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**CASE REPORT**
*Other*

# Successful MitraClip for severe rheumatic mitral regurgitation: a case report

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**Background** Anatomical exclusion criteria for the MitraClip procedure have included rheumatic heart disease (RHD) involving the mitral valve. This was primarily because RHD is typically associated with mitral stenosis (MS).

**Case summary** We report the case of an 85-year-old male who had recurrent heart failure admissions from severe rheumatic mitral regurgitation (MR). This was successfully treated with the MitraClip system.

**Discussion** Our case demonstrated the possibility of rheumatic MR being treated by the MitraClip system in appropriately selected patients. Careful examination of the mechanism of MR to determine suitability for MitraClip must be done as well as exclusion of significant MS.

**Keywords** Mitral regurgitation • Rheumatic heart disease • MitraClip • Case report

## Learning points

- MitraClip for rheumatic mitral regurgitation (MR) can be effective and safe in appropriately selected patients.
- Concomitant significant mitral stenosis (MS), as well as severe calcification in the grasping area, should be excluded prior to MitraClip for rheumatic MR.
- The Heart team should consider if the benefits of MR reduction significantly outweighs the risk of MS.

## Introduction

Transcatheter repair of severe mitral regurgitation (MR) with the MitraClip system is now an established therapeutic option for patients with anatomically suitable mitral valve and in whom surgery is assessed to be of high risk.[1,2] Anatomical exclusion criteria have evolved with greater collective experience worldwide. In the seminal EVEREST II trial, anatomical exclusion criteria included the presence of excessively large flail segments, flail gaps, clefts, endocarditis, etc.[3] Rheumatic heart disease (RHD) is often regarded as an exclusion criterion, primarily because RHD typically causes mitral stenosis (MS). We herein report a patient with RHD who had severe MR that was successfully treated with the MitraClip.

## Timeline

| | |
|---|---|
| Six months before procedure | Five admissions for heart failure from severe rheumatic mitral regurgitation (MR) |
| Procedure | MitraClip procedure (1 clip) with reduction to mild MR |
| Five years after procedure | No further heart failure admissions and MR remained mild |

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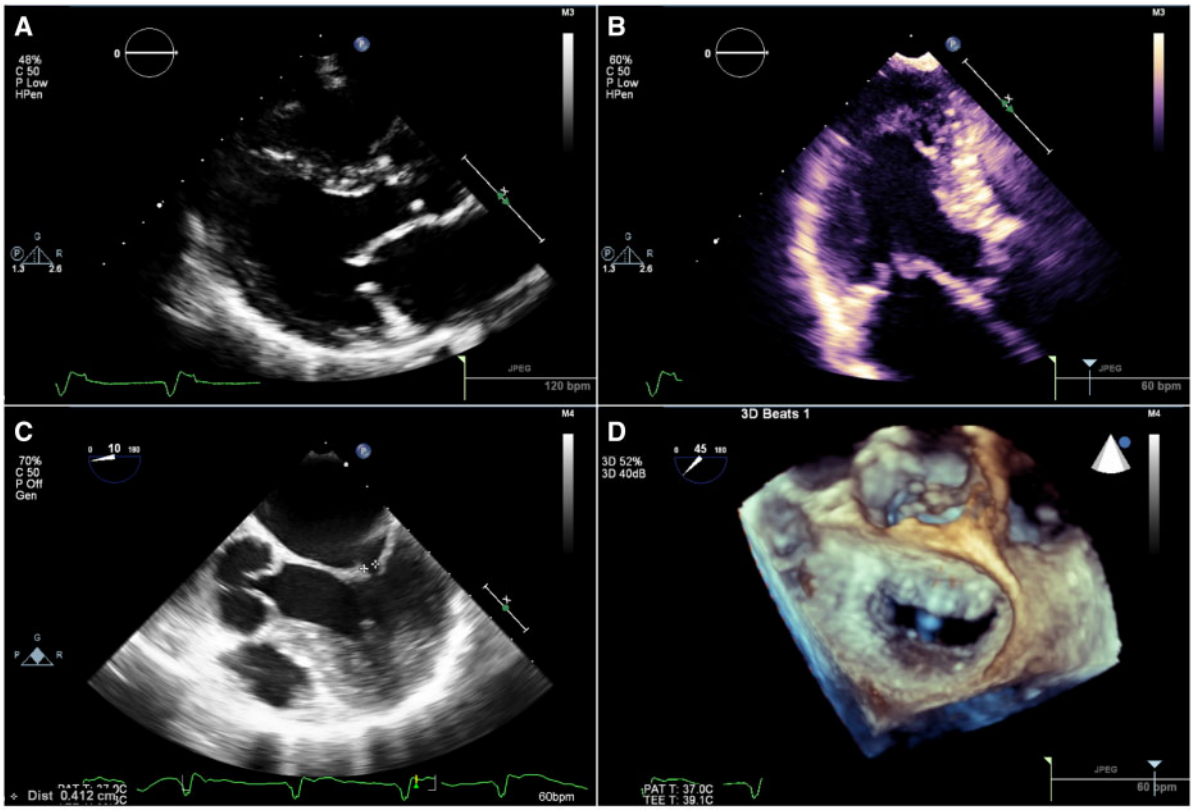


**Figure 1** (*A*) Transthoracic echocardiographic parasternal long axis and (*B*) apical 3-chamber views showing rheumatic mitral valve with moderately thickened leaflets and restricted mobility of the posterior leaflet in both systole and diastole. (*C*) 2D and (*D*) 3D transoesophageal echocardiographic images showing a wide coaptation gap (4.1 mm).

## Case presentation

The patient was an 85-year-old male with atrial fibrillation, sick sinus syndrome with a permanent pacemaker, and chronic kidney disease (CKD). He had multiple admissions for heart failure (5 over a 6-month period) with the most recent admission being associated with cardiogenic shock requiring inotropic support. He had shortness of breath and chest discomfort on exertion as well as orthopnoea for 1 week. Physical examination showed a pulse rate of 89 b.p.m., blood pressure (BP) of 88/57 mmHg, respiratory rate of 28/min, and 89% oxygen saturation on room air. Auscultation revealed a pansystolic murmur over the apex. He was in heart failure with bibasal lung crepitations and bipedal pitting oedema. Intravenous (IV) dopamine was given to support his BP while using IV furosemide to get him out of fluid overload. Electrocardiogram showed a ventricular paced rhythm. His haemoglobin was 14.7 (14.0–18.0) g/dL and estimated glomerular filtration rate was 27 mL/min/1.73 $m^2$ (stage 4 CKD). Coronary angiography showed single vessel disease with chronic total occlusion (CTO) of the right coronary artery (RCA) receiving collaterals from the left anterior descending artery.

Echocardiography showed a rheumatic mitral valve with moderately thickened leaflets and restricted mobility of the posterior leaflet in both systole and diastole (*Figure 1A, B*, Supplementary material online, *Video S1*). There was gross mal-coaptation of the mitral valve leaflets (*Figure 1C, D*, Supplementary material online, *Video S2*). This resulted in severe MR (*Figure 2A–D*, Supplementary material online, *Videos S3–S5*) with an effective regurgitant orifice area (EROA) of 0.99 $cm^2$, regurgitant volume of 65 mls, and systolic flow reversal in the pulmonary veins (*Figure 2E*). The mean mitral valve gradient was 2 mmHg and the mitral valve area by planimetry on 3D was 2.7 $cm^2$ (*Figure 2F, G*). There was rheumatic involvement of the aortic valve with mild aortic stenosis and mild-moderate aortic regurgitation. Tricuspid regurgitation was moderate in severity and the estimated pulmonary artery systolic pressure was 28 mmHg. He had normal left ventricular (LV) dimensions and a LV ejection fraction of 55%. There were no regional wall motion abnormalities. Of special note was the fact that although there was an RCA CTO, the inferior and posterior-basal walls did not demonstrate any wall motion abnormalities. The patient was referred to a cardiac surgeon who assessed him to be of very high surgical risk. His EUROSCORE II was 14.8% and his Society of Thoracic Surgeons (STS) score for mortality was 20.0%. After a Heart Team discussion, he was offered the MitraClip therapy.

The first grasp was performed centrally with careful attention to grasp both leaflets adequately especially since there was a significant gap of 4.1 mm between the leaflet tips. With a single clip, the MR was reduced substantially to 1+ (*Figure 3A–D*, Supplementary material

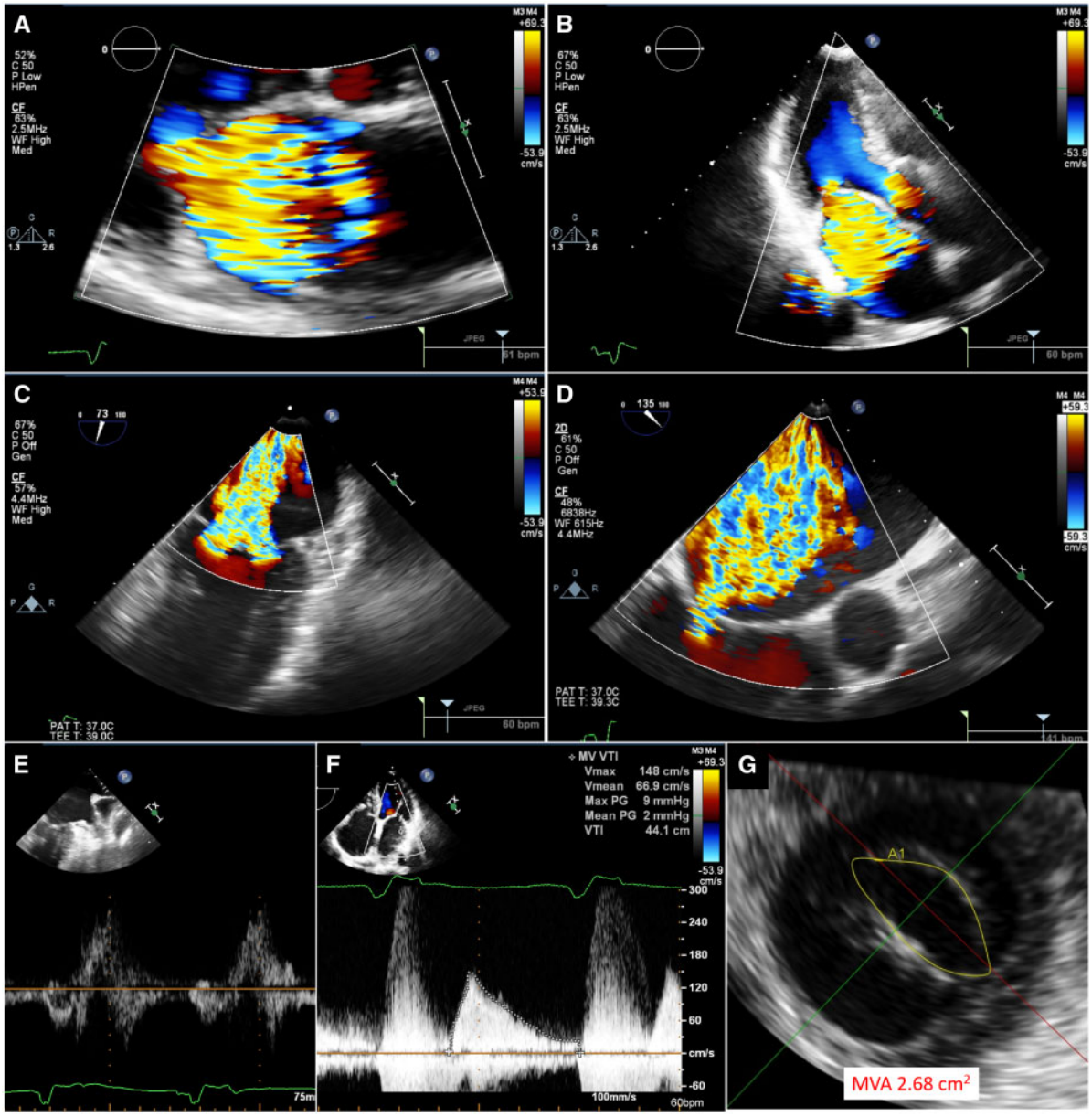


**Figure 2** Severe mitral regurgitation demonstrated on (*A*, *B*) transthoracic echocardiographic parasternal long axis and apical 3-chamber views, as well as (*C*, *D*) transoesophageal echocardiographic intercommissural and left ventricular outflow tract views. (*E*) Pulmonary vein systolic flow reversal. (*F*) Transmitral mean pressure gradient of 2 mmHg. (*G*) Mitral valve area of 2.68 $cm^2$ by planimetry.

online, *Video S6* and *S7*). The pulmonary venous flow now showed systolic predominance (*Figure 3E*). The mean mitral gradient was 3 mmHg at a BP of 126/66 mmHg (*Figure 3F*). The combined planimetered mitral valve orifice area was $0.7 + 1.3 = 2.0$ $cm^2$ (*Figure 3G*). Arterial BP improved substantially (*Figure 4*). Post-procedure, his functional status improved from New York Heart Association Classification IV to II. Five years later, at 90 years of age, he had no further heart failure admissions and the MR remained as mild on echocardiography.

## Discussion

To the best of our knowledge, this is the first report of successful treatment of rheumatic MR with the MitraClip system. Absolute contraindications for MitraClip implantation include mean mitral valve gradient > 5 mmHg as well as severe calcification in the grasping area. These features, especially significant MS, are frequently seen in a rheumatic mitral valve and hence RHD is excluded from MitraClip procedures.[4,5] In the EVEREST II trial, the exclusion criteria included patients with a mitral valve area of <4 $cm^2$. The features of rheumatic mitral disease in this

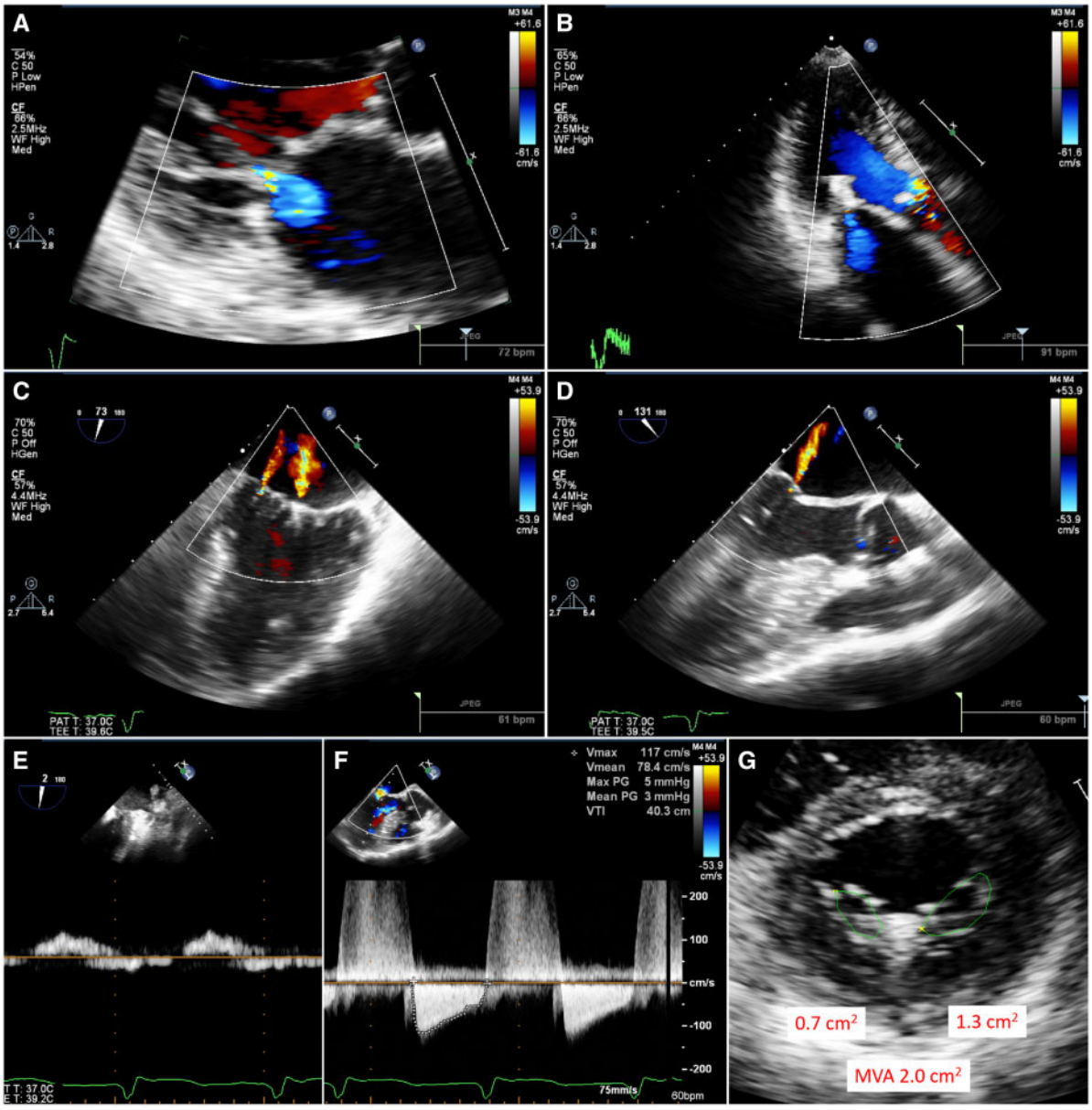


**Figure 3** Reduction in mitral regurgitation to mild after implantation of MitraClip as demonstrated on (*A, B*) transthoracic echocardiographic parasternal long axis and apical 3-chamber views, as well as (*C, D*) transoesophageal echocardiographic intercommissural and left ventricular outflow tract views. (*E*) Restoration of pulmonary venous flow. (*F*) Transmitral mean pressure gradient of 3 mmHg. (*G*) Total mitral valve area of 0.7 + 1.3 = 2.0 $cm^2$ by planimetry.

patient included the thickened and restricted mitral valve leaflets, with restriction in both systole and diastole. Compared to MR due to other pathologies such as degenerative, functional or MR due to infective endocarditis, MR due to RHD is associated with more restricted posterior leaflet movement.[6] Although there was known coronary artery disease, the patient had normal LV systolic function and there were no regional wall motion abnormalities to account for the restricted posterior leaflets. While most RHD typically present at a younger age, in modern societies, RHD is now uncommon and this elderly patient likely represents a late presentation.

Prior to the procedure, we had anticipated that the large coaptation gap and EROA would mandate at least two clips. However, the MR was dramatically reduced with just one clip. We hypothesized that the thickened and less pliable leaflets resulted in greater coaptation when the leaflets were forcibly coapted by the single MitraClip. Although there was a residual gradient of 4 mmHg, this was felt to be clinically not significant in the context of torrential MR at baseline. His subsequent clinical course of events validated our assessment.

In this case, our primary concern was the possibility of causing significant MS. Fortunately, the patient's baseline mitral valve area was


**Figure 4** Arterial blood pressure tracing showing dramatic improvement in blood pressure after implantation of MitraClip.

large enough such that the residual mitral valve area was adequate. There was also some concern that the gripper hooks would not allow the MitraClip to adequately grip the leaflets. However, although the leaflets were thickened, they were not very calcified and the thick leaflets ultimately influenced the procedure favourably by enhancing coaptation of the leaflets.

## Conclusion

This case demonstrates the possibility of rheumatic MR being treated with the MitraClip system in appropriately selected patients. Significant MS has to be excluded and the Heart team should carefully consider if the benefits of MR reduction is felt to significantly outweigh the risk of MS. More importantly, it illustrates the complexity of the mitral valve and how careful examination of the mechanism of MR can guide therapeutic intervention.

## Lead author biography

Ningyan Wong graduated with the Bachelor of Medicine and Bachelor of Surgery Degree from the National University of Singapore Yong Loo Lin School of Medicine. He completed both his Internal Medicine Residency and Cardiology Senior Residency in SingHealth and obtained the following degrees – Membership of the Royal Colleges of Physicians (UK) Internal Medicine and Master of Medicine (Internal Medicine) Singapore. He is currently an Associate Consultant as well as an Interventional Fellow with National Heart Centre Singapore.

## Supplementary material

Supplementary material is available at *European Heart Journal - Case Reports* online.

**Slide sets:** A fully edited slide set detailing this case and suitable for local presentation is available online as Supplementary data.

**Consent:** The authors confirm that written consent for submission and publication of this case report including image(s) and associated text has been obtained from the patient in line with COPE guidance.

**Conflict of interest:** K.K.Y. is a speaker, consultant and proctor for Abbott Vascular (MitraClip) and reports receiving honoraria from Abbott Vascular.

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