Minimally invasive tricuspid valve surgery after failed transcatheter tricuspid valve repair

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Clinical vignette

Severe tricuspid regurgitation (TR) is associated with increased risk of death and poor quality of life (1). Isolated tricuspid valve (TV) surgery is rarely performed and carries an increased risk of in-hospital mortality rate of 2–10% (2). Transcatheter TV repair (TTVr) has become an alternative treatment option to TV surgery for high-risk patients and those who have no other indication for cardiac surgery. Transcatheter procedures involve the edge-to-edge repair or indirect annuloplasty. Although its safety and success in reducing TR have been shown, an increasing number of patients still undergo a TV surgery after failed TTVr. The present study aimed to summarize our clinical experience with the explantation of different TTVr devices and the surgical treatment of the TR after failed TTVr.

Surgical techniques

Case 1

A 77-year-old female was referred to our center with severe TR. She complained of shortness of breath [New York Heart Association (NYHA) class III–IV]. The patient had a history of previous aortic root replacement surgery due to acute type A aortic dissection. She had concomitant coronary artery disease, hypertension, and chronic obstructive pulmonary disease. Surgical risk profile was clearly high; EuroScore II was 5.7%, Society of Thoracic Surgeons Predicted Risk of Mortality (STS-PROM) score was 5.7% and TRI-SCORE was 8%. The patient was initially scheduled for transcatheter valve repair because of high surgical risk. She still had severe residual TR after implantation of three TriClips (Abbott, Santa Clara, California, USA). Subsequently, a decision was made for a minimally invasive TV surgery in heart-team discussion. Severe TV regurgitation was confirmed by preoperative transesophageal echocardiography (TEE).

A minimally invasive approach through right anterolateral minithoracotomy was implemented, and the TV was visualized using a three-dimensional (3D) endoscope, as previously described in detail (3). Cardiopulmonary bypass was established by ultrasound-guided percutaneous cannulation of the femoral artery and vein, after introducing a vascular closure system. After right atriotomy, intraoperative evaluation of the TV apparatus was made and indicated a loss of insertion on one of the TriClips and a big coaptation gap on the TV. The decision was a TV replacement following explantation of the failed devices and excision of the valve leaflets. After the measurement for the optimal valve sizing, a 33-mm St. Jude Epic bioprosthesis (St. Jude Medical; St. Paul, MN, USA) was implanted. The perioperative TEE revealed a

good result without paravalvular leakage. The patient was discharged from the intensive care unit on postoperative day 5, and her postoperative course was uneventful, except for 3rd degree atrioventricular (AV)-Block. She underwent transvenous implantation of a permanent dual-chamber (DDD) pacemaker with right atrial and coronary sinus leads via subclavian vein puncture.

Case 2

The second patient was a 65-year-old male with symptomatic severe TR after a failed TTVr with Cardioband (Edwards Lifesciences, Irvine, CA, USA) implantation two years ago. He presented with progressive dyspnea and NYHA class III cardiac decompensation signs. He had systemic hypertension, diabetes mellitus, chronic renal failure and previous intervention history for atrial fibrillation and pacemaker implantation. After a heart team discussion, the patient was scheduled for minimally invasive TV surgery with high surgical risk scores; EuroScore II was 12.1%, STS-PROM score 15.0% and TRI-SCORE was 22%. Severe TV regurgitation and impaired right ventricular ejection fraction were confirmed by perioperative TEE.

Intraoperative inspection of the TV revealed that all anchors were securely fixed and completely endothelialized. However, a large coaptation gap was noted between the valve leaflets. We performed the cut and unscrew technique to remove the Cardioband device, as previously described (4). First, the endothelialized part of the Cardioband was dissected from the surrounding annular tissue using a scalpel, a tissue dissector and electrocautery. Here, care should be taken to avoid potential injuries to the surrounding structures. Then, Cardioband was cut between the anchors and removed separately by unscrewing each anchor in a counterclockwise direction. All anchors were removed to prevent a potential prosthesis-seating problem that could cause paravalvular leakage. Since the repair was unfeasible, the decision to replace the valve was made. A St. Jude Epic valve was implanted and secured using Cor Knot (LSI Solutions, Victor, NY, USA). The perioperative TEE revealed good results with a pleasant transvalvular mean pressure gradient. He was discharged from the intensive care unit (ICU) on postoperative day 7. The postoperative course was uneventful, except for a rethoracotomy on the first postoperative day due to bleeding.

Comments

Edge-to-edge devices can be explanted without leaflet damage if repair is feasible. First, the TV should have a pathology that was initially repairable prior to clip implantation. Secondly, repair must still be possible after explantation of failed clips, preferably recently implanted clips, so that endothelialisation does not occur, which can complicate repair. We have investigated the alternative explantation techniques for failed Mitra/TriClips, as previously reported (5). However, annuloplasty devices are more challenging to remove and may frequently require valve replacement under cardioplegic cardiac arrest. Care should be taken to avoid atrioventricular block by placing more superficial sutures in the portion of the annulus adjacent to the atrioventricular node; however, this strategy may not prevent atrioventricular block, as observed in the present case. Each device may require a different removal technique. Repair after failed TTVr can sometimes be feasible, but replacement is more common. In conclusion, increasing surgical experience may improve clinical outcomes after TV surgery for residual TR following failed interventions. Given that only two cases are presented in this paper, our findings and experience cannot be generalized to the broader population and should be confirmed in further studies involving larger cohorts.

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Footnote

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