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Case Report

Bilateral mini-thoracotomy for combined coronary bypass and mitral valve repair: A case series of two patients

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Abstract

Minimally invasive techniques are increasingly being adopted in cardiac surgery. Although thoracotomy-based approaches are well established for selected coronary and mitral operations, median sternotomy remains the standard access for most combined pathologies because of technical complexity and limited evidence. In this case series, we describe two highly selected patients who underwent combined coronary artery bypass grafting and mitral valve repair via bilateral mini-thoracotomy without sternotomy. We report the operative strategy, perioperative course, and early outcomes as a feasibility-focused technical experience. In both patients, the procedures were completed without conversion to sternotomy, mitral repair was confirmed intraoperatively by transesophageal echocardiography, and no major perioperative adverse events listed in Table 1 were observed. In conclusion, bilateral mini-thoracotomy appears technically feasible in carefully selected patients treated by an experienced minimally invasive team; however, this two-patient case series does not permit comparative claims regarding superiority, complication reduction, or long-term effectiveness.

Keywords: mini thoracotomy, MICAB, mitral valve repair, coronary artery bypass

Introduction

Minimally invasive cardiac surgery has emerged as an important alternative to median sternotomy for selected valvular and coronary procedures. In mitral surgery, minimally invasive approaches have been associated with reduced surgical trauma and shorter recovery in appropriately selected patients, while preserving procedural effectiveness in experienced centers [1]. Minimally invasive coronary artery bypass techniques (e.g., MIDCAB and related thoracotomy-based strategies) are less widely adopted, but specialized programs have reported favorable early and midterm outcomes in selected patients [2, 3, 4]. When concomitant mitral valve disease and coronary artery disease require operative treatment, conventional sternotomy remains the standard approach because exposure, cannulation strategy, myocardial protection, and procedural sequencing are substantially more complex in a minimally invasive setting.

The available literature on combined minimally invasive coronary revascularization and mitral valve repair is limited, heterogeneous, and largely composed of technical reports and small case series. Bilateral mini-thoracotomy has been proposed as one possible access strategy for selected combined procedures, but published experience remains sparse [3, 5]. In a small reported series, bilateral mini-thoracotomy was used successfully for combined mitral valve repair and minimally invasive CABG, supporting feasibility in carefully selected patients treated by teams with expertise in both techniques [3, 5].

The objective of the present report is therefore narrowly defined: to document the operative workflow and immediate perioperative outcomes in two patients undergoing combined coronary artery bypass grafting and mitral valve repair through bilateral mini-thoracotomy. In this manuscript, we use "feasibility" to mean completion of the planned operation without conversion to sternotomy, successful conduct of cardiopulmonary bypass and myocardial protection, intraoperative echocardiographic confirmation of mitral repair adequacy, and uneventful early postoperative recovery as descriptively reported. We do not aim to estimate complication rates or compare this approach with sternotomy or hybrid treatment strategies.

Case series

In March 2022, two patients underwent minimally invasive bilateral mini-thoracotomy for combined coronary revascularization and mitral valve repair. Patient 1 had left anterior descending artery (LAD) disease requiring surgical revascularization, and Patient 2 had left main coronary artery (LMCA) disease identified during preoperative assessment. Both patients had severe degenerative mitral regurgitation due to P2 prolapse rather than ischemic mitral regurgitation. All perioperative data for both patients are presented in Table 1.

Table 1: Patient characteristics, echocardiography, intra- and postoperative data

	Patient 1	Patient 2
Age	47	75
Gender	Male	Male
BMI	25,9	24,4
eGFR	> 90	> 90
Euroscore II (%)	0.85	1.2
Echo		
• LVEF	62	67
• Mitral Regurgitation	Severe	Severe
• Annular Dilatation	Yes	Yes
• Posterior Leaflet Prolapse	Yes	Yes
• Chordal Rupture	No	No
Operative Data		
• Number of bypass grafts	2	1
• LITA graft	Yes	Yes
• Proximal anastomosis	1	–
• CPB (min)	190	180
• Cross-clamp (min)	115	100
• Total time (min)	360	360
Post-operative Data		
• Atrial Fibrillation	No	No
• Revision	No	No
• Need for high inotropic support or IABP	No	No
• TIA/Stroke	No	No
• Sternal or groin complication	No	No
• Transfusion	No	No
• Mechanical Ventilation Time (hours)	6	12
• ICU stay (days)	3	2
• Hospital stay (days)	7	5

This report is a descriptive case series of two highly selected patients treated in routine clinical practice and is intended to document technical feasibility rather than provide comparative effectiveness evidence. Because the sample size is two and no control group is included, no formal statistical testing was planned. Perioperative outcome assessment was therefore descriptive and focused on procedural completion, intraoperative echocardiographic findings, and the postoperative events listed in Table 1. Written informed consent for publication of de-identified clinical information and images was obtained from both patients.

In Patient 2, surgery was initially planned for severe mitral regurgitation; however, preoperative coronary investigation additionally revealed an LMCA lesion, and combined surgery was therefore selected.

Routine preparation and operative procedures for minimally invasive cardiac surgery used in our clinic were applied in both patients [4]. Both patients were intubated with a double-lumen endotracheal tube to facilitate thoracic exposure. A jugular venous cannula was inserted preoperatively by the anesthesiologist at the time of central venous access, and 5000 units of heparin were administered before cannulation to reduce clot formation during line placement.

First, a 6-cm left anterior mini-thoracotomy was performed, and the left internal thoracic artery (LITA; referred to as LIMA in the operative description) was harvested under direct vision. During the same stage, the saphenous vein was harvested endoscopically.

Subsequently, on the right side, a 6-cm incision was made along the anterior axillary line, entering the thorax through the 4th intercostal space (ICS) using the transaxillary approach (Figure 1). For cardiopulmonary bypass (CPB), percutaneous jugular venous cannulation and femoral arterial and venous cannulation via a 2-cm groin incision were performed.

Following full systemic heparinization, CPB was initiated. In one case, the Chitwood cross-clamp was applied from the left 2nd ICS, and in the other, from the right 2nd ICS, to achieve cardioplegic arrest. Distal anastomoses, except for the LITA–LAD anastomosis, were completed first from the left side, after which mitral valve repair was performed from the right side. This sequence was used to optimize exposure for each component of the combined procedure while maintaining a reproducible operative workflow.

In both cases, repair consisted of implantation of two Gore-Tex neochords to the P2 segment, supported by mitral ring annuloplasty. Finally, the LITA–LAD anastomosis was completed. After de-airing, the cross-clamp was removed, and proximal anastomoses were performed on the ascending aorta using a side-biting clamp when indicated (Patient 1; Table 1).

Intraoperative transesophageal echocardiography (TEE) was used to assess mitral valve coaptation, residual regurgitation, and transmitral gradient (Figure 2). In this feasibility-oriented report, intraoperative TEE served as the primary immediate verification of repair adequacy.

Both patients had uneventful postoperative recoveries without the adverse events listed in Table 1. Discharge occurred on postoperative day 7 for Patient 1 and postoperative day 5 for Patient 2, consistent with

the values reported in Table 1. Clinical follow-up, including wound assessment, was performed for up to two years (Figures 3-4). Systematic long-term echocardiographic follow-up data and graft-patency imaging were not collected in a standardized manner for this brief technical report and therefore are not analyzed here.

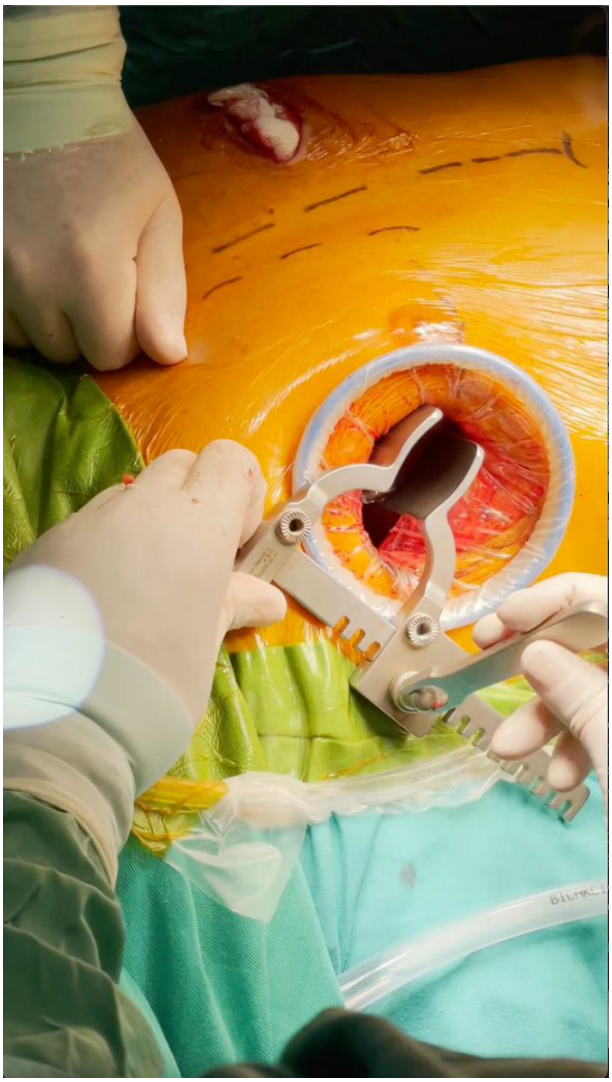

Figure 1: Bilateral thoracotomy

Discussion

Minimally invasive techniques in cardiac surgery have gained traction globally, although their adoption has been uneven across procedure types. Isolated minimally invasive mitral valve surgery is now routine in many specialized centers, whereas minimally invasive coronary artery bypass surgery (MICAB) remains concentrated in high-volume teams with specific technical expertise. Within this context, the combination of minimally invasive mitral valve repair (MVr) and coronary revascularization through bilateral thoracotomy is uncommon but technically feasible in selected patients [5, 4, 6, 7, 8, 9].

The main contribution of our report is not comparative effectiveness, but a detailed technical demonstration of procedural feasibility in two carefully selected patients with different coronary anatomies (LAD disease and LMCA disease) and the same degenerative mitral mechanism (P2 prolapse). In both cases, the planned operation was completed without conversion to sternotomy, the repair strategy was reproducible (two neochords plus ring annuloplasty), and no major perioperative adverse events listed in Table 1 were observed. These findings support feasibility of the approach in an experienced program, but they should not be interpreted as evidence of superiority over sternotomy or hybrid strategies.

Previous reports have described bilateral thoracotomy for combined mitral and coronary procedures, underscoring both its potential and its technical demands [9, 10, 11]. The present cases are broadly consistent with those reports in terms of operative concept and early recovery. However, the currently available evidence, including our series, remains based on small non-comparative experiences. Accordingly, statements about reduced complications, shorter hospitalization, or earlier rehabilitation relative to sternotomy should be considered hypotheses requiring formal comparative evaluation rather than conclusions established by this report. Babliak's reports on combined procedures note that, in selected cases performed via left mini-thoracotomy, mitral valve intervention may be achieved through right atrial and transseptal access after coronary grafting [11]. In contrast, similar to other reports in the literature, direct left atriotomy was used to access the mitral valve in our patient series [8]. This distinction is relevant because the chosen route affects exposure, procedural ergonomics, and the sequencing of combined surgical steps.

An important technical point in our series is that the need for proximal aortic anastomosis may vary by coronary anatomy and graft strategy. Avoiding an aortic anastomosis in selected cases can simplify the procedure and potentially reduce manipulation of the ascending aorta [7]. Conversely, our ability to perform a proximal aortic anastomosis through the same minimally invasive strategy when required (Patient 1) illustrates the procedural flexibility of bilateral thoracotomy in selected combined cases.

Another practical distinction between our two cases was the side used for aortic cross-clamping. In one patient, the clamp was placed through the left 2nd

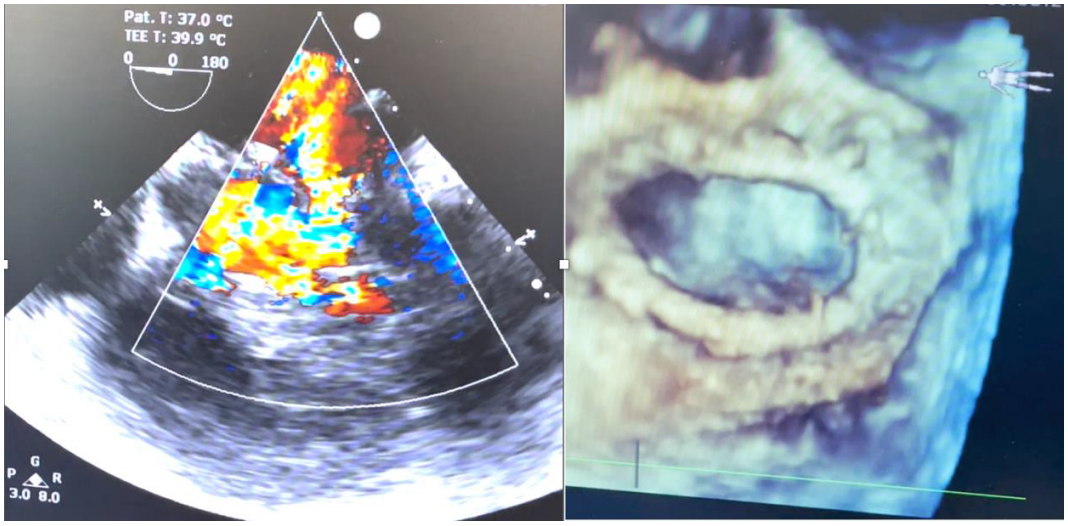

Figure 2: Preoperative Echo and Echo after mitral repair

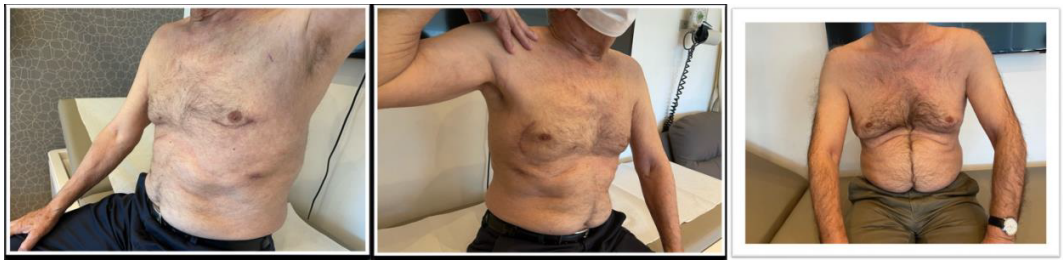

Figure 3: Healing wounds after one month of the surgery (left & middle), After one year (right)

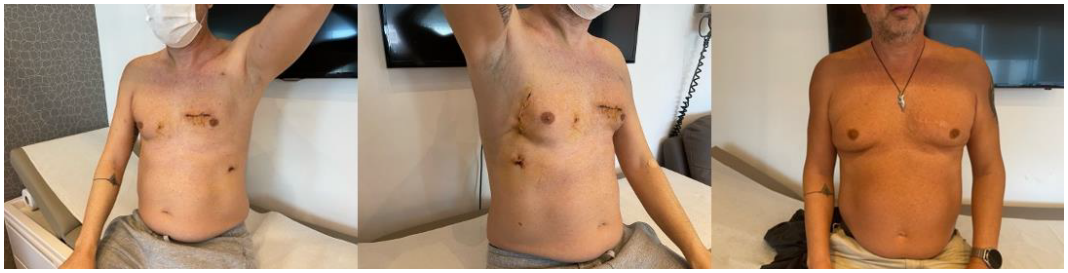

Figure 4: Healing wounds after 10 days (left & middle), 2 years after the surgery (right)

ICS, whereas in the other it was placed through the right 2nd ICS. This choice was guided by preoperative computed tomography assessment of the aorta's intrathoracic orientation and by the need to avoid instrument conflict with the operative field. We highlight this point because it provides a reproducible planning principle rather than a case-specific technical anecdote.

Alternative treatment strategies for similar patients may include full sternotomy or hybrid approaches (surgical mitral repair combined with percutaneous coronary intervention). Our case series was not designed to compare these strategies, and we therefore avoid claims regarding relative long-term effectiveness. Instead, we interpret our findings more cautiously: bilateral mini-thoracotomy can be considered a technically viable option in selected patients when both minimally invasive mitral surgery and minimally invasive coronary revascularization expertise are available.

Several limitations materially affect interpretation of our results. First, the sample size is extremely small (n=2), and zero observed complications in such a sample do not provide a reliable estimate of low event rates. Second, the report is descriptive and lacks a control group, so no causal or comparative inference is possible. Third, follow-up in this manuscript emphasizes clinical recovery and wound healing, whereas standardized longitudinal echocardiographic outcomes and graft-patency data were not

systematically collected for analysis. Fourth, patient selection was highly specific, which limits generalizability to broader populations or less experienced centers. These limitations should be considered when interpreting the apparent favorable early course.

In conclusion, bilateral mini-thoracotomy represents a technically feasible approach for selected patients requiring combined coronary bypass and mitral valve repair in centers with substantial minimally invasive experience. Our two-patient case series supports proof-of-concept and operative workflow feasibility only. Larger prospective or well-matched comparative studies with standardized postoperative echocardiographic and coronary follow-up are required to evaluate safety, durability, and comparative clinical benefit.

Clinical trial number

Not applicable.

Informed consent

Informed consent was obtained from the participants.

Financial disclosure

The authors have not provided financial support.

Conflict of interest

No conflicts of interest were declared by the authors.

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