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IMAGING VIGNETTE

ADVANCED

CLINICAL VIGNETTE

Virtual Simulated Implantation of an Adult-Sized Left Ventricular Assist Device in a Pediatric Patient

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ABSTRACT

There is very limited experience with simulated virtual implantation of left ventricular assist devices (LVADs) to assess device fitness in pediatric patients. In this clinical vignette, we report the case of a 9-year-old male patient with dilated cardiomyopathy who underwent successful placement of an LVAD after virtual simulated implantation was performed. (**Level of Difficulty: Advanced.**) (J Am Coll Cardiol Case Rep 2022;4:239–240) © 2022 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

BACKGROUND

As relatively smaller ventricular assist devices become more widely available, clinicians are increasingly interested in using these devices in pediatric patients.[1,2] However, clinicians have very limited experience in the assessment of chest fit of adult-sized ventricular assist devices for pediatric patients.[3]

CLINICAL VIGNETTE

A 9-year-old male patient with a history of in utero enteroviral infection, dilated cardiomyopathy with mitral valve regurgitation, and severely depressed left ventricular systolic function underwent mitral valve annuloplasty at 3 years of age. Because of progressive worsening of mitral valve regurgitation, he underwent mitral valve replacement with a mosaic bioprosthetic mitral valve at 8 years of age. Progressive worsening of heart failure symptoms developed, and he required ventricular assist device placement at 9 years of age. His weight was 27 kg, his height was 131 cm, and his body surface area was 0.99 m^2.

The patient underwent cardiac computed tomography (CT) in preparation for the ventricular assist device placement. Virtual simulated implantation of an adult-sized left ventricular assist device (LVAD) using a

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The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the Author Center.

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ABBREVIATIONS AND ACRONYMS

CT = computed tomography

LVAD = left ventricular assist device

segmented cardiac CT image was performed (Figure 1). The patient then underwent LVAD (HeartMate3, Abbott) placement without any complications. The patient did well postoperatively and is waiting for heart transplantation at the time of this report.

In conclusion, virtual simulated implantation of an LVAD using segmented cardiac CT imaging provides a more accurate assessment of device positioning in the chest of a pediatric patient.

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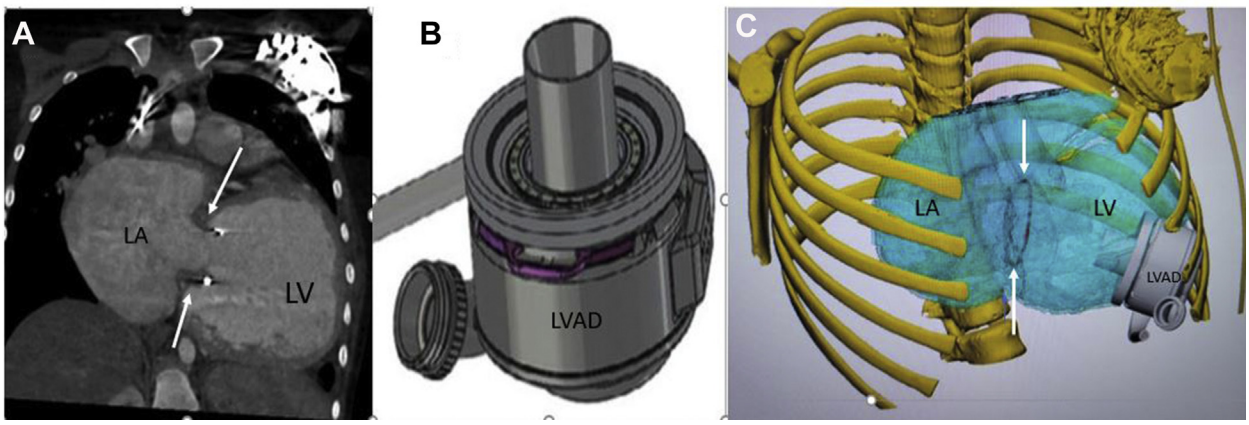
FIGURE 1 A 9-Year-Old Male Patient With Dilated Cardiomyopathy and Mitral Valve Regurgitation After Prosthetic Mitral Valve Replacement



(A) Cardiac computed tomography coronal reconstructed image, **(B)** schematic illustration of the left ventricular assist device (LVAD), and **(C)** simulated implantation of the ventricular assist device to a segmented cardiac computed tomography image of the patient showing a good size fit with the assist device far away from atrioventricular valve annulus **(arrows).** LA = left atrium; LV = left ventricle.

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