

Transaxillary aortic valve replacement with a sutureless valve

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Keywords: Minimally invasive cardiac surgery; aortic valve replacement; sutureless valve; transaxillary access



Submitted Aug 05, 2026. Accepted for publication Sep 22, 2026. Published online Sep 29, 2026.

doi: 10.21037/acs-2026-0277-tdv

View this article at: <https://dx.doi.org/10.21037/acs-2026-0277-tdv>

Clinical vignette

We report the case of a 70-year-old man who presented with exertional dyspnea, New York Heart Association (NYHA) functional class II. Transthoracic echocardiography demonstrated severe aortic valve stenosis, with an aortic valve area of 0.7 cm² and grade I regurgitation on a markedly sclerotic valve. Coronary angiography revealed two-vessel disease (right coronary artery 50%, left anterior descending artery 60%, first diagonal branch 50%); all lesions were angiographically intermediate. The patient reported no angina. His medical history included implantation of a dual-chamber pacemaker in April 2026 for intermittent third-degree atrioventricular block. Relevant comorbidities comprised arterial hypertension, insulin-treated type 2 diabetes mellitus, chronic kidney disease stage 3, and peripheral arterial disease with prior percutaneous transluminal angioplasty and drug-eluting balloon angioplasty of the left superficial femoral artery.

The case was discussed by our interdisciplinary Heart Team; transcatheter aortic valve implantation (TAVI) accounts for two-thirds of isolated aortic valve procedures at our center (1). Although current guidelines recommend TAVI as the primary modality from the age of 70 years (2), they require expected outcomes and lifetime management to be weighed. Surgery was favored because the patient's remaining life expectancy at the age of 70 years is likely to exceed the currently documented durability of transcatheter valves, because it preserves a later valve-in-valve option and unrestricted coronary access, and in view of the institutional results of transaxillary aortic valve replacement, with a 30-day mortality of 0.9% and a stroke rate of 0.8% in 1,000 consecutive patients (1). Invasive physiological assessment of the coronary lesions was not performed, as functional assessment is not well established in severe aortic stenosis (2). The Heart Team considered concomitant revascularization but opted for medical therapy, since all lesions were angiographically intermediate and bypass grafting would have required sternotomy and a longer ischemic time in a multimorbid patient. Coronary access remains unrestricted should percutaneous coronary intervention become necessary.

At our institution, minimally invasive aortic valve replacement via a right transaxillary minithoracotomy (Minimally Invasive Cardiac Lateral Surgery, MICLAT-S) has become the standard approach for elective isolated aortic valve surgery, irrespective of

age or comorbidity profile, reflecting the maturation of this technique across a series of more than 1,000 consecutive patients (1). The access was therefore not selected because of patient-specific anatomical considerations; it was used in 97.8% of these procedures in the last year of our published series (1). In this patient, the combination of a sutureless bioprosthesis with the transaxillary access was additionally expected to shorten cardiopulmonary bypass and cross-clamp times and to support a smooth postoperative recovery, in line with the principles of the one-access minithoracotomy concept (3,4). While the clinical outcomes of this approach have been reported previously (1), the present article and its accompanying video focus on the procedural details of exposure, sizing and deployment of a sutureless prosthesis through the transaxillary access, and on the practical pitfalls relevant to surgeons adopting the technique.

Surgical techniques

Preoperative assessment

Preoperative assessment included a high-resolution, full cardiac cycle angio-computed tomography (CT) scan of the heart, thoracic and abdominal aorta, and iliofemoral vessels. At our institution, the scan serves to plan the procedure rather than to select patients: it shows the position of the ascending aorta and the distance from the chest wall to the aortic annulus and thereby guides the choice of the intercostal space. In this patient, it also confirmed an annulus diameter compatible with rapid deployment technology. Given the patient's known peripheral arterial disease and prior intervention on the left superficial femoral artery, the right femoral vessels were selected for cannulation, and their suitability was likewise confirmed on CT.

Preparation

The patient was placed in a supine position, slightly rotated to the left, with the right arm suspended in a "javelin-thrower" position to widen the intercostal spaces and flatten the subcutaneous tissue. A double-lumen endotracheal tube was placed to allow single-lung ventilation if required. As the patient already carried a dual-chamber pacemaker, no additional temporary epicardial or transvenous pacing wire was necessary; the existing device was used for perioperative rate support if needed.

Exposure

A 5-cm skin incision was made along the right anterior axillary line at the level of the fourth intercostal space. After dissection of the subcutaneous tissue, the serratus anterior muscle, and the intercostal muscle, the thoracic cavity was entered and a soft-tissue retractor positioned. Peripheral cannulation of the right femoral vessels for cardiopulmonary bypass was established using the Seldinger technique under transesophageal echocardiographic guidance, and extracorporeal circulation was initiated.

Operation

Pericardial fat was removed and the pericardium opened longitudinally; pericardial stay sutures were placed and fixed to the skin to draw the heart closer to the operative field. A left ventricular vent was introduced through the right superior pulmonary vein, and a cardioplegia and venting line was placed above the sinotubular junction. The ascending aorta was cross-clamped using a flexible Cosgrove clamp, and antegrade cardioplegia was administered.

A transverse aortotomy was performed, and aortic stay sutures were placed to obtain a perpendicular view of the valve. The native, calcified valve cusps were excised, followed by meticulous debridement and decalcification of the annulus. The annulus was sized, and three guiding sutures were placed at the nadir of each cusp at the annular level to define the landing zone. A sutureless bioprosthesis (Perceval Plus™, size XL; Corcym, London, United Kingdom) was collapsed and loaded onto its dedicated holder, positioned under direct vision with the aid of the guiding sutures, and deployed. For deployment, the pericardial stay sutures pull the aorta toward the incision, so that the axis of the aortic root points toward the intercostal space; the surgeon looks straight onto the valve, as shown in the video, and the holder can be advanced perpendicular to the annulus. The three guiding sutures are kept under equal tension during descent, and correct seating is checked in all three sinuses before the valve is released. The prosthesis was then balloon post-dilated according to the manufacturer's protocol, after which the guiding sutures were removed. The aortotomy was closed with a double-layer, continuous over-and-over (baseball stitch) polypropylene suture, followed by meticulous de-airing and release of the aortic cross-clamp. Intraoperative transesophageal echocardiography confirmed correct valve positioning, absence of paravalvular leak, and normal transvalvular gradients.

Completion

Double-lung ventilation was re-established and the patient gradually weaned from cardiopulmonary bypass. After full administration of protamine, the femoral cannulas were removed and a final check for hemostasis performed. The pericardium was partially closed, the ribs approximated with a single suture, and the muscle and subcutaneous layers closed in standard fashion.

Comments

Clinical results

Total operative time was 89 minutes, with a cardiopulmonary bypass time of 52 minutes and an aortic cross-clamp time of 34 minutes. Postoperative mechanical ventilation time was approximately 4 hours, and intensive care unit stay was 1 day. The patient was discharged home on postoperative day 6 without complications. No blood transfusion was required, and the postoperative course was entirely uneventful. PredischARGE transthoracic echocardiography showed a well-seated prosthesis with a mean gradient of 10 mmHg, a peak gradient of 16 mmHg and no intra- or paravalvular regurgitation.

Advantages

This case illustrates how the combination of a transaxillary one-access approach with a sutureless bioprosthesis can extend the benefits of minimally invasive aortic valve replacement to older, comorbid patients. Short cardiopulmonary bypass and cross-clamp times are of particular relevance in patients with chronic kidney disease and diabetes, in whom minimizing the physiological insult of extracorporeal circulation may reduce the risk of postoperative organ dysfunction (5). Avoidance of sternotomy further reduces the risk of wound-healing complications, a relevant consideration in an insulin-treated diabetic patient. The rapid deployment characteristics of the sutureless prosthesis simplify implantation through the limited transaxillary access, allowing for reproducible and efficient valve exposure and seating without compromising the quality of annular decalcification or the accuracy of prosthesis positioning (6).

The benefits described here derive from two independent components. The transaxillary access preserves the sternum, the ribs and the right internal thoracic artery and is prosthesis-independent: in our first 1,000 patients, 14.5% received sutured biological and 4.1% mechanical prostheses through the same incision (1). The sutureless prosthesis contributes mainly by shortening cross-clamp and bypass times and by facilitating implantation in a deep operative field; it is a facilitator, not a prerequisite.

Compared with an anterior thoracotomy, the transaxillary access divides no rib or cartilage, preserves the right internal thoracic artery, is independent of the position of the ascending aorta and leaves a scar hidden under the arm. The price is a deeper operative field. Pericardial stay sutures tied under tension to the skin bring the aorta toward the incision, and long-shafted instruments are required. Dense pleural adhesions limit exposure and were the second most frequent reason for conversion in our series (1).

Long-term durability data for the Perceval platform are reassuring: a 15-year single-center experience of 1,136 patients reported a severe structural valve deterioration incidence of 0.74% (7). Transcatheter valves show comparable rates of bioprosthetic valve failure up to 10 years in randomized trials (2), but direct long-term comparisons between sutureless and transcatheter valves are lacking. In a 70-year-old patient, a large sutureless prosthesis also preserves a favorable valve-in-valve option.

Caveats

Careful preoperative assessment remains essential. In this case, angiographically intermediate coronary artery disease was accepted for conservative management following Heart Team discussion, underscoring the importance of a multidisciplinary approach when combining minimally invasive valve surgery with coexisting coronary disease. The presence of peripheral arterial disease required careful preoperative planning of the cannulation site, favoring the contralateral, uninstrumented femoral vessels. As with any sutureless prosthesis, precise annular sizing and decalcification are critical to avoid incomplete valve expansion and paravalvular leak (6).

Conduction disturbances remain the main drawback of sutureless valves. We avoid oversizing by combining CT-based annular measurement with intraoperative sizing and choose the smaller prosthesis if the annulus lies between two sizes. Decalcification near the membranous septum is kept conservative, the guiding sutures are placed at the nadir of each sinus at the annular level rather than below it, to prevent a deep implantation,

and balloon dilatation is limited to a single inflation at 4 atmospheres for 30 seconds. The length of the membranous septum on the preoperative CT scan may help to identify patients at increased risk and is currently being investigated at our institution. With this protocol, the pacemaker rate was 5.6% in our series (1). The XL prosthesis implanted here exerts a considerable radial force on the left ventricular outflow tract and carries a higher risk of new pacemaker implantation. This was irrelevant in the present patient, who already had a permanent pacemaker. In patients without a pacemaker who would require a large size, we size conservatively and consider a conventional stented prosthesis if conduction disturbances are already present.

For surgeons adopting the technique, we recommend starting with isolated aortic valve replacement in patients with a normal body mass index and no previous right-sided thoracic surgery, planning every case on the CT scan, using a sutureless or rapid-deployment prosthesis initially, and seeking proctoring for the first procedures. A standardized setup for the whole team and a low threshold for conversion (1.9% in our series) keep the learning phase safe (1).

Conclusions

Sutureless aortic valve replacement through a right transaxillary minithoracotomy is a safe and efficient minimally invasive strategy, well suited to elderly, comorbid patients. Short bypass and cross-clamp times, combined with the cosmetic and recovery advantages of the transaxillary access, support its use as an alternative to conventional sternotomy in appropriately selected patients (1,3).

Acknowledgments

None.

Footnote

Funding: None.

Conflicts of Interest: The authors have no conflicts of interest to declare.

Ethical Statement: As a retrospective, single-patient case report based on fully anonymized data describing standard institutional clinical care without any additional study-related intervention, formal Ethics Committee approval was waived, in accordance with institutional policy. The study was conducted in accordance with the Declaration of Helsinki (as revised in Edinburgh, 2000). Written informed consent was obtained from the patient for the surgical procedure. As no identifiable patient information, images, or video sequences are included in this report, separate consent for publication was not required.

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Cite this article as: Taghizadeh-Waghefi A, Arzt S, Alexiou K, Matschke K, Wilbring M, Kappert U. Transaxillary aortic valve replacement with a sutureless valve. *Ann Cardiothorac Surg* 2026;15(5):72. doi: 10.21037/acs-2026-0277-tdv