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Coronary: Short Report

Outcomes and Graft Patency After Coronary Artery Bypass Grafting With Descending Aortic Inflow

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ABSTRACT

BACKGROUND Coronary artery bypass grafting (CABG) using the descending thoracic aorta as the proximal inflow source represents an alternative revascularization strategy in patients with hostile ascending aortic anatomy, prior sternotomy, or isolated lateral wall coronary disease. Contemporary data regarding durability and midterm outcomes remain limited.

METHODS We retrospectively reviewed 31 consecutive patients who underwent CABG with proximal inflow from the descending thoracic aorta through a left thoracotomy between 2012 and 2025. Demographic characteristics, operative variables, postoperative outcomes, graft patency, and long-term survival were analyzed.

RESULTS Mean patient age was 70.3 years, and 74.2% were men. The mean Society of Thoracic Surgeons predicted risk of mortality was 3.0% (SD, 3.2%). Redo operations accounted for 48.39% of cases. Off-pump revascularization was achieved in 96.8% (30 of 31). Operative and in-hospital mortality were 0%. Postoperative renal failure and new-onset atrial fibrillation each occurred in 6.5% of patients. Mean postoperative length of stay was 8 days. Survival at 1 year was 100%, and actuarial 5-year survival was 83.3%. Among 11 patients undergoing clinically indicated postoperative coronary angiography, 9 (81.8%) demonstrated a patent graft.

CONCLUSIONS CABG using descending thoracic aortic inflow is a safe and durable revascularization strategy in selected patients and should be considered an important alternative in complex coronary surgical scenarios.

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Coronary artery bypass grafting (CABG) remains the most durable method of myocardial revascularization for patients with complex multivessel coronary artery disease, diabetes mellitus, or impaired left ventricular function, providing superior long-term survival and freedom from repeat revascularization compared with percutaneous coronary intervention.[1] Conventional CABG performed through median sternotomy with proximal anastomoses

IN SHORT

- Coronary artery bypass grafting, using descending thoracic aortic inflow, achieved 0% operative mortality and high off-pump feasibility in a high-risk cohort.
- Midterm survival was durable (100% at 1 year and 83% at 5 years).
- This technique avoids sternotomy and provides a practical alternative in complex reoperative or hostile aortic anatomy.

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to the ascending aorta is not feasible or optimal in all patients. An increasing proportion of patients referred for surgical revascularization present with advanced age, prior sternotomy, extensive comorbidity, and complex mediastinal or aortic anatomy, substantially increasing operative risk.

Redo CABG is consistently associated with higher morbidity and mortality compared with primary CABG. Large contemporary series have demonstrated increased rates of bleeding, transfusion, renal dysfunction, prolonged operative times, and neurologic complications in redo settings, after adjustment for baseline risk.[2] These adverse outcomes are driven largely by the technical hazards of repeat sternotomy, including injury to patent bypass grafts or cardiac structures, dense mediastinal adhesions, and limited operative exposure. In addition, redo patients frequently present with limited remaining coronary targets.

Manipulation of the ascending aorta during coronary surgery has been firmly linked to perioperative stroke and adverse neurologic outcomes. Groundbreaking investigations have demonstrated that both the presence and extent of ascending aortic atheroma independently predict postoperative cerebral events.[3,4] Stroke after CABG remains one of the most devastating complications of cardiac surgery, with implications for long-term survival, functional independence, and quality of life. Accordingly, strategies that minimize repeated instrumentation of the ascending aorta have become an important consideration in high-risk coronary surgery.

Several alternative revascularization strategies have been developed to address these challenges, including off-pump CABG, minimally invasive direct coronary artery bypass, hybrid coronary revascularization, and aortic "no-touch" techniques guided by epiaortic ultrasound.[5] These approaches may reduce the need for cardiopulmonary bypass or partial clamping of the ascending aorta, however, their applicability is limited in those undergoing redo sternotomy. In such patients, alternative inflow strategies may offer distinct anatomical and technical advantages.

CABG using proximal inflow from the descending thoracic aorta through a left thoracotomy has evolved primarily as a redo revascularization strategy rather than as a stroke-avoidance technique based on presumed differences in aortic atherosclerotic burden. The descending thoracic aorta is not inherently less diseased than the ascending aorta and may demonstrate significant atherosclerosis, particularly in elderly patients or those with vasculopathy.

The principal rationale for its use lies instead in anatomical and technical considerations. When approached through a left thoracotomy, the descending thoracic aorta provides a direct, high-capacity inflow source with a short, favorable conduit course to lateral and inferolateral coronary targets. This configuration facilitates exposure of the obtuse marginal and posterolateral branches, avoids repeat median sternotomy, and is highly conducive to beating-heart revascularization.

Elimination of repeat sternotomy and avoidance of prior graft injury are particularly advantageous in patients with hostile mediastinal anatomy or limited coronary targets. Although avoidance of ascending aortic manipulation may confer secondary neurologic benefit by reducing embolic risk, this should be viewed as a situational advantage rather than the primary indication for the technique.

Contemporary data describing operative outcomes, graft durability, and midterm survival after CABG with descending thoracic aortic inflow remain limited. The present study updates our institutional experience with CABG using proximal inflow from the descending thoracic aorta in an expanded cohort of 31 patients, with the aim of evaluating operative outcomes, graft patency, and midterm survival in a high-risk population.

PATIENTS AND METHODS

This study was approved by the Institutional IRB which determined that a patient consent was not required. This retrospective observational study included 31 consecutive patients who underwent CABG with proximal inflow from the descending thoracic aorta through a left posterolateral thoracotomy between January 2012 and March 2024. Indications included redo sternotomy, heavily calcified or hostile ascending aorta, prior mediastinal radiation therapy, and isolated lateral or inferolateral wall coronary disease unsuitable for percutaneous intervention.

The first case using this technique was performed in 2012, and all consecutive cases since inception were included to minimize selection bias and account for a potential learning curve.

SURGICAL TECHNIQUE. Patients were positioned in lateral decubitus, and a left posterolateral thoracotomy through the fifth or sixth intercostal space was performed. The pericardium was

opened anterior to the phrenic nerve. The descending thoracic aorta was exposed by dividing the inferior pulmonary ligament, allowing placement of a partial occlusion clamp. Saphenous vein grafts were used predominantly, with selective use of a radial artery conduit. Distal anastomoses were performed on the beating heart, followed by a proximal anastomosis to the descending thoracic aorta.

Postoperative outcomes included perioperative morbidity and mortality, length of stay, graft patency, need for repeat revascularization, and long-term survival. Survival analysis was performed using the Kaplan-Meier method.

RESULTS

PATIENT CHARACTERISTICS. Demographic and preoperative characteristics are summarized in Table 1. Mean age was 70.3 years, and 74.2% of patients were men. Diabetes mellitus was present in 54.8% of patients. Prior CABG and prior percutaneous coronary intervention were present in 45.16% and 74.2%, respectively. Mean preoperative left ventricular ejection fraction was 0.53, and redo operations accounted for 48.39% of cases.

OPERATIVE DETAILS AND OUTCOMES. Operative characteristics and postoperative outcomes are summarized in Table 2. Off-pump revascularization was achieved in 30 of 31 patients (96.8%). There was no operative or in-hospital mortality. Postoperative renal failure and new-onset atrial fibrillation each occurred in 6.5% of patients. No patient required reoperation for bleeding, surgical site infection, or repeat revascularization. Mean postoperative length of stay was 8 days.

TABLE 1 Demographics and Preoperative Characteristics

Variable	Data Value (N = 31)
Age, mean y	70.3
Male sex	23 (74.2)
Body mass index, mean kg/m^2	31.2
STS predicted risk of mortality, mean (SD), %	3.00 (3.20)
Diabetes mellitus	17 (54.8)
Previous procedure	
Coronary artery bypass grafting	14 (45.16)
Percutaneous coronary intervention	23 (74.2)
Preoperative	
Atrial fibrillation	6 (19.4)
Left ventricular ejection fraction, mean	53
Redo operations	15 (48.39)

Values are presented as n (%) unless indicated otherwise as mean or mean (SD). STS, The Society of Thoracic Surgeons.

TABLE 2 Operative Details and Clinical Outcomes

Variable	Data Value (N = 31)
Procedure time, mean h	3.6
Off-pump coronary artery bypass grafting	30 (96.8)
Coronary artery bypass grafting ×1	26 (83.9)
Coronary artery bypass grafting ×2	5 (16.1)
Postoperative renal failure	2 (6.5)
New-onset atrial fibrillation	2 (6.5)
Reoperation for bleeding	0
Surgical site infection	0
Postoperative length of stay, mean d	8

Values are presented as n (%) unless indicated otherwise as mean.

SURVIVAL AND GRAFT PATENCY. Kaplan-Meier survival analysis (Figure) demonstrated 100% survival at 1 year and 83.3% survival at 5 years, with durable survival extending beyond 10 years. Among the 11 patients who underwent clinically indicated postoperative coronary angiography, 9 demonstrated patent grafts without significant stenosis. Of the 2 patients with graft failure, 1 had a graft to the obtuse marginal branch, and that graft was occluded. The other patient had a sequential graft to the obtuse marginal branch and ramus intermedius with a single proximal anastomosis from the descending thoracic aorta; this graft demonstrated severe distal stenosis (~95%) at the sequential distal segment.

No patients required repeat revascularization, and no clinically significant recurrent ischemia prompting intervention was observed during follow-up.

COMMENT

This updated 31-patient experience demonstrates that CABG using descending thoracic aortic inflow can be performed safely with excellent early outcomes and durable midterm survival. The absence of operative mortality, high rate of off-pump revascularization, and favorable postoperative recovery underscore the feasibility of this approach.

In this cohort, the technique was associated with durable midterm survival. These findings support the role of descending thoracic aortic inflow as a valuable adjunct in the management of complex redo CABG patients.

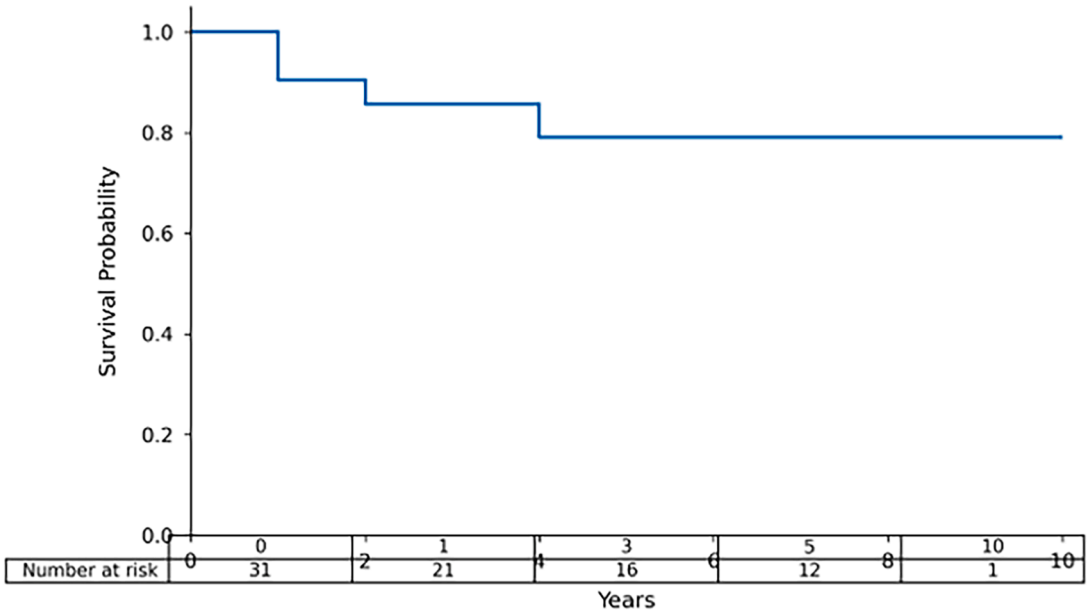

FIGURE Kaplan–Meier survival curve demonstrates overall patient survival after coronary artery bypass grafting with descending thoracic aortic inflow. The number of patients at risk at each time point is shown below the *x*-axis.

The clinical utility of this approach lies primarily in its anatomic and technical advantages rather than in any assumption regarding comparative aortic atherosclerotic burden. Importantly, the descending thoracic aorta is not uniformly free of disease and may demonstrate significant atherosclerosis, particularly in elderly patients or in populations with vasculopathy. Accordingly, this strategy should not be interpreted as relying on a "cleaner" inflow source. Instead, its principal advantages relate to surgical exposure, conduit geometry, inflow characteristics, and feasibility of off-pump revascularization.

First, the descending thoracic aorta provides a robust, high-capacity inflow source capable of supporting reliable graft perfusion.

Second, its anatomic relationship to the lateral and inferolateral left ventricular wall enables a short, tension-free conduit course to obtuse marginal and posterolateral coronary targets. This feature is particularly advantageous in redo settings, where prior grafts, adhesions, and limited target availability often complicate conventional approaches.

Third, the left thoracotomy exposure is highly conducive to beating-heart revascularization, facilitating off-pump CABG and avoidance of cardiopulmonary bypass.[2,5]

Redo sternotomy is a major contributor to adverse outcomes in repeat coronary surgery. By avoiding repeat median sternotomy, the thoracotomy-based approach used in this series minimizes the risk of injury to patent grafts and cardiac structures. These advantages are particularly relevant in patients with limited revascularization requirements, in whom a focused, targeted surgical strategy may provide substantial clinical benefit.[2]

Avoidance of ascending aortic manipulation should be viewed as a secondary and situational benefit. Extensive literature has established the association between ascending aortic instrumentation and perioperative neurologic events.[3,4] Elimination of cross-clamping or side-clamping may reduce embolic risk in selected patients; however, this benefit derives from avoidance of ascending aortic manipulation rather than from any inherent difference in plaque burden between aortic segments. Framing the technique in this manner avoids overstating its neurologic impact and aligns more closely with its true surgical rationale.

Graft durability in this series was acceptable and consistent with established principles of bypass graft physiology, in which long-term patency is influenced predominantly by target vessel quality, conduit selection, competitive flow, and surgical technique rather than by the specific location of the aortic inflow.[6,7] Contemporary literature underscores the importance of

standardized definitions of graft failure and systematic angiographic reporting.[6] Consistent with these principles, graft patency in the present study was defined as the absence of occlusion or significant stenosis, whereas graft failure was defined as complete occlusion or severe stenosis on postoperative angiography.

Many contemporary redo CABG candidates have undergone prior percutaneous coronary intervention, and prior stenting has been associated with differences in subsequent surgical complexity and outcomes.[8] In parallel, the growth of minimally invasive and robotic-assisted coronary surgery has increased institutional familiarity with thoracotomy-based coronary exposures in selected centers, further supporting the feasibility of alternative surgical approaches in appropriate patients.[8]

LIMITATIONS. Several limitations merit consideration. This study represents a single-center, retrospective experience with a relatively small sample size, limiting the ability to draw definitive comparative conclusions. Selection bias is inherent, because patients were chosen for this approach because of anatomic and clinical features that favored thoracotomy-based revascularization. Angiographic follow-up was clinically driven rather than systematic, introducing potential selection bias. Nevertheless, the consistency of outcomes across this expanded cohort and the absence of operative mortality provide meaningful insight into the role of descending thoracic aortic inflow in contemporary practice.

In summary, CABG using proximal inflow from the descending thoracic aorta represents a technically sound and clinically effective revascularization strategy in selected redo CABG patients. Its principal advantages include anatomic suitability for lateral wall targets, provision of a brisk and reliable inflow source, and high feasibility of off-pump revascularization, rather than assumptions regarding aortic atherosclerotic distribution. When applied judiciously, this approach offers excellent early outcomes and durable midterm survival in a complex, high-risk population.

CONCLUSIONS. CABG using descending thoracic aortic inflow is a safe, reproducible, and durable alternative for selected patients in whom conventional sternotomy-based approaches are contraindicated or undesirable. This updated 31-patient experience demonstrates excellent early outcomes and sustained midterm survival, supporting broader consideration of this technique in contemporary coronary surgery.

DATA AVAILABILITY STATEMENT

Data supporting the findings of this study are available from the corresponding author upon reasonable request.

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The authors have no funding sources to disclose.

DISCLOSURES

The authors have no conflicts of interest to disclose.

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