

Alternative access for transapical transcatheter mitral valve implantation



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Received for publication May 24, 2023; revisions received July 14, 2023; accepted for publication July 25, 2023; available ahead of print Aug 20, 2023.

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JTCVS Techniques 2023;21:102-5

2666-2507

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<https://doi.org/10.1016/j.jtc.2023.08.011>



Alternative approach for implantation of the Tendyne prosthesis.

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.

 Video clip is available online.

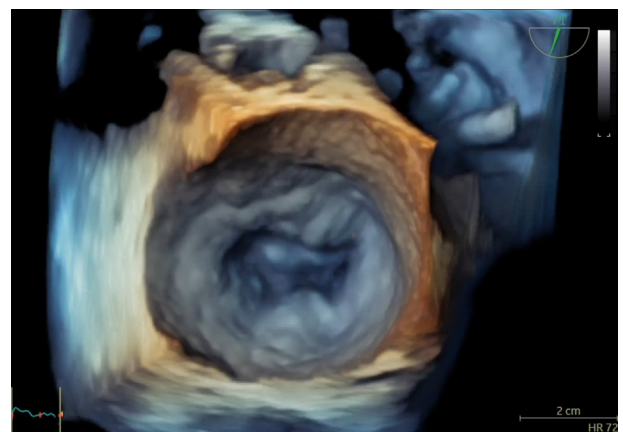
The self-expanding Tendyne device (Abbott Cardiovascular) is the first transcatheter mitral valve prosthesis approved for the treatment of severe symptomatic mitral regurgitation. It offers selected patients not eligible for surgery or transcatheter edge-to-edge repair the opportunity of transcatheter 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



VIDEO 1. Mitral valve insufficiency and mitral valve anatomy preoperatively. Video available at: [https://www.jtcvs.org/article/S2666-2507\(23\)00287-0/fulltext](https://www.jtcvs.org/article/S2666-2507(23)00287-0/fulltext).

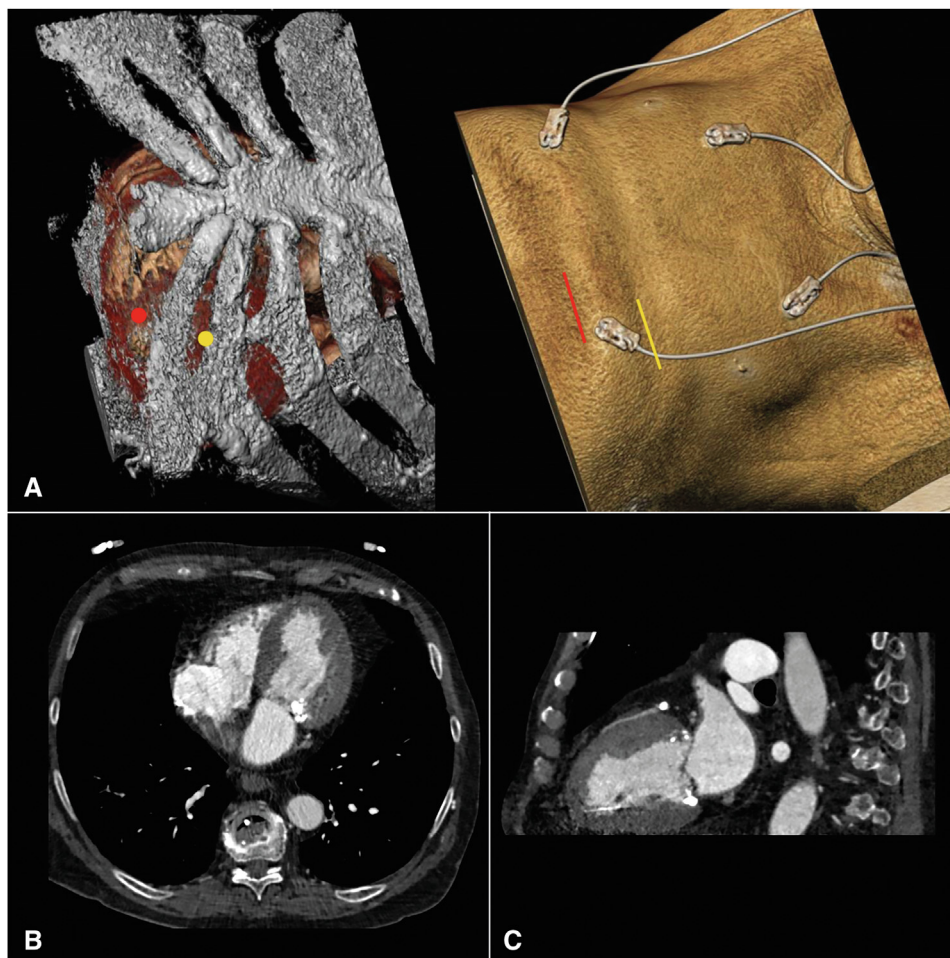


FIGURE 1. Calculated (*yellow*) and actual target site (*red*) as well as corresponding skin incisions for transcatheter mitral valve replacement in 3D-CT scan (A) presentation of the heart in the transversal (B) and sagittal plane (C) of the 2D CT scan. 2D, 2-Dimensional; 3D, 3-dimensional; CT, computed tomography.

calcification and 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 interdisciplinary implantation team decided to access the apex via a 5-cm skin incision left of the xiphoid apex. After transverse dissection of the left ventral abdominal muscles, the pericardium was directly accessed above the diaphragm

through the left sternocostal triangle. In addition, a small portion of the adjoining medial costal insertion of the diaphragm was detached.

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 predilatation 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 respirator, 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



FIGURE 2. Echocardiographic evaluation of alternative access site (A and B) subcostal incision (C) and valve deployment (D).

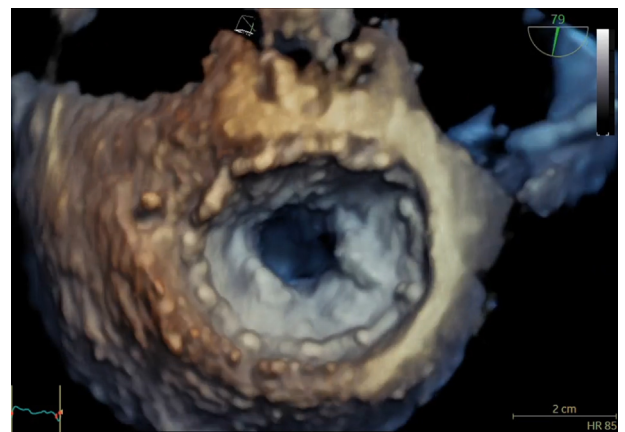
rehabilitation unit. Echocardiography at discharge showed a correct position and function of the mitral valve prosthesis (Video 2).

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, paraxiphoidal 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.



VIDEO 2. Postoperative result. Video available at: [https://www.jtcvs.org/article/S2666-2507\(23\)00287-0/fulltext](https://www.jtcvs.org/article/S2666-2507(23)00287-0/fulltext).

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.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or

reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

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