

CASE REPORT

# Coming undone: a case of annuloplasty ring suture degeneration post mitral valve repair leading to recurrent severe MR

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## Summary

Mitral valve repair is the gold standard treatment for degenerative mitral valve disease with superior perioperative and long-term morbidity and mortality outcomes vs mitral valve replacement. The 10 year survival freedom from redo valve repair varies from 72 to 90%. Often, failure of valve repair necessitating redo surgery is directly related to disease progression; however, rarely it can be attributed to technical complications such as annuloplasty dehiscence, leaflet suture rupture, incorrect artificial chord length or incorrect annuloplasty position. We report one such case of severe mitral regurgitation secondary to a degenerative annuloplasty ring suture occurring 1 year post valve repair.

### Key Words:

- ▶ 3D transoesophageal echocardiography
- ▶ mitral valve
- ▶ mitral regurgitation
- ▶ mitral valve repair
- ▶ mitral valve surgery

## Learning points:

- Differentiation of causative pathology involved in recurrent mitral regurgitation following repair has important implications for patient outcomes.
- In the hands of an experienced practitioner echocardiography – in particular, integrated 2D- and 3D echocardiography – is a powerful tool for differentiating between progressive disease and procedural failure.

## Background

Mitral valve repair is the gold standard treatment for degenerative mitral valve disease with superior perioperative and long-term morbidity and mortality outcomes vs mitral valve replacement. The 10 year survival freedom from redo valve repair varies from 72 to 90% (1). Often, failure of valve repair necessitating redo surgery is directly related to disease progression; however, rarely it can be attributed to technical complications such as annuloplasty dehiscence, leaflet suture rupture, incorrect artificial chord length or incorrect annuloplasty position.

The differentiation of whether recurrent regurgitation is secondary to disease progression or procedural failure has direct implications on both management and outcomes. In cases of disease progression, redo repair is avoided as these patients are felt to have poor tissue quality and thus would be poor candidates for further re-repair. In procedural failure, however, redo repair is preferred and is associated with improved survival and improved recovery of left ventricular function.

This case report demonstrates how integrated 2D- and 3D imaging derived from TTE and TOE allows for greater

insight into the mechanisms of repair failure and thus, in the hands of an experienced practitioner, is a powerful tool for guiding the correct course of management.

## Case presentation

A 67 year old male originally presented in January 2018 with worsening dyspnoea on exertion with a New York Heart Association (NYHA) score III. Subsequent transthoracic echocardiography (TTE) and transoesophageal echocardiography (TOE) imaging demonstrated dual valve pathology with severe aortic incompetence and severe mitral regurgitation (MR) with preserved left ventricular function. He subsequently underwent bioprosthetic aortic valve replacement (AVR) and mitral valve repair using a 65 mm Simplici-T Medtronic band. He had an excellent post-operative recovery noting a dramatic improvement in his symptoms from NYHA class III to I. This was re-iterated in a follow-up TTE performed 2 months post-operatively which demonstrated normal biventricular function with a well seated AVR with no regurgitation and only trivial MR.

## Investigation

Fourteen months following his initial operation, he was referred to the Cardiology department of Craigavon Area Hospital, Northern Ireland, for a rapid access TTE at the request of his GP due to worsening exertional dyspnoea. This demonstrated a moderate-severe anterior paraannular

jet of MR. He was subsequently brought forward for an urgent TOE. It demonstrated mobile, mildly thickened mitral leaflets with a moderate to severe jet of MR adjacent to A1/P1 scallops with the regurgitant jet appearing to spread obliquely across the left atrium (Fig. 1 and Video 1). Vena contracta was measured at 6 mm with a proximal isovelocity surface area (PISA) of 8 mm. Upon review of the images, a focal point of interest was noted at a suture point of the annular ring at the 7 o'clock position in the surgical view, likely representing a degenerative suture repair (Figs 2, 3 and Video 2).

### Video 1

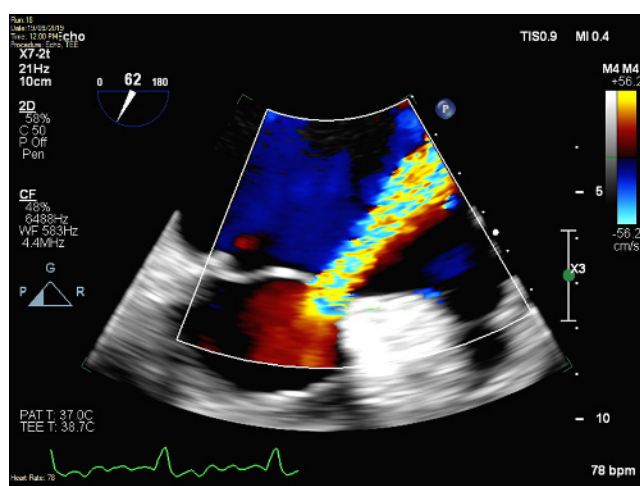
Mid-oesophageal bi-commissural view with colour Doppler demonstrating a moderate to severe jet of mitral regurgitation at the level adjacent to A1/P1 scallops with the MR jet appearing to spread obliquely across the left atrium. View Video 1 at <http://movie-usa.glencoesoftware.com/video/10.1530/ERP-19-0058/video-1>.

### Video 2

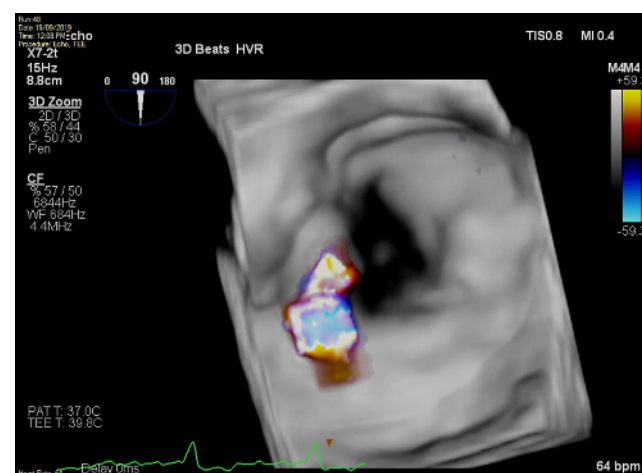
3D assessment of mitral valve annuloplasty ring in surgical view demonstrating a discrete jet of regurgitation at the 7 o'clock position overlying an annuloplasty suture point. View Video 2 at <http://movie-usa.glencoesoftware.com/video/10.1530/ERP-19-0058/video-2>.

## Discussion

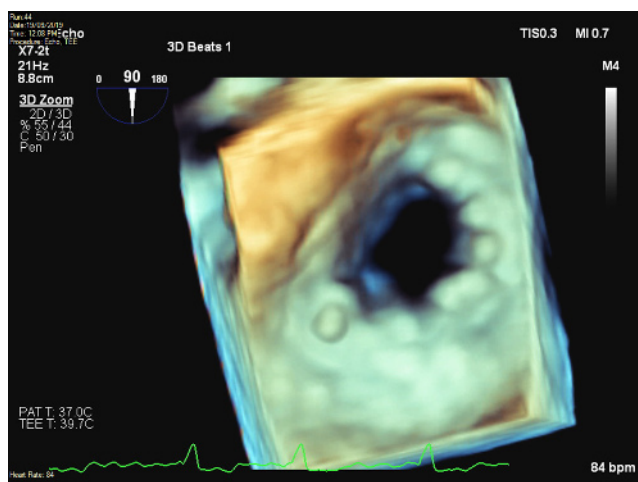
The mitral valve is a morphologically complex valve, the structure and function of which is delicately linked



**Figure 1** Mid-oesophageal bi-commissural view with colour Doppler demonstrating a moderate to severe jet of mitral regurgitation at the aortomitral curtain level adjacent to A1/P1 scallops with the MR jet appearing to spread obliquely across the left atrium.

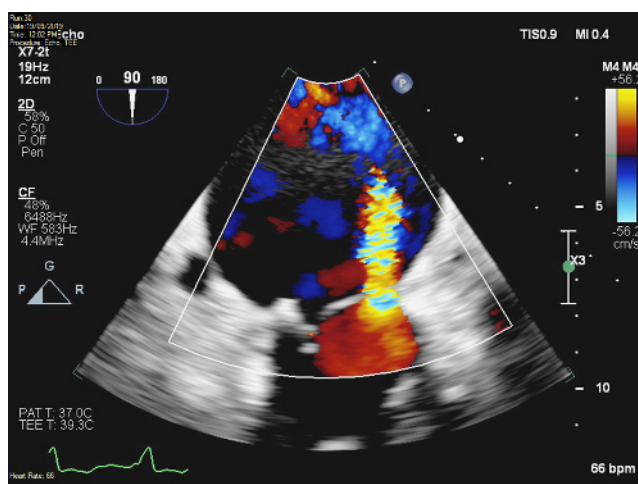


**Figure 2** 3D assessment of mitral valve annuloplasty ring in surgical view demonstrating a discrete jet of regurgitation at the 7 o'clock position overlying an annuloplasty suture point.



**Figure 3**  
3D assessment of mitral valve annuloplasty ring in surgical view demonstrating a focal area of interest at the 7 o'clock position. This position overlies an annuloplasty suture point used in mitral valve repair and likely represents degradation of the original suture.

to its surrounding architecture. Unlike the aortic valve, its innate mechanistic function is not easily replicated by valvular replacement. For this reason, mitral valve repair is the preferred choice for the treatment of severe mitral regurgitation secondary to degenerative valve disease. It confers multiple benefits when compared to replacement, including better preservation of left ventricular function, lower risk of thromboembolism and, therefore, lack of need for anticoagulation and its associated haemorrhagic risks; together these factors equate to improved morbidity and longer term survival (1).



**Figure 4**  
Mid-oesophageal 60-degree view with colour Doppler demonstrating a moderate to severe jet of mitral regurgitation at the level of the P1 scallop.

Interestingly the rate of re-operation for both mitral valve replacement and repair are similar with an annualised rate of 0.5 to 1.5%; however, their respective mechanisms and timing of onset differ. In mitral valve replacement, failure tends to occur at 10 years, whereas in repair, it tends to occur earlier with a 5-year freedom from re-operation in approximately 90% of patients. This is most commonly due to a progression of underlying valvular disease. In rarer cases, procedural complications are to blame; these include leaflet suture rupture, incorrect annuloplasty position and incorrect artificial chord length (2).

The differentiation of whether recurrent regurgitation is secondary to disease progression or procedural failure has important implications for ongoing care. Often redo repair is avoided in patients with disease progression due to the acceptance that they are likely to have poor tissue quality and thus would be poor candidates for further re-repair. In these patients, the preferred strategy is to completely replace the regurgitant valve. However, in cases of procedural failure, the rate of re-repair is much higher at 56%. This has important implications in outcome, since in patients undergoing re-repair vs replacement, re-repair is associated with improved survival and improved recovery of left ventricular function (3). Indeed, the prior benefits conferred from primary repair on survival and left ventricular function have been shown to persist after re-repair (1). Therefore, this reiterates the importance of echocardiography, in particular 3D echo, in determining the aetiology of recurrent MR.

Multimodality imaging plays a vital role in the diagnosis of MR which has only become more central with the ever increasing technological advances of the past two decades. In particular, integration of 2D- and 3D imaging derived from TTE and TOE has yielded much greater insight into the mechanisms of repair failure and is therefore a crucial tool in evaluating and differentiating between the different aetiologies of repair failure. This case demonstrates how the use of 3D TOE can be used to identify the distinct causative pathology in this instance (Figs 1, 2, 3, 4 and Videos 1, 2). As demonstrated, in the hands of an experienced practitioner, the use of integrated 2D- and 3D echocardiography is a powerful tool for determining the distinct pathology in recurrent post-operative MR and therefore has a crucial role in conferring improved patient outcomes.

#### Declaration of interest

The authors declare that there is no conflict of interest that could be perceived as prejudicing the impartiality of this case report.

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### Patient consent

Written informed consent for publication of clinical details and/or clinical images was obtained from the patient.

### Author contribution statement

Patrick Savage performed literature review of relevant information with respect to the case report and wrote the case report in its entirety. Michael Connolly obtained enclosed images using TTE/TOE, advised on the best image selection for the report and proof read the finished article.

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