

# Live Three-Dimensional Transesophageal Echocardiography-Guided Transcatheter Percutaneous Implant of the Corevalve Revalving™ in the Aortic Position

## Clinical Case Portal

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### Abstract

This case illustrates an example of the use of live three-dimensional echocardiography to monitor and guide transcatheter percutaneous implantation of an endovascular aortic valve. The case involves a 84-

year-old male who had severe and symptomatic calcific aortic stenosis and was unsuitable for open heart surgery. The unprecedented anatomical images provided by the new live 3D transesophageal echo technique allow monitoring the procedure and guiding the operator in crossing the valve and correctly positioning the device.

## Introduction

Degenerative calcific aortic stenosis is the most frequent and potentially serious valvular disease in Western countries, and its incidence is expected to increase with population aging. Until recently, surgical aortic valve replacement was the only effective treatment for symptomatic patients with severe stenosis, providing relief of symptoms and an improved survival. Recently, endovascular aortic valve implantation has been proved to be feasible in patients with aortic stenosis unsuitable for open heart surgery, using either self- or balloon-expandable valved stents.

Usually the procedure is performed under fluoroscopic monitoring of native valve crossing and device positioning. Transesophageal echocardiography (TEE) being used almost exclusively to measure the left ventricular outflow tract diameter to size the prosthesis at the beginning of the procedure, and to check for leakages at the end of the procedure. Recent evolution of TEE probes into a 3D fully-sampled matrix array capable of allowing real-time acquisition and on line display of volume rendered 3D images of the aortic valve has renewed the interest of TEE to monitor interventional percutaneous procedures.

## Case Report

A 84-year-old male with severe and symptomatic calcific aortic stenosis who was unsuitable for open heart surgery underwent percutaneous implantation of the CoreValve Revalving™ (Figure 1) prosthesis in the aortic position.

At the beginning of the procedure the 3D TEE probe is used a usual 2D probe to provide the left ventricular outflow tract diameter which is used to size the prosthesis (fig.2). In our patient, a 23-mm bioprosthesis was used. Immediately after, we switched the probe to a volume render “en-face” imaging of the valve from the aortic root (fig.3).

The 3D TEE probe allows simultaneous and live imaging of volume rendered and orthogonal multiplane 2D views of the valve (fig.4). Steering the imaging plane to long axis view provided a better appreciation of the thickening and reduced mobility of the valve leaflets, of the morphology of the left ventricular outflow tract, and relationship with anterior mitral leaflet (fig.5).

Adequate spatial resolution and live display of volume rendered images allow the use of the 3D TEE probe to guide the wire in crossing the valve (fig.6 and 7) and to check the position of the wire once the valve has been crossed (fig.8 and 9).

When the prosthesis is positioned within the aortic annulus the nitinol frame is clearly visible at 3D TEE (fig.10).

Therefore, the position of the prosthesis and its spatial relationships with surrounding structures (mainly anterior mitral leaflet) can be easily assessed before the release of the device.

At the end of the procedure the device has been switched gain to 2D imaging with color Doppler to check for any intervening prosthesis leakage.

The procedure was successful with no leakage at the end.

Fig. 1 :

## The CoreValve



### Video 1 :

Transesophageal two-dimensional long-axis view of left ventricular outflow tract



### Video 2 :

3D Volume rendering enface view of the aortic valve from the aortic root



### Video 3 :

Simultaneous display of 3D volume rendering imaging of the valve and two two orthogonal 2D views of the same valve



### Video 4 :

3D volume rendering longitudinal view of the aortic valve, left ventricular outflow tract and aortic root



### Video 5 :

Adequate spatial resolution and on-line display of the volume rendered images make the technique suitable for monitoring and guiding the operator in crossing the valve with the wire.



**Video 6 :**

Monitoring of the procedure can be performed simultaneously with the 3D volume rendered images and two 2D orthogonal views of the same cardiac structure



**Video 7 :**

Once the valve is crossed the 3D images allow to check the position of the wire in the left ventricular outflow tract



**Video 8 :**

Two orthogonal 2D views of the wire across the valve can be displayed simultaneously



**Video 9 :**

The nitinol wire can easily be identified by 3D volume rendered images

