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Commentary: When virtuality embraces reality

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CENTRAL MESSAGE

Virtual imaging technology contributes to the clinical outcome by improved real-world delineation of complex anatomy in congenital heart diseases.

This case reported by Oh and colleagues[1] is interesting and illustrative for mainly 2 reasons. First, the case represents a very unusual aberration of the spectrum of conotruncal heart diseases by combining an aortopulmonary window and a tetralogy of Fallot configuration. Although anatomical variations of the aortic arch and its related vessels as well as of the pulmonary arteries are well known within both entities, deviations were noticed at systemic arterial level by a right-sided aortic arch and abnormal origin of the left subclavian artery from the pulmonary artery, together with a hypoplastic right pulmonary artery at the right-sided arterial level. From the perspective of pathologic presentation, this case is already unique.

Second, advanced virtual-based imaging was used here for better delineation of the special anatomical relationships between the main vascular structures to facilitate surgical planning. The advent of high-resolution multislice computed tomography and nuclear magnetic resonance has enhanced the understanding of complex congenital heart malformations through adding the possibility for off-line digital 3-dimensional (3D) reconstruction, on top of the 2-dimensional visualization of heart structures as obtained by classical echocardiography and computed tomography imaging. The major advantage of the virtual reality software tool is that it allows to reproduce the global cardiac defect into a realistic 3Dl model, comprehensible for all physicians involved to the management of this particular patient.[2,3]

One may assume that the first on-site echocardiography in this neonate already had revealed the complexity of the cardiac malformation but probably remained elusive concerning the arrangement of great vessels, being hindered by the distorted heart position due to the hypoplastic right lung. Especially for getting better insight into the spatial course of extracardiac structures like the aorta and aortic vessels and the pulmonary arteries, such a 3D model might be helpful for the preoperative planning of the surgical repair, in order to improve the final outcome, regardless of the complexity of the malformation. From this perspective, this case presentation illustrates how advanced imaging can contribute to refining the management of an individual patient.

Actually, if the surgical outcome of various congenital heart diseases has improved over time, major merits hereto are due to novelties in sophisticated imaging technology addressing both the morphological and physiological characteristics of even the most complex heart lesions. Therefore, to integrate this increased understanding into sustainable clinical success, one has to make that virtuality is absorbed by reality.

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Disclosures: The author 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.

Received for publication April 25, 2022; accepted for publication April 25, 2022; available ahead of print April 28, 2022.

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JTCVS Techniques 2022;14:195

2666-2507

https://doi.org/10.1016/j.xjtc.2022.04.024

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