood count: normal.
Liver function test: low albumin 27 g/l (normal range 30 – 51 g/l).
Creatinine: 196 umol/l (normal range 62 – 115 umol/l). Creatinine is an important indicator of renal health, as it is removed from the blood primarily by the kidneys. If the filtration in the kidney is deficient, Creatinine levels rise. In this case, a level of 196 umol/l indicates an acute kidney injury, likely from a combination of urinary retention and infective processes.
C reactive protein (CRP): > 250 mg/l. CRP is a protein found in the blood plasma, the levels of which rise in response to inflammation. A level of > 200 mg/l indicates a severe infection.
CT of head: no significant abnormality.
Chest x-ray: slightly enlarged heart, lungs clear.
ECG: atrial fibrillation with a ventricular rate of 150 bpm.
Blood cultures were also taken, which later revealed a Staphylococcus aureus infection.
The patient was admitted to the Coronary Care Unit (CCU).

Medication
The patient was started on the following medication:
Omeprazole 20 mg, paracetamol 1g, Furosemide 40 mg, Ramipril 2.5 mg, Tramadol 50 mg, Warfarin 18 mg, Bisoprolol 2.5 mg, Vancomycin, and Ramampicin.

Further testing
Serial ECGs performed on the CCU showed that the patient returned to sinus rhythm. This coincided with the onset of pericarditis, shown clearly on the ECG by concave ST segment elevation in all leads and reciprocal ST segment depression in aVR (fig 1).

Transthoracic echocardiography (TTE) was carried out at the bedside whilst the patient was in atrial fibrillation at a rate of approximately 140 bpm, and was a technically difficult study with limited views, thus vegetations could not be ruled out even though none had been visualised. The left ventricle (LV) was mildly dilated with reduced systolic function (EF 34%), mild to moderate aortic regurgitation, and a small pericardial effusion mainly posterior to the LV.

Transoesophageal echocardiography (TOE) was carried out after the patient had reverted to sinus rhythm at a rate of 70 bpm, and demonstrated a dilated and hypertrophied LV, with no regional wall motion abnormalities and mild systolic impairment (EF 56%). This improvement in systolic function is likely to have been the result of rhythm change. The left atrium was dilated, the mitral valve was normal with a mild central jet of MR. The aortic valve was found to be bicuspid with a vegetation attached, and the aorta had a large root abscess with Left ventricular outflow tract (LVOT)-left atrium fistula and complete disruption of aorto-mitral continuity (figs. 2 & 3).
MRI with diffusion weighted imaging (DWI) was carried out in view of ongoing confusion, and showed a wedge-shaped area of restricted diffusion, consistent with an acute cerebral infarct, likely from septic emboli. As the mobility of water is driven by thermal agitation and highly dependent on its cellular environment, the hypothesis behind DWI is that findings may indicate early pathologic change. DWI is more sensitive than more traditional MRI measurements to early changes after a stroke.

**Surgery**

The patient was transferred to a tertiary centre where he underwent aortic valve replacement and LVOT-left atrium fistula repair. He subsequently returned to theatre 10 days later for evacuation of a clot over the right ventricle.

Surgical treatment is used in approximately half of all patients with infective endocarditis (IE) due to severe complications. Reasons to consider early surgery in the active phase of IE are to avoid progressive heart failure and irreversible structural damage caused by severe infection and to prevent systemic embolism (Baddour, et al 2005). However, surgery during the active phase of IE is associated with significant risk.

Left untreated, abscess cavities may progress to create fistulous tracts with resultant intracardiac or pericardial shunts. Fistulas are severe complications of IE and are frequently associated with very severe valvular and perivalvular damage (Tingleff, et al 1995). It is seen in approximately 1.6% of all cases of IE, with S. aureus being the most commonly associated organism. Despite high rates of surgery within this population (87%), hospital mortality remains high (41%) (Bashore, et al, 2006). Factors associated with mortality included moderate to severe congestive heart failure, prosthetic valve involvement, and need for an urgent operative procedure (Bashore, et al 2006).

Surgery for periannular extension involves drainage of abscess cavities, excision of necrotic tissue, and closure of fistulous tracts. Replacement of the valve is often necessary, and the use of aortic homografts or stentless valves may be considered when surgical difficulties are posed by extensive destruction of periannular supporting tissues. Other complications due to major extension of infection include VSD, 3rd degree AV block, and acute coronary syndrome (Manzano, et al, 2007).

Systemic embolism occurs in 22% - 50% of patients with IE, with the highest rates of embolic complications seen in patients with left-sided IE, especially when infection is related to S. aureus. Several echocardiographic and clinical parameters have been associated with increased risk of embolism, including the size and mobility of vegetations, location on the mitral valve, increasing size whilst antibiotic therapy is being given, infection with specific organisms (staphylococci, streptococci bovis, candida species), previous embolism, multi-valvular infection, and biological markers (Mugge, et al 1989).

Overall, risk of new embolism is greatest in patients with large mobile vegetations, especially in staphylococcal IE that involves the mitral valve. The risk is greatest during the first few days of antibiotic therapy, and the benefits of surgery to prevent embolism are thus greatest at this time (Steckelberg, et al 1991).

**Outcomes**

The patient completed a prolonged course of antibiotics (Vancomycin and Rifampicin) via a PIC line and after 7 weeks was feeling better with improved inflammatory markers. Since stopping antibiotics he has remained afebrile. He is having regular follow-ups with the cardiology team as an outpatient and at the last clinic appointment he reported had been gradually increasing his exercise capacity with no exertional symptoms. There have been no fevers, rígors, or night sweats.

On examination, he was in sinus rhythm with a blood pressure of 140/78 mmHg and saturations of 100% on air. There was a mechanical S2 with associated flow murmur. There were no carotid bruits, the JVP was normal with no peripheral oedema, and the chest was clear. An ECG demonstrated sinus rhythm at 54 bpm with normal PR interval. Right bundle branch block was present with a normal axis and QRS duration of 150 ms. He was instructed to reduce his Furosemide to 40mg od and to discontinue his Bisoprolol. A recent echo demonstrated the mechanical prosthesis was functioning normally with no other significant valvular abnormalities. Biventricular function was low normal. Most importantly, there was no echocardiographic evidence of active endocarditis.

There were several splinter haemorrhages in the right ring finger only, and short-term memory has been slightly diminished, consistent with the cerebral infarct. He is keen to return to HGV driving; however current weaknesses in his left arm and leg are preventing this, for which he is receiving physiotherapy.

**Discussion**

Positive blood cultures remain the key diagnostic tool for IE, and provide live bacteria for susceptibility testing. Blood cultures which are negative for IE occur in 2.5 – 31% of all cases, with an appreciable impact on clinical outcome due to delayed diagnosis. This situation most commonly occurs as a result of prior antibiotics administration and in these cases would require the withdrawal of antibiotics and repeat blood cultures. Infection by organisms with limited proliferation under conventional culture conditions are often seen in IE affecting patients with prosthetic valves, indwelling venous lines, pacemakers, renal failure, and those who are immunocompromised (Prendergast, 2004).

Both TTE and TOE are fundamentally important to the diagnosis, management, and follow-up of patients with IE, and must be performed rapidly in patients where IE is suspected. There are three major echocardiographic findings in the diagnosis of IE: abscess, vegetation, and the new dehiscence of a prosthetic valve. In cases with an initially negative TTE/TOE, examination should be performed again 7-10 days later if clinical suspicion still remains. An exception to this is a S. aureus infection, where earlier repeat imaging is recommended (Vieira, et al 2004).

TTE is recommended as the first-line imaging modality in patients with suspected IE; TOE is recommended in patients with a normal TTE and a high clinical suspicion of IE; TOE should be considered even in cases with positive identification of IE by TTE, due to better sensitivity and specificity, in particular for the diagnosis of abscess and measurement of vegetation size (Petti, et al 2003).

The modified Duke criteria are also a useful tool for the diagnosis and classification of IE, based on clinical, echocardiographic, and microbiological findings; however,
clinical judgement remains essential. This is especially true when dealing with cases of negative blood cultures, when infection affects prosthetic valves or pacemaker lead, and when there is right heart involvement (Prendergast, 2004).

S. aureus is usually responsible for acute and destructive IE, and the formation of an annular abscess and fistulous communication is the most devastating complication of destructive aortic valve endocarditis. The role of surgery in active IE has rapidly expanded, and expedited surgery in carefully selected patients can be attributed as a factor in the decline in mortality, as well as improvements in management techniques.

IE presents in a variety of different forms, varying according to the clinical manifestation, underlying cardiac disease (if present), the micro-organism involved, the potential for substantial consequences, and underlying patient characteristics. For this reason, IE requires a collaborative approach, involving (but not limited to), cardiologists, cardiac physiologists, nurses, pathologists, microbiologists, GPs, surgeons, radiologists, and radiographers. Despite major advances in diagnostic and therapeutic procedures, IE still carries a poor prognosis and high mortality. For these reasons, clinical suspicions should remain high in a variety of different clinical situations.

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References

7) An unusual case of Double Chambered Right Ventricle

Double chambered right ventricle (DCRV) is a rare condition, occurring in 0.5-2.0% of patients with Congenital Heart Disease but is seen in as many as 10% of patients with a ventricular septal defect (VSD), usually of the membranous type. It is best understood as a form of septated right ventricle caused by the presence of abnormally located or hypertrophied muscular bands. In the classic form the right ventricle is divided into a high-pressure proximal chamber and a low-pressure distal chamber by anomalous muscle bundles. Interestingly the right ventricle may be divided into two or more compartments by various structures in various ways. In 1984 Restivo et al described several variations of anatomy leading to a divided right ventricle, with one morphological substrate resulting in isolation (sequestration) of the right ventricular apex from its inlet and outlet components. Yoo et al later reported 4 such cases, each with different underlying lesions but all sharing the common pathology of apical sequestration of the right ventricle.

A 7-year old child was referred to the tertiary congenital heart disease clinic for a detailed ultrasound assessment. She was diagnosed as a neonate with a single, large apical muscular VSD. No other cardiac anomalies were detected. Subsequently she received regular cardiology follow-up in her local cardiology out reach clinic but was referred in to the centre for detailed assessment because of the potential for the development of pulmonary hypertension with such a large defect. A TTE performed in clinic confirmed a large defect in the apical trabecular septum but in addition demonstrated a muscular shelf within the apex of the right ventricle (Fig. 1). Colour Doppler confirmed turbulent flow across the muscular

Fig 1. A4C showing large apical muscular VSD
shelf (Fig. 2) with low velocity, unrestrictive flow across the VSD into the sequestered chamber (Fig. 3). CW Doppler sampling across the RV apex demonstrated high velocity flow (4.5m/s) indicating low right heart pressures within the inlet portion of the RV (Fig. 4). This was confirmed from the presence of low velocity TR flow (Fig. 5).

So although there is a large apical VSD, shunt flow is contained by the sequestered right ventricular segment. The muscular shelf doesn’t interfere with blood flow from inlet to outlet and therefore is not producing any adverse haemodynamic consequences. Indeed the muscular lesion significantly reduces left to right shunting by functioning as a restrictive ventricular septum. Although the child will be kept under cardiology review it was felt that conservative management was appropriate in this case.

I find echocardiography endlessly fascinating and never cease to be amazed that there are always new things to discover. Although I had been aware of this particular anatomical variant until recently, despite being an echocardiographer for over 35 years, I had never seen a case until now!

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References
Stentless AVR with a fluttering motion

Introduction

Stentless bioprosthetic heart valves were developed in the early 1990s; designed to provide a more physiological flow pattern and superior haemodynamics in comparison to stented valves. This was achieved by avoiding the obstructive stent and sewing cuff present in conventional biological valves, thereby maximizing the effective orifice area, and reducing risk of patient-prosthesis mismatch especially in patients with a small aortic annulus. The resulting lower trans-prosthetic gradient facilitates left ventricular mass regression. Studies have demonstrated greater benefits in patients with left ventricular impairment (ejection fraction <50%) (1).

First generation stentless bioprostheses include the Prima valve, the Freestyle valve and the Toronto stentless porcine valve. The second generation Super stentless aortic porcine valve required only one suture line. Third generation valves include the Sorin Pericarbon Freedom and the Equine 3F heart valve pericardial bioprostheses. Stentless valves can be implanted using several surgical techniques as described in Fig. 1.

Fig. 1. Techniques of implantation (a stentless valve to replace a full root can be implanted by several surgical techniques): complete (a) or modified subcoronary (b), root inclusion (c) and full root (d). In the case of the complete subcoronary technique all porcine sinuses are excised, with the exception of the noncoronary sinus in the so-called modified subcoronary technique. Root inclusion and full root technique require implantation of the coronary ostia.

Case History

A 73 year old woman was referred for transthoracic echocardiography (TTE) following a hospital admission with fast, symptomatic atrial fibrillation. TTE revealed severe aortic valve stenosis with good systolic function. The aortic valve area was calculated at 0.8cm² with a peak gradient 55mmHg and mean gradient 33 mmHg; in the presence of mild central aortic regurgitation (AR). The patient reported a six month history of increased shortness of breath on exertion (NYHA Class III) which was limiting daily activities; with no loss of consciousness or chest pain. There was a previous history of rheumatic fever but no other risk factors or any other cardiac history. Cardiac catheterisation was performed and showed normal coronary arteries. She was therefore referred for surgical aortic valve replacement; the aortic valve was found to be trileaflet in anatomy with calcified leaflets and annulus. The valve was excised and the annulus decalcified. A stentless tissue valve (23mm Freedom prosthesis- third generation stentless AVR) was implanted using a semi-continuous 4/0 suture. Intra-operative Trans-oesophageal echocardiography showed good systolic function and no aortic regurgitation or para-valvular leaks. TTE was not performed prior to discharge.

At three months post-operative follow-up the patient was well with no shortness of breath on exertion. The Prosthetic AVR found to be functioning well with no clinical evidence of paraprosthetic leak and chest was clear on auscultation; TTE was not performed at the time. At nine months follow-up she remains asymptomatic with unlimited exertional capacity (she remains in sinus rhythm). Clinical examination revealed an ejection systolic murmur with no signs of heart failure. 2D-TTE (in sinus rhythm) showed unusual fluttering of the aortic valve bioprosthesis (Figs. 2-4); Peak PG 13mmHg and Mean PG 5mmHg. Mild intra-prosthetic AR was noted. LV systolic function was good.

Discussion

Fluttering of the leaflets is clearly seen in figs. 2 and 3. It is not uncommon to see fluttering of the aortic valve when patients are in atrial fibrillation and occasionally even in sinus rhythm. Here the patient was in sinus rhythm and the fluttering appears to be symmetrical with a repetitive pattern. Literature on fluttering aortic valves in sinus rhythm is limited, and there is no definite explanation for such motion. Our hypothesis is that high velocity microcirculation around the bioprosthesis leaflet tips results in symmetrical fluttering motion of the leaflets.

The parasternal long axis (PLAX) 2D M-mode at the aortic root level (fig. 2) demonstrates the symmetrical pattern nicely. From valve opening there appears to be five oscillations before valve closure. The “saw tooth” like pattern initially appears to be
rapid in the first three oscillations and gradually slows towards valve closure. One possible explanation for this motion is microcirculation in the pocket formed between the valve cusps and the sinuses of Valsalva; this is demonstrated with PLAX colour M-mode at the aortic valve level in fig. 3. There is high turbulent flow seen within the pocket formed between the valve cusps and the sinuses of Valsalva (b). Repetition of this microcirculation results in the “saw tooth” appearance.

In an attempt to address the fluttering motion of the valve we also directly compared the cusp motion with the flow through the aortic valve. This was done by obtaining continuous wave (CW) Doppler through the aortic valve from an apical 5 chamber view and compared it with an M mode at the aortic root level from PLAX view (fig. 4). Alignment was based on the R wave of the electrocardiogram recording of similar heart rates (cannot perform instantaneously).

The valve opens during systole and remains open with no fluttering until peak velocity is reached. The first oscillation is seen immediately after peak velocity. The remaining four “saw tooth” like patterns are formed as the peak velocity/pressure drops until valve closure. From this we conclude that microcirculation within the cusp-sinuses pocket occurs after peak velocity is reached. This is confirmed by figure 3 where turbulent flow is seen within the pocket following peak velocity.

**Conclusion**

We have attempted to explore the fluttering motion of the aortic valve, which is most probably a normal finding with little clinical importance, although some opinion suggests that this can be a marker of increased risk of valve degeneration. In this clinical scenario there was no post-operative TTE until nine months follow up and we cannot conclude if the fluttering motion is of new onset and how it correlates to the degree of aortic regurgitation. This highlights the importance of post-operative TTE for comparative reasons. The patient remains asymptomatic and we will therefore continue to monitor as planned.

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**References**

The images accompanying this short text were obtained from the study of an 83 year old man. He had been paced four years earlier for A-V block at which time he was found to have mild aortic stenosis. On the occasion of this study, arranged for a follow up of this aortic valve, moderate concentric LVH was noted with well maintained LV systolic function in dual chamber paced rhythm.

Mild mitral annular calcification noted but the mitral leaflets opening well with a normal forward flow velocity of 1.1m/sec. and mild mitral regurgitation into a mildly dilated left atrium. The LVOT velocity was 1.2 m/sec. with a peak CW velocity of 2.4m/sec. (peak pressure drop of 24mmHg.). Mild AR was present with a pressure half time of > 500 m/s. The right heart size and function was visually normal, TAPSE 27mm and an estimated PA systolic pressure of 25-30 mmHg (including RA pressure).

All therefore appeared to be as expected with nothing untoward until a closer examination of the transmitral flow signal, reproduced here in both pulsed and continuous wave modes.

I and I’m sure many other readers of ECHO will be grateful to receive the wisdom of others. Please forward your replies to Dr Gordon Williams , Editor of ECHO so that he can publish the various explanations in the next edition. He has agreed that replies can be anonymous if preferred, so don’t be shy in responding, it would be good to read what may be a range of explanations.

Stuart Self
York Teaching Hospitals
The Academy of Healthcare Science is now accepting applications for STP equivalence. Up to now, those professionals who were interested in applying could only register an expression of interest (EOI). Because the Academy received such large numbers of EOI, they decided to coordinate the process by inviting a controlled number to go through the process at one time. For those of you who registered an EOI with the Academy earlier this year, some will have received a reply informing you you would be invited to proceed later in the year and some will have been invited to submit the initial application.

So far over 300 healthcare science professionals have submitted and EOI and by far the largest number from cardiac science, 81.

From November 2014 all professionals can now submit an initial application. So whether you have previously registered and EOI or not, you do not have to wait to be invited you can now submit your initial application.

All information regarding STP equivalence is found on the Academy’s website www.ahcs.ac.uk

Overview of the process

An applicant will submit an intital application to the AHCS, and this will be screened to ensure the individual is who they claim to be and that their qualifications and experience are valid. If the applicant passes the screening they will be asked to compile a portfolio of evidence to demonstrate their equivalence to the standards of ‘Good Scientific Practice’ and the applicable curriculum outcomes. The applicant will have a maximum of six months to submit a completed portfolio.

The submitted portfolio will be sent for assessment by a panel of assessors. The assessors will determine whether the portfolio provides all the necessary information and if so, will then invite the applicant for interview.

The assessment panel will make a recommendation about the person’s equivalence, based on both the portfolio and the interview. This will be considered by the AHCS governance structures and if the recommendation is supported, the applicant will receive a Certificate of Equivalence.

The assessment panel will comprise at least two professional assessors and a lay assessor. All assessors are specially appointed to their roles by the AHCS and receive training. Assessors make a recommendation based on the evidence they receive.

There are three possible outcomes of equivalence assessment:

- Full equivalence is determined and a Certificate of Equivalence is issued.
- Partial equivalence is determined and the applicant is invited to resubmit further information/evidence to support their application.
- Equivalence is not determined and the applicant is advised to undertake a full accredited programme.

Jane Allen
York Teaching Hospitals
Re: “Focussed echocardiography is a limited goal- directed 2D scan...subsequent formal scan is necessary...” (ECHO November 2013, issue 84).

Taken out of context this illustrates a point (it was an appropriate comment in the context of ICU).

The BSE does an excellent job in evaluating new echo technology and establishing which measurements are validated and useful, establishing what makes a full echo examination and validating individuals and departments.

Echoes, therefore, are more complete, but also more time consuming, with the consequence in under -staffed district hospitals, of longer waiting times, and the possibility that urgent in-patient echoes are delayed in order that routine out-patient echoes meet time targets. In one Trust (not ours) I heard that there were 60 in-patient echoes waiting on one day; few were done with the consequent delay in discharge of the other patients.

May I swim against the stream for a moment? I have been a consultant cardiologist and echocardiographer for years, previously accredited by the BSE. I used to have a portable echo machine in the outpatient clinic, and used it to answer a specific question. For example, does the systolic murmur represent significant aortic stenosis, or is there a scar anteroseptally where the position of the ECG chest leads may have been faulty. I don’t necessarily need further information to sort out the patient---- just this one detail.

I recorded what I saw in the notes but there was no facility for recording on the machine.

Echoes aren’t just about gathering maximum information. There are other benefits from an accredited cardiologist doing this:

a. It reduces the number of referrals from out-patients to the echo department (my figures, around half), so reducing demand.

b. It saves the patient a return visit.

c. At virtually no cost in time, it allows the consultant to confirm or refute the referring GP’s opinion, by being seen to use technology to which the patient knows GPs do not have access.

d. For those who don’t mind looking at their hearts on the screen, it can provide instant reassurance, which is, I think, of much more benefit than a letter in a few weeks’ time.

I have been advised that there could be legal consequences of a) not looking at the whole heart in detail or b) not having recorded the evidence for what I have seen. This does not seem reasonable; we don’t record phonocardiograms as evidence for our stethoscope findings, and a radiographer is not expected to look at the gallbladder and the ovaries if she or he is asked for the size of the abdominal aorta.

What do you think? Is there a legal problem? If so, should there be?

Dr Richard A Best
Airedale General Hospital

Please forward your responses to the Editor editor@bsecho.org
This year’s BSE Lifetime Achievement Award was presented by Professor Patricia Pellikka to Dr Gordon Williams, one of the founding members of the society. It proved difficult to describe Gordon's enormous contribution to echocardiography, to cardiology in general and to the life of this society. Gordon was initially appointed as a cardiologist specialising in paediatric and adult congenital heart disease at Killingbeck Hospital, Leeds, leading and developing a nationally and internationally recognised service, having developed one of the first dedicated buildings specifically for Non Invasive services. He acquired and inserted the nation’s first TOE probe. With the reorganisation of services in Leeds he moved to Leeds Infirmary and latterly to York. Over all that time he has inspired a fierce sense of loyalty in all those who have worked with him, which is a mark of the man. A renaissance man in so many ways, Gordon has had a rich and varied career, which continues undiminished despite his alleged retirement. Society members will know him from his time as President, from his endlessly fascinating and unique take on the areas of echo that others do not look at, and his enthusiastic contributions to the social aspects of the society. Above all, however, it is in the pages of this journal which Gordon originated that Gordon has tirelessly tried to infect the society with his enthusiasm and commitment to the art that we all practice. ECHO remains one of the principle ways that society engages with its members and consistently comes out as the most popular. This was a very well deserved award on which the BSE council was absolutely unanimous.

Guy Lloyd
Members were invited to complete a short online survey via the BSE website. 132 of you responded. Here is a summary of some of the responses (in the interest of space not all comments are printed)

**Question: Are you, have you ever been on, or have you ever applied (without success) to be on BSE Council or other committee (i.e. Accreditation, Education, Research)?**

<table>
<thead>
<tr>
<th></th>
<th>Current member</th>
<th>Past member</th>
<th>Applied (without success)</th>
<th>Never applied</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSE Council</td>
<td>7%</td>
<td>1%</td>
<td>1%</td>
<td>91%</td>
</tr>
<tr>
<td>BSE Committee</td>
<td>10%</td>
<td>2%</td>
<td>0</td>
<td>88%</td>
</tr>
</tbody>
</table>

If you have never applied, please tell us why

- I would rather commit to local issues 19%
- I would apply but wouldn't have departmental support for time out to attend meetings 19%
- I want to apply but am worried I wouldn't get in 11%
- I don't think I have anything to offer that any other member applying won't have 31%
- I'm just not interested 20%

Other:

- Too busy already!
- Difficult to manage a F/T position and family & childcare commitments
- With our departmental meetings plus clinical work little time left for extra commitments but always try and support meetings and encourage others to do also
- No back fill available for time out, implication for service delivery. Active member of other committees.
- I’m not sure that I have anything to offer. Also BSE was very 'cliquey' for years and this was offputting - I stopped going to meetings. Pleased to say from my last conferences that I think this has changed
- Would be interested but don't currently have the time.
- It is definitely an aspiration but I have never really considered how the board is elected and therefore have not looked into applying

**Question: Have you ever voted in a BSE Council Election?**

- Yes 63%
- No 33%
- n/a 4% (new to society)

Comments:

- I live and work in Ireland and I don’t personally know any of the members
- I guess it was not very robust, so I didn’t know how significant it was for us the members to vote and what were the interest and support it will provide us
- Not sure, I should have. I will in future

**Question: The current list of BSE Council (as voted for by members) is available on the BSE website. Do you think the current make up of BSE Council is representative of the membership?**

- Yes 54.2%
- No 11.45%
- Don’t know 34.35%

Comments:

- Most are doctors, whereas most of membership is not.
- Only one council member from outside England, but "British" Society of Echocardiography.
- Variety of backgrounds and wide range of experience. There does not seem to be anybody to represent trainees, especially physiologists

**Question: ECHO is the long running publication of the BSE. All members are encouraged to submit articles and case studies for potential inclusion**

Do you read ECHO regularly? Yes 89% No 1% Sometimes 10%

Would you consider submitting an article or case study? Yes 49% No 11% Maybe 39%
Comments:
• I would like to submit interesting case (images)... BUT do I get any re accreditation points???
• Don't think I have anything to offer
• Lack of confidence
• Time consuming - short staffed
• I am not a doctor

Question: Have you ever interacted with BSE (for something other than a membership, accreditation or event query)?
No, I've never had reason to interact with BSE 45%
Yes, I have sought advice regarding work conditions 5%
Yes, I have sought advice regarding education/training 38%
Yes, I have sought advice regarding another matter (please specify below) 17%
• No as it's not particularly encouraged unless you know someone
• Supervisor course training
• Travel bursary
• Used forum for advice from other members. Have never thought of contacting committee regarding education / working conditions as assumed that was not in their remit.

Question: Do you have a preference for communication for how the Society communicates with you?
Email 44%  ECHO (publication) 11%
Website 2%  A combination of or all the above 43%
Postal Letter 0%

Question: Are you interested in finding out more about joining any of the following BSE Committees?
BSE Council  22%  78%
Accreditation  38%  62%
Communications  17%  83%
Departmental Accreditation  28%  72%
Education  45%  55%
Research  37%  63%

Question: Generally, is there anything that BSE could do that would encourage you to become more involved with the society?
• Have more events outside of the South of England... Video-conferencing of major BSE meetings would allow more members in Scotland/Wales/Northern Ireland to participate.
• How it is at the moment is perfect
• Happy to help if meetings are close to London area due to childcare commitments
• local meetings e.g. London group networking
• Active research
• not sure
• An electronic version of ECHO so we can see the images moving, more likely to actually submit an article
• Ensure the role of the cardiac physiologist continues to be a priority role within BSE
• Organise regular local regional scientific meetings throughout the year
• Seems quite adequate for my requirements.
• Perfectly happy with keeping up to date with website and Echo journal
• Lots of successful initiatives BUT need more support in the dgh's...
• Website that was updated more frequently
• Firstly the membership is too expensive for the services provided. Thereafter given the amount of Irish members more Irish based educational events would be a great benefit

We are grateful to all the members who participated in this survey. Those who expressed interest in joining a committee, and provided their email address, will shortly receive an email from us with more information.
A new 60 second survey is now available on the website www.bsecho.org. Topic: Accreditation
SPRING 2015
ACCREDITATION EXAMS

The next sitting of the Transthoracic and Community written accreditation exams will take place on Friday 13th March 2015.

Registration will take place via the BSE website (www.bsecho.org) and will open on 12th January.

Places will be allocated on a first come, first serve basis.

Places for the exam cannot be reserved in advance.

COMMUNICATING WITH THE SOCIETY

Dawn Appleby admin@bsecho.org - 020 7345 5185
BSE, Docklands Business Centre, 10-16 Tiller Road, London, E14 8PX
Tel: 020 7345 5185          Fax: 020 7345 5186

We can also be contacted via email to:

Accreditation Queries (Exams, Logbook Submission, re-accreditation)
Jo Thanjal at jo@bsecho.org & Nasreen Begum at Nasreen@bsecho.org

Financial matters (payments, direct debits, duplicate receipts)
Ingrid Daniel at ingrid@bsecho.org or finance@bsecho.org

Meetings and Events – Dawn Appleby at bsecho.org - 020 7345 5185

For submission of educational articles or case reports for ECHO:
Dr. Gordon Williams at drgjwilliams@gmail.com and/or ingrid@bsecho.org

Echo Research Practice Journal related queries.
Echo Research And Practice, Bioscientifica Ltd, Euro House, 22 Apex Court, Woodlands, Bradley Stoke, Bristol BS32 4JT
Tel: 01454 642274   www.echorespract.com
The BSE Annual General Meeting was a truly inspiring event. There were many talks by experts, which both refreshed and expanded my knowledge on common topics and up to date advancements in the field of Echocardiography. Professor Alan Fraser from the University Hospital of Wales, explained why we should be using strain, if we are not already using it. Do you often wonder if an apparently normally functioning Left Ventricle is actually normal or not? Do you wonder if you are maybe missing something? I certainly do it all the time. He showed an interesting case where a mother had typical echo features for HOCM. Her daughter had a screening echo which looked perfectly normal, other than abnormal pulmonary vein flow. Strain indicated abnormality which was confirmed by subsequent genetic screening. He highlighted that strain is useful for detecting abnormalities when the Left Ventricle function appears normal and how this can be useful in the evaluation of certain patient groups i.e. those on cardiotoxic chemotherapy or with Fabry's or Amyloid. The well known, Mark Monaghan from Kings College Hospital in London, updated us on the use of 3D echo in his lab. He highlighted that 3D volumes have less of a variability than 2D volumes. With more demand on the echo lab to produce accurate EF measurements, especially with patients on cardiotoxic chemotherapy treatment, or where the decision to implant a CRT device depends on a criteria of EF<35% , we need measurements that are as accurate and reproducible as possible. He stated that EF measurements using 3D volumes are well validated against MR (which is the gold standard). He also talked about the use of 3D in Mitral valve assessment. The Mitral valve is a complex 3D structure, so it only makes sense that it is better to use 3D imaging techniques for it's assessment. 3D TOE is now gold standard. Vena contracta and PISA measurements using 2D can be quite inaccurate because there are assumptions, that it is a circular structure, where in fact it's more elliptical. Software on the machine can now evaluate PISA in Mitral Regurgitation using 3D automatically. He also touched on some exciting, possible future applications, such as measuring twist rather than LV volumes, using real-time 3D strain and fusion imaging (i.e. combining CT images with 3D echo). In general, the BSE conference gave me food for thought, increased my personal knowledge and inspired me to do further reading.

Lorraine McMahon
Senior Cardiac Physiologist
Accreditation News

Practical Assessment Process for 2015

Following the success of the previous 2 pilot assessments undertaken in 2014, we are delighted to announce that, as from the next written exam in Spring 2015, this process will become the expected route to take the practical portion of the BSE Adult TTE Proficiency Accreditation. Candidates attending the practical assessment will be given their result on the day, together with feedback, resulting in an improved process and shorter turnaround times for candidates.

The next Practical Assessment will be held on Sunday 8th February at Wythenshawe Hospital in Manchester. There will be 3 more sittings throughout the year in various locations. Registration for these assessments will be available on a first come basis. Registration will open in the New Year, please check our website for further updates.

We will also be offering a pilot sitting of a Practical assessment for both the Critical Care Accreditation process and the TOE Accreditation. This process will include an assessment of practical skills, using volunteer models for the Adult TTE and the Critical Accreditations, and a simulator for the TOE process. Logbooks and video cases will be assessed at the venue also.

Full details of the process, registration and dates for future assessments will be announced on the BSE website in due course, and the Accreditation packs will soon be updated to reflect the changes.

DEPARTMENTAL ACCREDITATION

Echotech – 5 year reaccreditation
Clinical Diagnostix – 5 year reaccreditation
RECENTLY ACCREDITED MEMBERS

Congratulations to the following members who have recently achieved BSE Accreditation

Transthoracic Accreditation

Lois Albin  County Durham and Darlington NHS Foundation Trust
Fiona J Almack  Friargate hospital
Liiliana Alves  Luton and Dunstable Hospital
Tanya Andrews  Queens Hospital
Dr Matthew Balerdi  Leeds General Infirmary
Dr Russell Barber  Grantham and district hospital
Carol A Barrett  NHS Tertiary Centre
Gemma Bassindale  Leeds General Infirmary
Dr Gordon Begg  Leeds General Infirmary
Daniela Bispo  Harrogate District Foundation Trust
Robert Bunce  John Radcliffe Hospital
Dr Thomas Cahill  Milton Keynes Hospital
Dr Paul D Callan  Castle Hill Hospital
Lisa Clay  Manchester Royal Infirmary
Stefanie Clement Abertawe-Bro Morgan
Rui Miguel Da Silva Mota  Royal Brompton Hospital
Michaela Dhillon  Hereford County Hospital
Luciana Dias  The Royal Brompton & Harefield NHS Trust
Dr Hind Elzein  Ysbyty Gwynedd, Bangor
Dr Bara Erhayiem  Nottingham University Hospitals - City Campus
Dr Graham Fent  Northern General Hospital
Andrew Fitzpatrick  Leeds General Infirmary
Lucy Ford
Arjun Ghosh  St Mary's Hospital
Lisa Gosling  Pilgrim Hospital
Anna Gray  Naa General Hospital
Katie Gregory  Birmingham Heartlands Hospital
Ana Guerreiro  East Surrey Hospital
Kate Hallows  Leighton Hospital
Dr Paul Hong  University Hospital of Wales
Angela Iles  University Hospital Southampton
Dr Rumyana Iskrev
Dr Tevfik Ismail  Imperial College Healthcare NHS Trust
Earnest Jayaraj  Royal free Hospital
Dr Zohya Khalique  St George’s Hospital
Dr Kevin Leong  Imperial College Healthcare NHS Trust
Peter Luke  Freeman Hospital
Dr Vishal Luther  West Middlesex Hospital
Dr Kristopher Lyons  Antrim Area Hospital
Jayne Maher  St. Vincents University Hospital
James Malcolmson  Barts and The London NHS
Maria Matheus  Mayo General Hospital
Colum McKay  St. Vincents University Hospital
Cara Jane Mercer  Grantham & District Hospital
Dr Monica Mila  Doncaster Royal Infirmary
Susan Mulholland  Mater Hospital
Dr Hanif Mustafa  University Hospital of Coventry and Warwickshire
Greg Mysak  Papworth NHS Trust
Dr Michael Chi Yuan Nam  Southampton General Hospital
Michael Nixon  Royal Victoria Infirmary
Dr Helen Parry  Ninewells Hospital and Medical School
Dr Tania Pawade  University of Edinburgh
Marta Penas  Milton Keynes Hospital
Amy Pine  Royal Bournemouth Hospital
Dr Carla Plymen  St Thomas’ Hospital
Dr Keerthi Prakash
Karen Quinn  Mater Misericordiae University Hospital
Dr Anna Reid  Macclesfield District General Hospital
Dr Sushma Rekhraj  Papworth Hospital
Eleanor Rowley  Worcester Royal Hospital
Dr Rebecca Schofield  St Vincents University Hospital, Dublin
Dr Mark Scoote  Colchester Hospital
Muhammad Shahid  University Hospital Coventry, Warwickshire NHS FT
Rosie Tarafdar  St Richard’s Hospital
Dr Upasana Toyal  Barnet Hospital
Rhian Thomas  Morriston Hospital
Dr Alexandra Thompson  Darlington Memorial Hospital
Marsha Thornton  St Vincent's University Hospital
Alison Threlfall  St Helens and Knowsley Teaching Hospitals
Louise Tyler  Sandwell and west Birmingham hospital
Grace Ward  Regional Hospital Tullamore
Anna White  Belfast Health and social care trust
Amy Frances  Wilkins Royal Gwent hospital
Sarah Williams  Wirral University Teaching Hospital
Kylie Woolmore  Royal United Hospital
Matthew Fomonyuy Yuyun

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Transoesophageal Accreditation

Dr Anne Scott

Dr Nicholas Lees, Harefield Hospital
Dr Liam Ring, West Suffolk Hospital
Dr Lynne Williams, Papworth Hospital
Dr Kristopher Lyons, Antrim Area Hospital
Dr Mohammed Khanji, Barts and the London NHS Trust, Queen Mary University
Maxine Lang Lancashire Cardiac Centre
Dr Liam Ring
Dr Daniel Augustine
Dr Pankaj Garg, Sheffield Teaching Hospitals NHS Foundation Trust
Dr Adil Rajwani, James Cook University Hospital
Dr Chris Steadman
Gurpal Bhogal, Russells Hall Hospital

Practical Assessment TTE Accreditation

Victoria Church Derriford Hospital
Dr Andrew Cluer Hammersmith Hospital
GolzarFaraji The Royal Free Hospital
Luis Geraldes Aberdeen Royal Infirmary
Harjeet Kang Royal Derby Hospital
Kojo Kyereme Saint Anthony's Hospital
Lindsay Male South Tyneside DGH
Anna Proudlove St George's Hospital
Kirsty Randall Royal Derby Hospital
Dr Idrisu Sanusi Musgrove Park Hospital
Kimberley Scott Queen Elizabeth The Queen Mother Hospital
Sadie Scriven University Hospital of South Manchester
Dr Colin Stirrat Royal Infirmary, Edinburgh

DATES FOR YOUR DIARY 2014/15

BSE members can also see up-to-date details via the Events Calendar on the website www.bsecho.org

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
<th>Location</th>
<th>Contact</th>
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<tbody>
<tr>
<td>20th January</td>
<td>Manchester TOE Simulator Workshop</td>
<td>Manchester</td>
<td><a href="mailto:eileen.mclaggan@uhsm.nhs.uk">eileen.mclaggan@uhsm.nhs.uk</a> or 0161 291 4643</td>
</tr>
<tr>
<td>28th January</td>
<td>Manchester TOE Simulator Workshop</td>
<td>Manchester</td>
<td><a href="mailto:eileen.mclaggan@uhsm.nhs.uk">eileen.mclaggan@uhsm.nhs.uk</a> or 0161 291 4643</td>
</tr>
<tr>
<td>10th March</td>
<td>Manchester TOE Simulator Workshop</td>
<td>Manchester</td>
<td><a href="mailto:eileen.mclaggan@uhsm.nhs.uk">eileen.mclaggan@uhsm.nhs.uk</a> or 0161 291 4643</td>
</tr>
<tr>
<td>13th March</td>
<td>BSE Transthoracic Exams</td>
<td>London, Dublin, Manchester, Bridgend &amp; Edinburgh</td>
<td><a href="mailto:accreditation@bsecho.org">accreditation@bsecho.org</a> or 0207 345 5185</td>
</tr>
</tbody>
</table>
Letters to the Editor

To enhance ECHO both for the authors of submissions and for other readers, if you have any views regarding items appearing in ECHO please write to the editor.

Publishing your views and comments, inviting responses from authors and readers can make ECHO an even more enjoyable and informative publication.

Please email the editor at: Editor@bsecho.org
Joint BSE & ICE Meeting  
Saturday 14th March 2015  
Royal College of Physicians of Ireland, Dublin  
Provisional Programme  
Please note this programme is subject to change.  
Please visit the BSE website for the most current version.

Session 1  Heart Muscle Disorders  
Connective tissue disorders  
Restrictive cardiomyopathy and cardiac amyloidosis  
Ventricular non compaction

Session 2  Echocardiography in the adult with Congenital Heart Disease and the Right Heart  
Ebsteins Anomaly: Diagnosis, Prognosis and Surgical Assessment  
Diseases of the RVOT, Pulmonary Stenosis and Double Outlet RV Transposition

Session 3  Role of Echo in Endocarditis  
Left Heart Endocarditis  
Right Heart Endocarditis

Session 4  DICE presentations  
DICE sessions- interesting cases

Session 5  Echocardiography in Africa  
A View of Rheumatic Heart Valve Disease in the 21st Century

The pre registration fee for this meeting is £65 (approx €82). Pre registration closes on 6th March 2015.  
The onsite registration fee will be €95 or £75.

Registration is via the BSE website http://www.bsecho.org/events-courses/bseice-joint-meeting/  
Non members will be able to register by downloading and completing a paper registration form.  
5 BSE re-accreditation points are awarded to this meeting.