

Usefulness of Echocardiographic-Fluoroscopic Fusion Imaging in children with Congenital Heart Diseases

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Introduction

Transesophageal echocardiography (TEE) has become indispensable in Cat-Lab to guide some percutaneous interventions as a complimentary imaging for fluoroscopy. However the two imaging modalities are presented separately and differently making complicated the interpretation of the anatomic spatial relationships. Echonavigator® is an innovative software enabling fusion between fluoroscopic and echocardiographic image on the same screen.

Aims: To assess the feasibility of Echonavigator to guide interventional procedure, and to present our initial clinical experience using this software.



Image fusion during atrial septal defect (ADS) closure between 3D echocardiography and fluoroscopy. A marker was positioned at the center of ASD. We can appreciate the perfect alignment of the guide in 3D and fluoroscopic images

Methods

Children with congenital heart disease (CHD) underwent interventional catheterization needing guidance by TEE from December 2015 to December 2017 were included. TEE was realized using X7-2t TEE probe connected to an echocardiographic system (EPIC). Fluoroscopy was realized using Allura Xper FD/10 system (Philips Healthcare). Image fusion was attempted in all patients using Echonavigator. Markers were positioned on the target zone on echocardiographic images and projected to the merged screen.

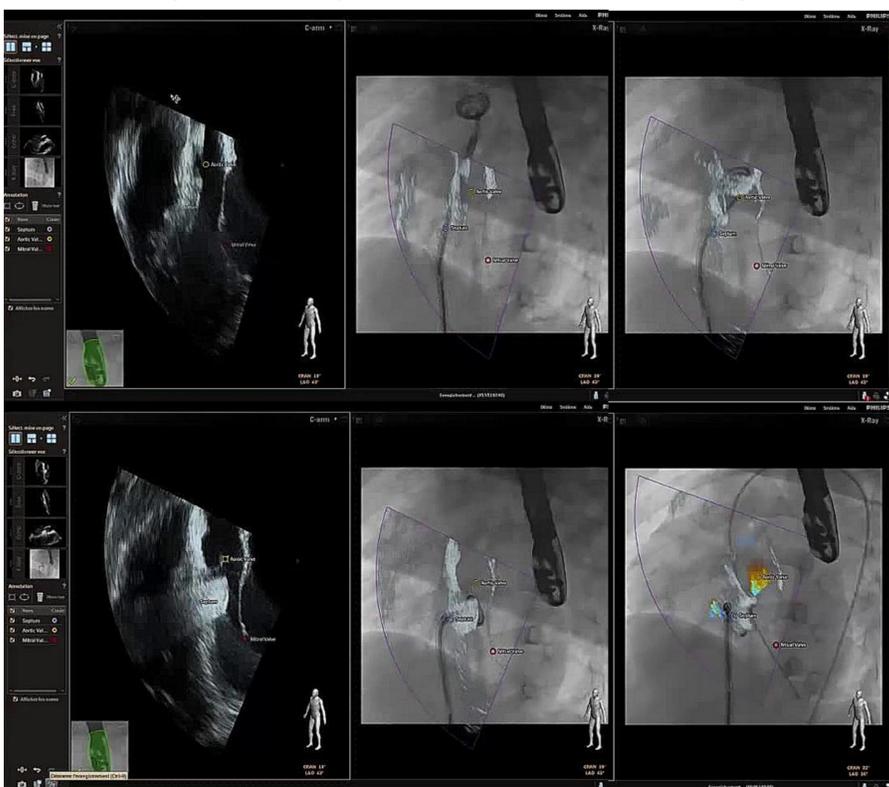


Image fusion during ventricular septal defect (VSD) closure procedure using Nit-Occlud device. Three markers were positioned at the level of VSD, aortic valve and mitral valve

Résultats

51 children were included (mean age 8 years, mean weight 25 kg). 36 patients underwent atrial septal defect closure, 10 ventricular septal defect closure, 3 aortic valve dilatation and 2 right ventricular outflow tract reevaluation.

Image fusions were successfully obtained in all patients during all steps of procedure. No complication related to TEE probe was observed. Markers were successfully positioned in the all target zones and automatically projected to the fusion screen.



Echonavigator during aortic valve dilatation procedure, Marker was placed at the level of aortic valve opening on 2D and 3D echocardiographic images (red arrow) and the anterior mitral valve leaflet (green arrow) and automatically projected at the fluoroscopic screen. This enables easier crossing of the stenotic aortic valve, optimal positioning of the balloon, and avoiding mitral valve injury

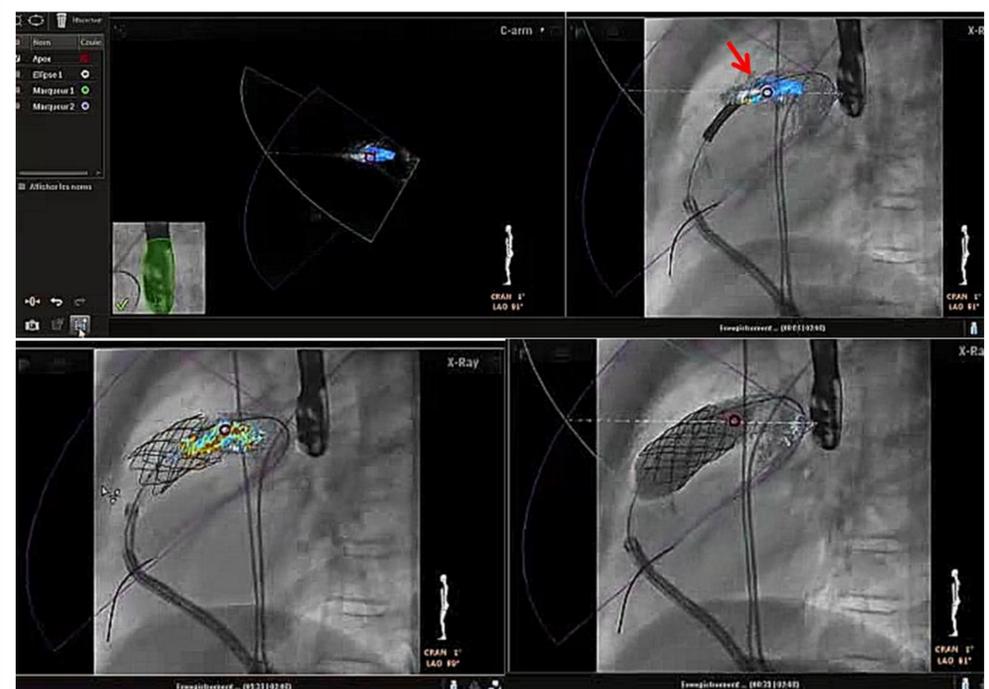


Image fusion during pulmonary outflow tract reevaluation procedure using Melody valve. Marker was placed at the leading zone on biplane TEE images (upper right screen) and automatically projected at the fluoroscopic screen (red arrow), Fusion of 2D color echocardiographic image enables to evaluated the absence of residual regurgitation (lower right screen).

Conclusion

Echonavigator system is feasible and safe to guide interventional catheterization in children with CHD. It enables better appreciation of anatomical relationships and improves confidence of interventionist.