Alternative access for transapical transcatheter mitral valve implantation

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The self-expanding Tendyne device (Abbott Cardiovascular) is the first transcatheter mitral valve prosthesis approved for the treatment of severe symptomatic mitral regurgitation. It offers selected patients not eligible for surgery or transcatheter edge-to-edge repair the opportunity of transcatheter mitral valve replacement. Recently published data proved the safety and feasibility of the procedure and showed a significant and sustainable reduction of mitral regurgitation up to 2 years of follow-up.1,2

Conventionally, a left anterolateral minithoracotomy is performed to gain access to the apex of the heart, where the valve is deployed transventricularly. We present the first case of transcatheter mitral valve replacement in which the procedure was conducted through a subcostal incision in order to preserve patient’s chest-wall integrity. The institutional review board or equivalent ethics committee of the University Hospital Münster, Münster, Germany, approved the study protocol and publication of data (March 15, 2023/2023-164-F-N). Patient written consent for the publication of the study data was waived by the institutional review board because of the retrospective data collection and the anonymized processing and presentation of data.

CASE PRESENTATION

An 85-year-old male patient was admitted to our hospital with recurrent severe heart failure caused by a mixed mitral valve disease with severe regurgitation and moderate stenosis (Video 1). Due to impaired leaflet mobility, the valve was not eligible for transcatheter edge-to-edge repair, but high operative risk also denied the opportunity for conventional surgery. Despite sensitive anatomic conditions caused by severe annulus calcification and

CENTRAL MESSAGE

Transcatheter mitral valve replacement performed through a subcostal incision is feasible and reduces the surgical trauma by preserving patient’s chest wall integrity.

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previous TAVI, the patient was found suitable for off-label Tendyne implantation.3,4

Preoperative 3-dimensional computed tomography reconstruction located the ideal position for apical access, in terms of orthogonal approach to the mitral valve plane, in the left sixth intercostal space approximately at the parasternal line. Unfortunately, accessory cartilaginous or osseous structures attached the sixth and seventh rib parasternally, requiring an additional transection of these structures or a partial rib resection to reach the target site (Figure 1).

After the patient had been positioned correctly on the surgical table, final transthoracic echocardiography showed that, uncommonly, an appropriate trajectory for implantation could also be attained by placing the probe subcostal, slightly left of the xiphoid (Figure 2). Therefore, the interdiscipli

A slight reverse Trendelenburg position of the patient shifted the heart more caudally, which facilitated improved apical access and device trajectory. Implantation of the Tendyne prosthesis (29S LP), preceded by a predilation of the mitral valve apparatus with a 28-mm balloon valvuloplasty catheter, was performed in a routine fashion and proceeded uneventfully. Finally, an intrapericardial drainage was inserted, the muscular costal part of the diaphragm was reattached to the costal margin and the layers of the abdominal wall were closed in anatomical planes.

After immediate weaning of the patient from the respira
tor, initial postoperative course was complicated by general vasoplegia with consecutive high demand for vasopressors and a temporary need for hemofiltration. Later on, the patient experienced an influenza infection, but on the 19th postoperative day he could be discharged to a
rehabilitation unit. Echocardiography at discharge showed a correct position and function of the mitral valve prosthesis (Video 2).

DISCUSSION

Preoperative imaging delivers crucial data to determine the correct size and profile of the mitral valve prosthesis, but regarding the access route to the left ventricular (LV) apex, surgeons should keep in mind that certain anatomical characteristics and auxiliary patient positioning may offer favorable access sites diverging from the preprocedural 3-dimensional computed tomography reconstruction.

In the presented case, a preexisting mediocaudal shift of the LV apex (Figure 1, B and C), increased by a reverse Trendelenburg positioning, enabled an almost perpendicular and centered device trajectory from the LV apex to the mitral valve plane through a less-traumatic, paraxiphoideal incision. The slight scaphoid-shaped chest of the patient further facilitated this approach due to a greater range of motion for the prosthesis delivery system.

Consequently, transthoracic echocardiography is highly recommended to verify the preoperatively estimated surgical access route and to evaluate potential alternatives.

Caution is advised, however, as the technical requirements for a proper and stable alignment of the Tendyne prosthesis tolerate only minor deviations of approximately 6 to 10° from an orthogonal device delivery to the mitral valve plane.

**Conflict of Interest Statement**

Dr Bleiziffer is a proctor for Abbot. All other authors reported no conflicts of interest.

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