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Case Report

Edge-to-edge transcatheter mitral repair for refractory heart failure: Case report and clinical insights

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ABSTRACT

Secondary mitral regurgitation (SMR) aggravates prognosis in heart failure with reduced ejection fraction, particularly when guideline-directed medical therapy (GDMT) fails. Transcatheter edge-to-edge repair (TEER) has emerged as a viable option for high-risk surgical candidates. Herein, we report the case of a 77-year-old male with end-stage non-ischemic dilated cardiomyopathy and severe SMR who experienced five decompensations in three months despite optimal GDMT. This case illustrates that in select patients with advanced heart failure and severe SMR, TEER may provide meaningful symptomatic and hemodynamic improvement when surgical or mechanical circulatory support is not feasible. Key determinants of success included precise anatomic selection, preprocedural optimization with levosimendan and natriuresis-guided diuresis, and structured follow-up. TEER, when integrated into a multidisciplinary care pathway, offers more than palliation-it can help stabilize disease and preserve quality of life.

Keywords: Edge-to-edge transcatheter mitral repair, HFrEF, MitraClip, secondary mitral regurgitation.

Secondary (functional) mitral regurgitation (SMR) worsens prognosis in heart failure with reduced ejection-fraction (HFrEF) by perpetuating volume overload and ventricular remodelling. When surgical risk is prohibitive, the transcatheter edge-to-edge repair (TEER) system has emerged as an evidence-based option. The Cardiovascular Outcomes Assessment of the MitraClip Percutaneous Therapy for Heart Failure Patients with Functional Mitral Regurgitation (COAPT) trial showed that adding TEER to guideline-directed medical therapy (GDMT) reduced heart failure (HF) hospitalizations and all-cause mortality at five years in symptomatic patients with severe SMR despite maximally tolerated GDMT.[1,2] Current European Society of Cardiology (ESC)/the European Association for Cardio-Thoracic Surgery (EACTS) valvular guidelines grant a class IIa recommendation for TEER when anatomy is suitable and surgery is high-risk, provided the case is discussed by a multidisciplinary Heart Team.[3]

CASE REPORT

A 77-year-old man with known non-ischemic dilated cardiomyopathy (15-year history), prior implantable cardioverter-defibrillator, atrial fibrillation-related transient ischemic attack, and a previous apixaban-associated gastrointestinal bleeding was followed on bisoprolol 10 mg, sacubitril/valsartan 24/26 mg b.i.d., dapagliflozin 10 mg, furosemide 40 mg b.i.d., rivaroxaban 15 mg, and atorvastatin 40 mg. He had five HF admissions in the last three months. Written informed consent was obtained from the patient. Initial evaluation was summarized below:

- *The New York Heart Association (NYHA):* III-IV, cachexia, peripheral edema, pulmonary rales
- *N-terminal pro-B-type natriuretic peptide (NT-proBNP):* 10 532 pg/mL, creatinine 1.09 mg/dL; mildly cholestatic liver function tests

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- *Transthoracic echocardiography (TTE):* LVEDD 6.8 cm, left ventricular end-systolic diameter (LVESD) 5.8 cm, left ventricular ejection fraction (LVEF) 20 % (globally severe hypokinesia), severe SMR (vena contracta [VC] 0.8 cm, effective regurgitant orifice area [EROA] 0.9 cm^2, proximal isovelocity surface area [PISA] volume: 126 mL), moderate tricuspid regurgitation (TR), estimated systolic pulmonary artery pressure (sPAP) 78 mmHg, tricuspid annular plane systolic excursion (TAPSE) 1.1 cm, as shown in Figure 1.
- *Chest X-ray:* pulmonary congestion, enlarged cardiac silhouette, as shown in Figure 2.
- *Admission electrocardiogram:* atrial fibrillation, as shown in Figure 3.

The patient was hospitalized. Loop-diuretic infusion was titrated using 1., 2. And 6. spot-urine sodium (>50 mmol/L) per ESC acute HF guidance. Rivaroxaban was replaced by weight-adjusted low molecular weight heparin. Re-assessment on Day 3 showed persistent LVEF 20% and levosimendan 6mcg/kg bolus was loaded over 10 min and 0.1 mcg/kg/min continues infusion was applied in 24 h. Day 5 echocardiography: LVEF 27%, SMR still severe (VC 0.7 cm, EROA 0.6 cm^2, PISA volume: 97 mL), sPAP 62 mmHg; NT-proBNP fell to 2993 pg/mL and bilirubin normalized.

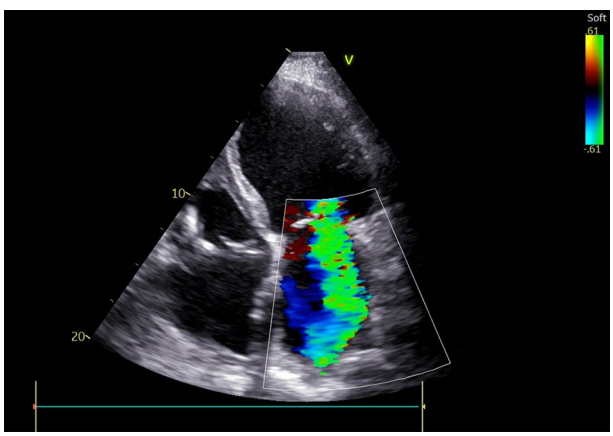

Figure 1. Admission TTE evaluation with severe secondary mitral regurgitation.
TTE: Transthoracic echocardiography.

After a thorough discussion, the patient was counselled on all advanced-therapy options, including durable left ventricular assist device (LVAD) implantation and orthotopic heart transplantation. He expressly declined both. The team then introduced transcatheter edge-to-edge repair with the Edwards Pascal Ace Implant System MitraClip (Abbott Laboratories, Illinois, USA). Since he was receptive to this alternative, the Heart Team scheduled a trans-esophageal echocardiogram to verify anatomic suitability. Transoesophageal echocardiography (TOE) revealed: a mitral annulus diameter of 4.5 cm; anterior mitral leaflet length 2.4 cm and posterior leaflet length 1.6 cm; trans-septal puncture (TSP) height 4.2 cm; a single dominant 4+ regurgitant jet originating at A2 and directed toward P2-P3 with a flail gap of 0.5 cm; and a

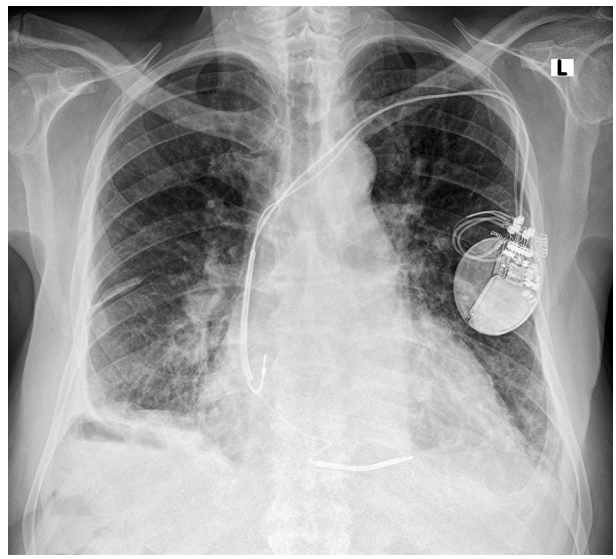

Figure 2. X-ray on admission.

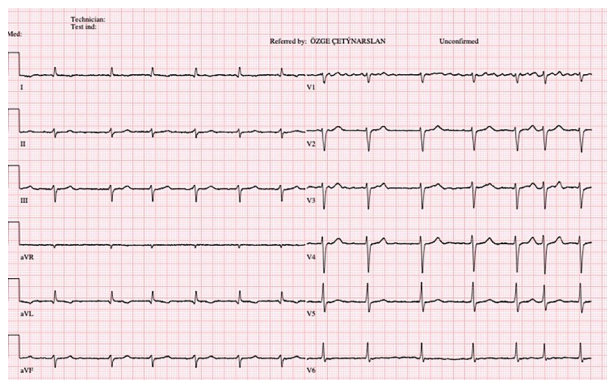

Figure 3. Electrocardiogram on admission.

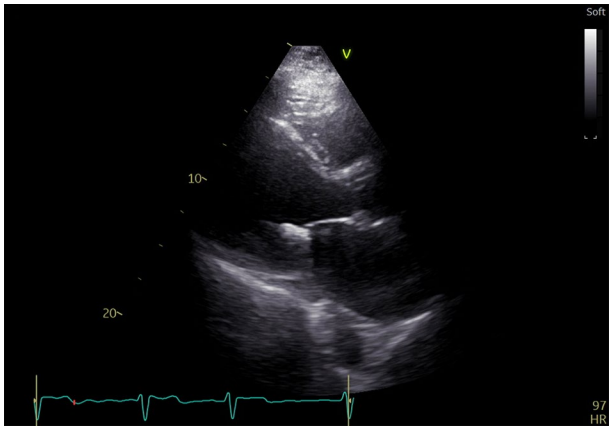

Figure 4. The patient's postoperative TTE evaluation. Edge-to-edge repair apparatus on PLAX view.
TTE: Transthoracic echocardiography.

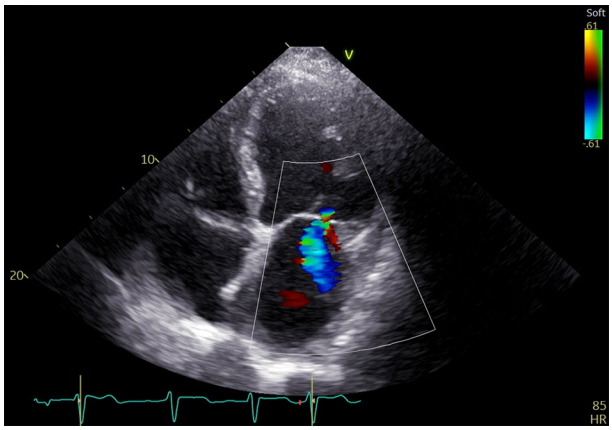

Figure 5. The patient's postoperative TTE evaluation at 1 month. Mild to moderate mitral regurgitation on A4CH view.
TTE: Transthoracic echocardiography.

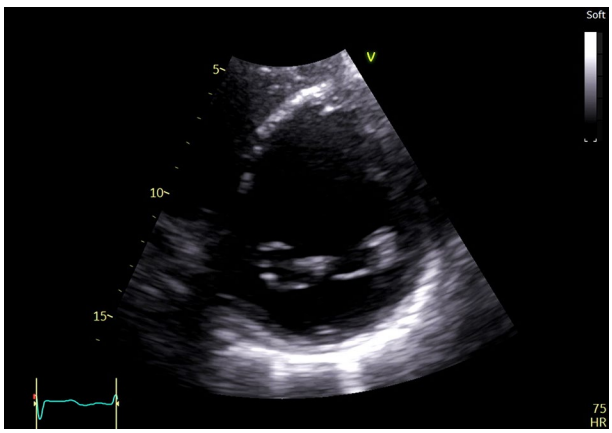

Figure 6. The hallmark 'double-orifice' or '8-shaped' mitral valve pattern on parasternal short axis following transcatheter edge-to-edge repair.

preserved mitral valve area with no stenosis. In the left-atrial appendage (LAA) +2 spontaneous echo contrast was present, but no thrombus was detected, and the LAA emptying velocity measured 0.19 m/s. These findings collectively confirmed that the patient's anatomy was suitable for transcatheter edge-to-edge repair.

Under general anesthesia, right femoral venous access (18 Fr) and TSP were obtained. One clip grasping A2-P2 was deployed under continuous TOE guidance; no clinically significant mitral stenosis ensued. The patient was transferred to the coronary care unit for 6 h without complications and discharged 48 h later on furosemide 40 mg daily, spironolactone 50 mg daily, sacubitril/valsartan 24/26 mg b.i.d. (later down-titrated to once a day due to hypotension), apixaban 2.5 mg b.i.d., and bisoprolol 10 mg.

At the first outpatient visit, one week after discharge, the patient reported NYHA II symptoms and was able to do his own shopping. Since his systolic blood pressure remained below 90 mmHg and laboratory tests showed mild hyperkaliemia (5.5 mEq/L), both sacubitril/valsartan and loop-diuretic doses were reduced by half, as shown in Figure 4: postoperative first week TTE.

One month later, he presented with occasional dizziness. Device interrogation revealed several daily runs of 6- to 8-beat non-sustained ventricular tachycardia, so amiodarone 200 mg twice daily was started. Transthoracic echocardiography demonstrated a LVEF of 20%, residual mild to moderate (Grade 2-3) SMR, mild TR (Grade 2), a TAPSE of 1.7 cm, and an sPAP 46 mmHg, as shown in Figure 5 and Figure 6: postoperative first month TTE views.

By the two-month review, he could walk 1 km without pausing; his appetite and overall mood had markedly improved. At three months, he remained asymptomatic on remote tele-monitoring, and no further adjustments to medical therapy were required.

DISCUSSION

Secondary mitral regurgitation amplifies LV volume overload, wall stress, and neuro-hormonal activation, accelerating

adverse remodeling and worsening prognosis in HFrEF. The TEER device recreates the surgical Alfieri stitch; two arms grasp the anterior and posterior leaflets, form a double orifice and acutely lower regurgitant orifice area, thereby increasing forward stroke volume and lowering LV end-diastolic pressure without the hemodynamic insult of sternotomy or cardiopulmonary bypass.

Appropriate case selection is pivotal. Beyond the COAPT clinical thresholds, effective regurgitant orifice area ≥0.30 cm^2, LVESD ≤70 mm, and LVEF 20-50% operators now rely on a pragmatic anatomic checklist for TEER.[4] Key "green-light" features include a single significant jet, flail width ≤15 mm, flail gap ≤10 mm, mobile-leaflet length in the grasping zone >7 mm, mitral-valve area >4 cm^2, TSP height ≥3.5 cm, and the absence of leaflet or chordal calcification in the grasping area; values falling beyond these limits move the case into the challenging categories and predict lower device success. Our patient comfortably met every benchmark: annulus 4.5 cm, a single +4 jet from A2 toward P2-P3, flail gap 0.5 cm, and a generous 4.2 cm TSP height, rendering him an excellent TEER candidate once he had declined LVAD or transplantation.[5]

Large post-approval registries corroborate those findings in broader populations: ACCESS EU (A Contemporary European Study of the Safety and Effectiveness of the MitraClip System), and EVEREST (Endovascular Valve Edge-to-Edge REpair Study)-High-Risk consistently report procedural success >85% and ≤5% in-hospital mortality.[6,7] Although most series enrolled moderate NYHA II-III cohorts, newer data suggest benefit even in advanced disease. In 119 INTERMACS (The Interagency Registry for Mechanically Assisted Circulatory Support)-profile ≥3 patients from the international MitraBridge registry, TEER enabled one-year freedom from death, urgent LVAD or transplant in two-thirds of cases and actually rendered 22% of initially ineligible patients transplant-free after two years.[8] The salvage role of MitraClip in cardiogenic shock is also expanding. Meta-analysis of >4,000 shock patients showed successful mitral regurgitation (MR) reduction in 88% with 11% in-hospital mortality and 36% one-year mortality.[9-12]

Device success halves early mortality relative to device failure. Our case illustrates these principles: posterior-superior TSP at 4.2 cm delivered coaxial access; one clip across A2-P2 achieved durable MR ≤ moderate without iatrogenic stenosis, and TAPSE rose from 1.1 cm to 1.7 cm while sPAP fell from 78 to 46 mmHg.

Beyond anatomy, timing matters. The patient endured five decompensations in three months before referral. Each admission escalates end-organ injury. By applying natriuresis-guided loop diuretic infusion and a single course of levosimendan, we restored renal and hepatic function (bilirubin normalized, NT-proBNP fell from 10 532 pg/mL to 2 993 pg/mL), optimizing his physiological window for intervention. Such bridge optimization echoes registry observations that lower right-sided pressures and preserved end-organ metrics predict TEER durability in advanced HF.

Equally instructive is the comprehensive counselling process. Contemporary reviews emphasize that TEER, durable LVAD, and orthotopic heart transplantation share overlapping eligibility; thus, clinicians must present the full therapeutic continuum, respecting patient autonomy yet avoiding therapeutic inertia. In our center, the Heart Team documented the patient's informed refusal of LVAD/heart transplantation, explained TEER benefits and limitations, and proceeded only after anatomy was confirmed favorable. Close post-procedural surveillance is warranted. Hypotension, hyperkaliemia, and arrhythmias mandated up or down titration of neuro-hormonal blockade and anti-arrhythmic medications.

In conclusion, in this septuagenarian with end-stage dilated cardiomyopathy and torrential SMR, TEER produced sustained symptomatic relief, pulmonary pressure reduction, and avoidance of further hospitalizations despite the patient's refusal of surgical or mechanical circulatory support options. The case underscores three transferable messages: early Heart Team referral prevents needless decompensations, preprocedural optimization, including levosimendan bridging and natriuresis-guided diuresis, enhances candidacy, and diligent follow-up allows dynamic adjustment of GDMT

and arrhythmia management. When delivered within such an integrated pathway, TEER is not merely a palliative gesture but a potent tool to stabilize advanced HF patients and reclaim quality of life in settings where conventional surgery or transplant are unfeasible.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions: Idea/concept, control/supervision, critical review, materials: Ö.Ç, F.M.U, S.Y.; Design, literature review, writing the article, data collection and/or processing, analysis and/or interpretation, references and fundings: Ö.Ç.

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