

MITRACLIP AS A THERAPEUTIC ALTERNATIVE IN A POLYMORBID PATIENT WITH SEVERE SECONDARY MITRAL REGURGITATION AND MULTIPLE COMORBIDITIES

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MITRACLIP КАТО ТЕРАПЕВТИЧНА АЛТЕРНАТИВА ПРИ ПОЛИМОРБИДЕН ПАЦИЕНТ С ТЕЖКА ВТОРИЧНА МИТРАЛНА ИНСУФИЦИЕНЦИЯ И МНОЖЕСТВО ПРИДРУЖАВАЩИ ЗАБОЛЯВАНИЯ

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Abstract.

Functional mitral regurgitation in patients with heart failure and reduced ejection fraction is associated with high morbidity and mortality, especially when other serious conditions are present. Here we present a 69-year-old patient with advanced heart failure with reduced ejection fraction (HFrEF), severe secondary mitral regurgitation, stage 5 chronic kidney disease on haemodialysis, complete atrioventricular (AV) block with a permanent pacemaker, and a history of haemorrhagic stroke. Due to the extremely high surgical risk, transcatheter edge-to-edge repair with MitraClip was performed, resulting in a reduction of mitral regurgitation from grade IV to grade I+ without significant mitral stenosis. Five months later, follow-up showed the result was lasting and the device remained stable in place. This case shows that transcatheter edge-to-edge repair (TEER) can be an effective option for high-risk patients with multiple comorbidities.

Key words:

mitral regurgitation, MitraClip, polymorbid patient

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Резюме.

Функционалната митрална регургитация при пациенти със сърдечна недостатъчност с намалена фракция на изтласкване е свързана с висока заболяемост и смъртност, особено при наличие на тежки съпътстващи заболявания. Тук представяме 69-годишен пациент с напреднала сърдечна недостатъчност с редуцирана фракция на изтласкване (СНрФИ, HFrEF), тежка вторична митрална регургитация, хронично бъбречно заболяване стадий 5 (на хемодиализа), пълен атриовентрикулен блок с имплантиран постоянен електростимулатор и анамнеза за преживян хеморагичен мозъчен инсулт. Поради изключително високия оперативен риск беше извършена транскатетърна edge-to-edge корекция с MitraClip, което доведе до редукция на митралната регургитация от степен IV до степен I+ без данни за значима митрална стеноза. При петмесечното проследяване се потвърди трайността на постигнатия резултат и стабилната позиция на устройството. Този клиничен случай подчертава, че транскатетърната edge-to-edge корекция (TEER) може да е ефективна алтернатива при високорискови пациенти с множество съпътстващи заболявания.

Ключови думи:

митрална регургитация, MitraClip, полиморбиден пациент

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INTRODUCTION

Functional mitral regurgitation in patients with heart failure with reduced ejection fraction is associated with an unfavourable prognosis, frequent decompensations, and increased mortality. Treatment decisions in these patients are complex due to factors such as older age, severe left ventricular dysfunction, and the presence of multiple comorbidities. In such cases, transcatheter mitral valve repair with MitraClip may help stabilize the patient and relieve symptoms.

We report the case of a 69-year-old patient with advanced chronic heart failure and a low ejection fraction (EF 29%), severe mitral regurgitation, stage 5 chronic kidney disease (CKD) on haemodialysis, complete AV block with a permanent pacemaker, a history of haemorrhagic stroke, and several other comorbidities. The patient was successfully treated with transcatheter MitraClip implantation. The case illustrates the challenges of complex multisystem involvement in a patient with high cardiovascular and haemorrhagic risk.

CASE PRESENTATION

Medical history: The patient had ischaemic heart disease with an inferior myocardial infarction, followed by several coronary interventions on the RCA, LCx, and OM1. A permanent dual-chamber pacemaker was placed for complete AV block. He was admitted due to complaints of progressive shortness of breath with minimal exertion and at rest, easy fatigue, and peripheral oedema – a clinical presentation of decompensated chronic heart failure (NYHA class III–IV). Comorbidities included the following diseases/conditions: type 2 diabetes mellitus with diabetic nephropathy, CKD stage 5 (on haemodialysis, 3 times per week), secondary anaemia and secondary hyperparathyroidism, previous haemorrhagic stroke with residual right hemiparesis, chronic obstructive pulmonary disease (COPD), bilateral bronchiectasis, and abdominal aortic aneurysm treated with endovascular prosthesis (EVAR).

Physical examination: On admission, the patient was in impaired general condition. Auscultation revealed fine moist wheezing basally bilaterally and a systolic murmur with a maximum intensity at the cardiac apex. The heart rate on admission was 86 bpm, and the blood pressure was 105/70 mmHg. Hepatomegaly was also found (with the liver border at 3 to 4 cm below the costal arch in the midclavicular line). Discrete peripheral oedema was observed.

Instrumental and laboratory data

Laboratory tests: The results showed severe chronic kidney disease, with elevated creatinine (up to 332 $\mu\text{mol/L}$) and urea (up to 25.6 mmol/L) levels, and an

estimated eGFR of 15–20 mL/min/1.73 m². Electrolytes were stable, with serum potassium between 4.6 and 5.0 mmol/L and normal sodium levels. Blood glucose was high (up to 9.4 mmol/L), matching the patient's known type 2 diabetes. The lipid profile showed low LDL cholesterol due to statin use. Liver enzymes were normal. Cardiac markers (hs-Troponin I) were raised (151–163 ng/L) but did not change over time, so there was no sign of an acute coronary syndrome. Blood gas analysis showed metabolic acidosis (pH 7.29; HCO₃⁻ 20.7 mmol/L) with some respiratory compensation. Overall, these results matched expected findings in advanced heart and kidney failure. There were no laboratory indications to avoid the transcatheter procedure.

ECG: The electrocardiogram on admission showed sinus rhythm with effective P-wave-synchronised ventricular pacing, with a heart rate of about 75 bpm.

Chest and lung X-ray: The chest X-ray demonstrated an increased cardiothoracic index, mainly attributed to the left ventricular arch. Signs of pulmonary congestion and reticular changes basally in the right lung were also detected, as well as a minimal right-sided pleural effusion. A haemodialysis catheter and a dual-chamber pacemaker were visualised in an adequate position.

Preprocedural echocardiography: Transthoracic echocardiography showed a dilated left ventricle (LV) with LV end-diastolic dimension of 62 mm and severely reduced systolic function (EF 29%). Severe mitral regurgitation (grade IV) was found with a functional mechanism related to left ventricular remodelling (**Figure 1A**). Tricuspid regurgitation was moderate, and the assessed right ventricular systolic pressure was approximately 60 mmHg. Tricuspid annular plane systolic excursion (TAPSE) was 12 mm, indicating right ventricular dysfunction.

Heart Team Decision

A multidisciplinary Heart Team reviewed the case. The patient's surgical risk was found to be extremely high (EuroSCORE II 13.94%, STS score 42.8%). Because of the severe health problems and high risk, the team decided to proceed with transcatheter edge-to-edge mitral valve repair.

Coronary angiography and intervention

Selective coronary angiography was done through the right radial artery. There was 90% restenosis in the left circumflex artery stent, so a new drug-eluting stent was placed successfully, restoring normal blood flow (TIMI III).

MitraClip implantation procedure

A MitraClip XTW (22/12/6 mm) was implanted in the A2-A3/P2-P3 area using the right femoral vein (24F) and after transseptal puncture. The procedure was performed without any intra- and early postprocedural complications (**Figure 2**).

Fig. 1. Colour Doppler echocardiography before and after MitraClip implantation. **A.** Before the procedure, a massive regurgitation jet was visualised, occupying a significant part of the left atrium. **B.** After MitraClip implantation, a marked reduction in mitral regurgitation was established.

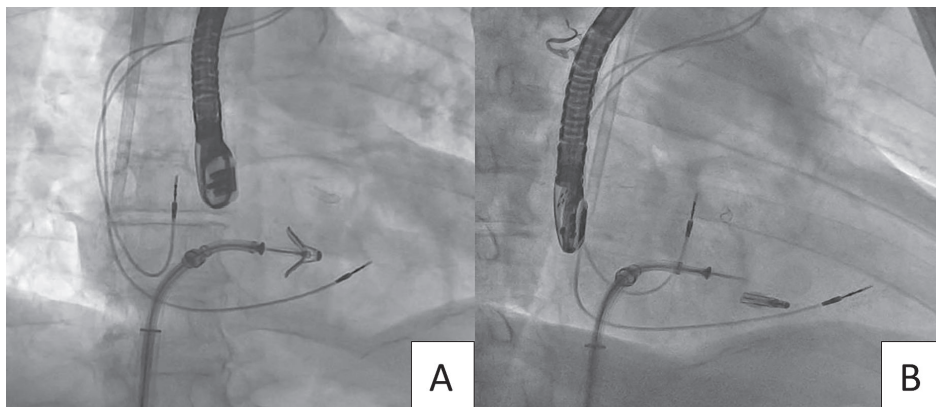
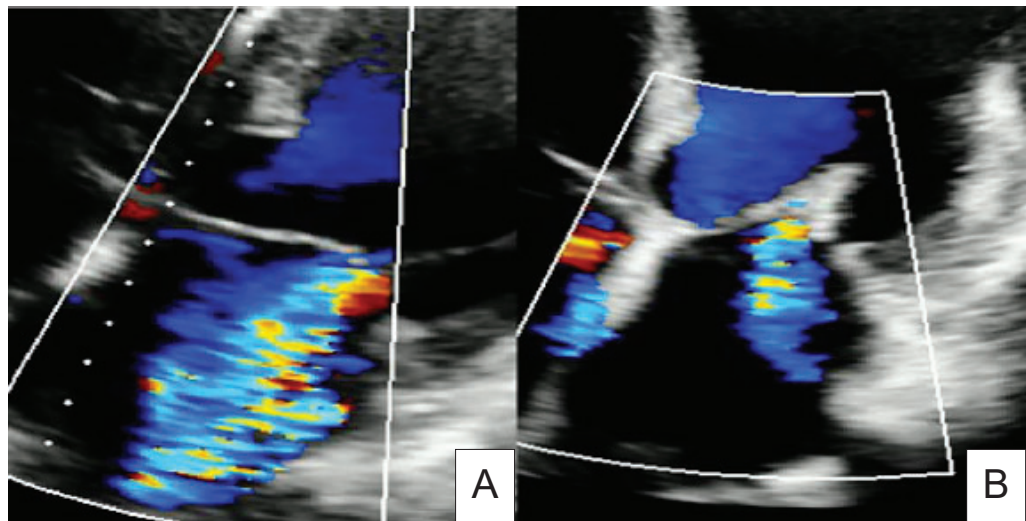


Fig. 2. Fluoroscopic guidance during transcatheter edge-to-edge mitral valve repair (M-TEER). **A.** The image demonstrates intraprocedural fluoroscopic visualisation during device navigation and positioning. A steerable guide catheter is advanced via transseptal access into the left atrium, followed by manipulation of the delivery system and alignment toward the mitral valve plane. The clip delivery system is oriented across the mitral valve under fluoroscopic control to achieve optimal leaflet grasping and secure deployment. **B.** The MitraClip is stably positioned.

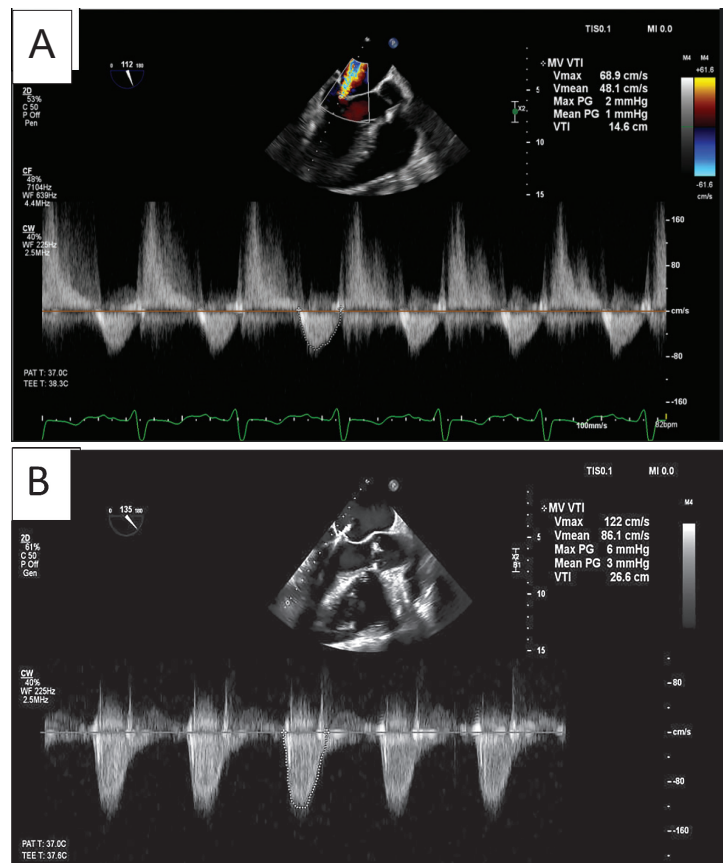


Fig. 3. Transoesophageal echocardiography with cw Doppler examination across the mitral valve before and after transcatheter edge-to-edge repair. **A.** Preprocedural assessment demonstrated low mitral valve gradients, with a maximum pressure gradient (PG) of 2 mmHg and a mean PG of 1 mmHg. **B.** Postprocedural examination revealed increased mitral flow velocities (Vmax 122 cm/s) with a mild rise in mean gradient (to 3 mmHg), without evidence of clinically significant iatrogenic mitral stenosis

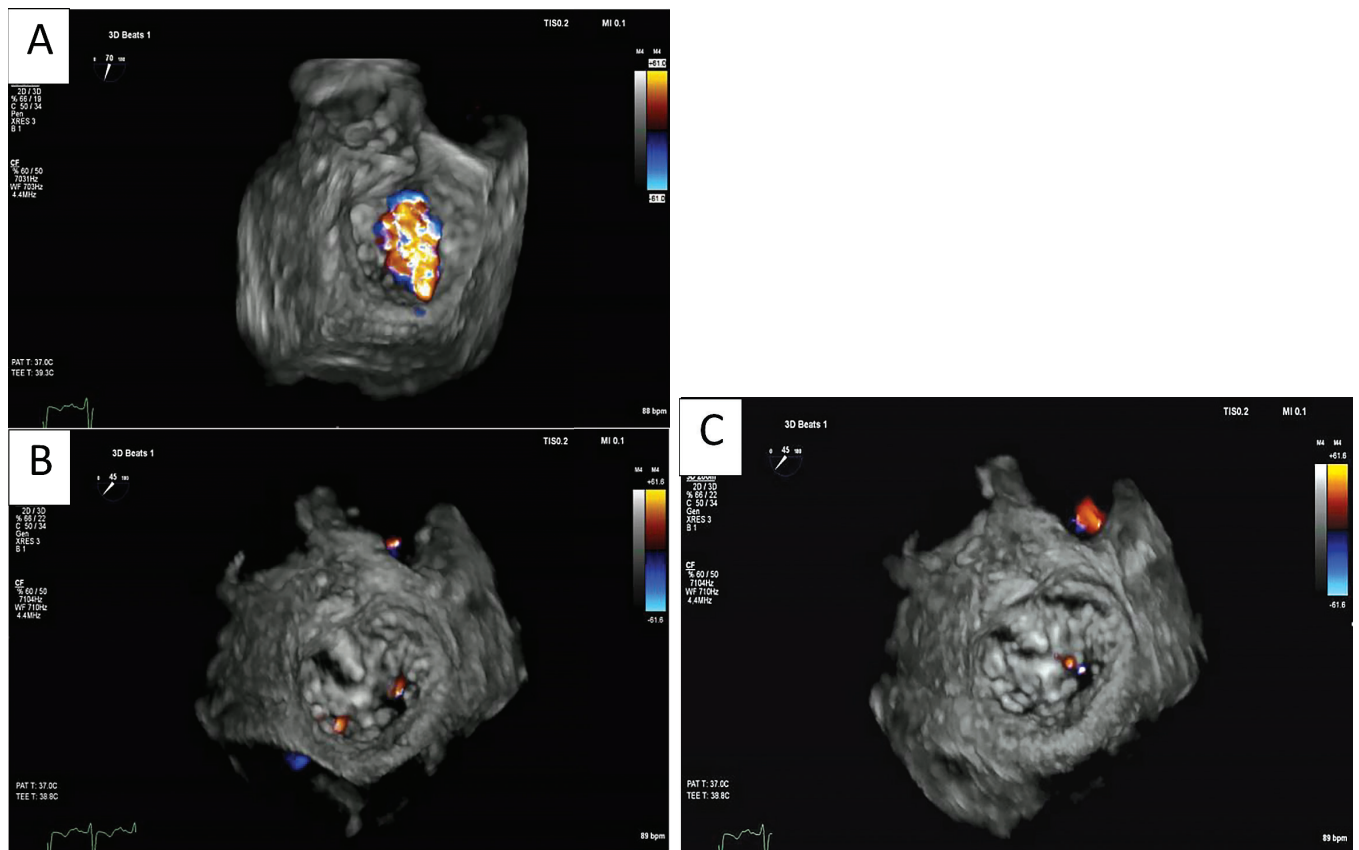


Fig. 4. **A.** Before the procedure, three-dimensional (3D) transoesophageal echocardiogram in early systole showed a large central regurgitation jet, indicating severe functional mitral regurgitation. **B.** After the procedure, in early systole, 3D TEE showed two small side jets but no central defect. **C.** After the procedure, later in systole, 3D TEE showed only a minimal residual mitral regurgitation jet

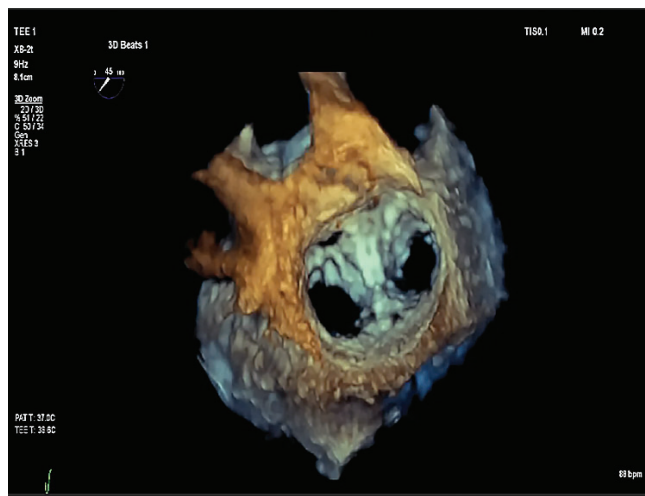


Fig. 5. Postprocedural 3D transoesophageal echocardiography en face view of the mitral valve, demonstrating the final clip position and the resulting double-orifice configuration

Postprocedural outcome

In the early postprocedural period, the patient was haemodynamically stable.

Laboratory tests: On the first day after the procedure, the patient had a temporary increase in white blood cell count (WBC $13.78 \times 10^9/L$, Neu 82.5%), which decreased the next day (WBC $10.59 \times 10^9/L$). CRP was slightly raised (7.5 mg/L) but dropped to 5.7 mg/L. Haemoglobin stayed stable (126 to 130 g/L), with no signs of significant blood

loss. Evidence of severe chronic renal failure persisted, with elevated baseline creatinine (334 $\mu\text{mol/L}$; eGFR 15 mL/min). Renal function improved the following day (creatinine 263 $\mu\text{mol/L}$; eGFR 20 mL/min). Urea levels also fell (25.5 to 17.9 mmol/L). Right after the procedure, potassium was at the high end of normal values (5.4 mmol/L) but later returned to normal (4.8 mmol/L).

ECG: Postprocedural ECG showed sinus rhythm with effective P-wave-synchronised ventricular pacing at a rate of 78 bpm, with no evidence of new abnormalities.

Echocardiography: Postprocedural echocardiography showed a significant reduction in mitral regurgitation to grade I+ (**Figure 1B, Figure 4**). The MitraClip device was stably positioned and clamped to both leaflets at the A2–A3/P2–P3 transition area (**Figure 5**). There was no significant stenosis of the mitral valve orifice (**Figure 3**). The left ventricle remained dilated (EDV/ESV 232/172 mL) with a significantly reduced ejection fraction (EF 26%). Moderate tricuspid regurgitation (grade II) persisted. A decrease in right ventricular systolic pressure to approximately 39 mmHg was found. **Patient's state at discharge.** The patient was fully ambulatory and discharged with clinical improvement and recommendations for follow-up.

Fifth-month follow-up

Clinical status: The patient's condition remained stable.

Laboratory tests: Five months later, tests still showed advanced kidney failure, with high creatinine (355–360 $\mu\text{mol/L}$) and low eGFR (about 14 mL/min/1.73 m²). Urea remained high (21.5–22.1 mmol/L), as expected in a patient on regular haemodialysis. High-sensitivity troponin I was slightly raised (45.7 ng/L), but there were no signs of an acute coronary syndrome. White blood cell count was normal (8.39 $\times 10^9/\text{L}$). There was no laboratory evidence of inflammation. Electrolytes were stable (potassium 3.6–3.7 mmol/L; sodium 138–142 mmol/L). LDL cholesterol was well controlled (1.44 mmol/L), and TSH (1.78 IU/mL) was normal.

ECG: ECG showed effective P-wave-synchronised ventricular pacing with a heart rate of 70 to 80 bpm.

Echocardiography: Control transthoracic echocardiography demonstrated persistent severe left ven-

tricular systolic dysfunction with global hypokinesia and an ejection fraction of 26%. Left ventricular volumes were increased (EDV/ESV – 284/210 mL). The MitraClip device was stably positioned in the A2–A3/P2–P3 transition area, with preserved stable clamping of the mitral leaflets. Mitral regurgitation remained mild (grade I+) (**Figure 6**). Transmitral gradients were low (max/mean PG – 6/2 mmHg), without echocardiographic evidence of clinically significant mitral stenosis. Tricuspid regurgitation remained moderate, with a TAPSE 12 mm. The estimated systolic right ventricular pressure was 45 mmHg.

DISCUSSION

The presented case illustrates the use of transcatheter edge-to-edge repair in a patient with severe secondary mitral regurgitation, advanced heart failure, and extremely high surgical risk.

The COAPT trial demonstrated that in patients with symptomatic secondary mitral regurgitation despite optimal medical therapy, the addition of transcatheter mitral repair resulted in a significant reduction in heart failure hospitalisations and all-cause mortality [1]. In contrast, MITRA-FR did not find a statistically significant benefit over medical therapy [2]. The differences between the two studies are likely due to differences in patient selection, degree of left ventricular remodelling, and severity of regurgitation.

The decision to perform the procedure in our patient was in accordance with the current ACC/AHA and ESC/EACTS guidelines for management of valvular disease, which emphasize the role of the Heart Team and an individualised approach in patients at high surgical risk [3, 4].

Advanced chronic kidney disease and haemodialysis are independent adverse predictors for mortality. In patients with TEER, severe renal dysfunction is associated with an increased 1-year mortality, but the procedure remains feasible and has an acceptable safety profile [5, 6].

In our patient, the achieved reduction of mitral regurgitation from grade IV to grade I+ is associated with improved haemodynamics and a reduction in pulmonary pressure. The EVEREST II study showed that, despite a higher incidence of residual mitral regurgitation compared with surgery, the method is safe and clinically effective in selected high-risk patients [7, 8].

Five months after the procedure, the reduction in mitral regurgitation to grade I+ was still present, with no signs of device destabilisation or development of iatrogenic mitral stenosis. The ongoing enlargement of the left ventricle and severe systolic dysfunction are due to advanced cardiomyopathy, not a failure of the transcatheter procedure. The patient's long-term

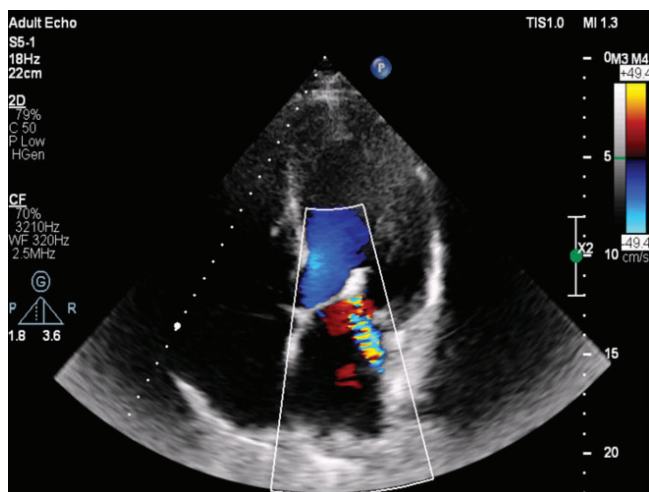


Fig. 6. Apical four-chamber transthoracic echocardiographic view with color Doppler demonstrating mild (grade I+) mitral regurgitation at the five-month follow-up

outlook will depend on the durability of the reduction in mitral regurgitation, the dynamics of left ventricular remodelling, right ventricular function, and control of comorbidities.

CONCLUSIONS

The follow-up of this patient shows that transcatheter edge-to-edge repair is feasible and safe in polymorbid patients with extremely high surgical risk. Significant reduction of mitral regurgitation can be achieved without the development of haemodynamically significant mitral stenosis. The durability of the effect in the medium term confirms the role of TEER as an alternative to surgical treatment in carefully selected patients. Long-term prognosis remains dependent on the underlying cardiomyopathy and concomitant diseases.

No conflict of interest was declared

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