Masters of Cardiothoracic Surgery

Surgery without visible scars—double valve surgery using the right lateral access

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Clinical vignette

We report a 79-year-old male who presented with dyspnea NYHA III°. Echocardiography revealed severe aortic stenosis and significant mitral regurgitation (MR). The mechanism of the MR seemed predominantly functional as a result of annular dilatation, with additional small calcifications at the A1/P1 segments. The anterior mitral leaflet was measured to be 30 mm and left ventricular ejection fraction remained preserved at 57%. Coronary artery disease was ruled out by coronary angiography. His medical history consisted of a single-chamber pacemaker implantation 6 years ago and his Euroscore 2 was calculated to be 1.97%, attesting to an overall low-risk profile, despite the patient's advanced age.

Our surgical strategy consisted of biological aortic valve (AV) replacement using a rapid deployment valve and isolated mitral annuloplasty, using right lateral access through the 3rd intercostal space, along the right anterior axillary line. The development and evolution of this technique in our institution was inspired by the "Miami-Method", initially described by Lamelas (1).

Surgical technique

Patient selection

The most essential parts of surgery are indications and patient selection. The presented technique presumes pre-operative screening by high-resolution full cardiac cycle angio-CT scan of the heart and complete aorta. Accessibility of the AV is crucial for double valve procedures. The ascending aorta should be right of the midline, specifically, the distance measured from the third intercostal space to the aortic annulus, if shorter than 15 cm, indicates good feasibility. The diameter of the aortic annulus should also be estimated using the CT-scan, for e.g., a large annulus making use of a rapid deployment impossible, combined with long distances to the annulus, could be a reason not to perform this method of access. There are no particular limitations of using this form of access for the mitral valve (MV).

Preparation

The patient is placed in supine position, slightly rotated to the left. For exposure of the right axilla, the right arm is brought into somewhat of a "javelin-thrower" position. A double-lumen breathing tube is placed allowing single lung ventilation if needed, and a transvenous temporary pacing wire is placed. This facilitates post-operative pacing, as placement of epicardial wires can sometimes be challenging. Furthermore, it allows for the possibility of rapid pacing during administration of cardioplegia, in the presence of aortic regurgitation.

Exposition

A 5–7 cm skin incision is made along the right anterior axillary line, and after dissection of the subcutaneous tissue, the M. serratus anterior and intercostal muscle, either the 3rd or 4th intercostal space is opened. Following placement of the soft tissue retractor and inspection of the operative field, heparin is administered and dissection of the femoral vessels performed. Extracorporeal circulation

(ECC) is established.

Operation

Now, pericardial fat must be removed and then the pericardium can be opened. Pericardial stay sutures are tied firmly to the skin helping to approximate the whole operative field. After placement of the left ventricular venting line and cardioplegia cannula, the aorta is cross-clamped using a flexible Cosgrove clamp. Then the left atrium is opened. After full administration, the atrial retractor is brought into position and MV surgery is performed as standard. The left atrium is then closed and focus is switched to the AV. Aortotomy can be performed either transversely or longitudinally. After placing aortic stay sutures, a perpendicular view of the AV can typically be established. After AV surgery, the aorta is closed as per standard. Now, meticulous de-airing is followed by loosening of the cross-clamp. A first check using transesophageal echocardiogram should confirm regular valvular function and the absence of intra-cardiac air.

Completion

Double lung ventilation can then be established for weaning from ECC. After weaning and full administration of protamine (during this stage, the femoral cannulas are removed), a final check for bleeding is conducted. Afterwards, the pericardium is closed, ribs are approximated by sutures, and muscles and subcutaneous tissue are closed.

Comments

Clinical results

As part of the "One-Access-Concept", the described access is routinely used for AV, MV and tricuspid valve surgeries—and combinations of these. During a 1-year period, 130 procedures were performed using this access without major intra-operative morbidity or mortality. However, one conversion to partial upper sternotomy was required, in the case of an isolated AV surgery, as a consequence of lung adhesions. Post-operative courses were mainly uneventful by means of the surgical access route. Access-related minor complications were infrequent and consisted of aerodemectasia, late pleural effusion and minor chest wall hematoma. None of these infrequent complications required surgical revision.

Advantages

Demonstrating medical advantages is perhaps too early for this young technique and may not be possible in the future due to an indisputable patient selection bias. From our experience, the technique is reproducible and safe. Omitting elaborate and expensive 3D-visualization techniques assisted in circulating this technique within the institution and change it from a "one-man-show" to a real team approach. The learning curve is quick and the required case load to maintain quality is comparably low as a result of the "One-Access-Concept" for multiple valves. The reduction in surgical steps until the valves are exposed, allows for short procedure times. The "One-incision" strategy without the need for additional incisions (for ports, clamps, etc.), help make the procedure less complex. Finally, the cosmetic result with a nearly hidden scar on the right chest wall is unbeatable. In particular small, obese women benefit once the chest is entered as the anatomy corresponds more to the small height rather than to the weight.

Caveats

Real surgical limitations include lung adhesions as well as an aorta ascending on the left side of the midline. Essential keystones are patient selection, according to the anatomy revealed by CT-scan and the pericardial stay sutures.

Conclusions

Essentially, the reported technique is compatible with all types of mechanical and biological stented valve prostheses. Despite all the alternatives available, it is the use of a rapid deployment valve that helps facilitate double valve surgery using the right lateral access approach, thereby increasing the number of patients that can be safely treated using this technique.

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None.

Footnote

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

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