

Introduction Understanding of cardiac structure has been improved by 3D cardiac echocardiography. The anatomy and geometry of the mitral valve annulus (MVA) has been previously described with advanced imaging techniques, allowing for a better comprehension of valve dysfunction and providing significant information for the surgical repair.

Aim To apply transthoracic 3D echocardiography (3DTTE) for quantitative and qualitative assessment and comparison of the pathologic MVA in congenital cardiopathies (CC) of the valve with a normal group.

Methods Patients with repaired atrioventricular septal defect (AVSD) attending consultation were prospectively included and matched with a control group of healthy children by sex, age and body surface area (BSA). 3DTTE full volume and 3D zoom acquisitions were performed on a Philips EPIQ7. The 3D shape of the annuli was reconstructed and analysed with TOMTEC™ 4D MV-ASSESSMENT© (Fig. 1). The assessed and compared parameters were annular area (2D & 3D), circumference, high-low distances (height), anterolateral-posterolateral (ALPM), and anteroposterior (AP) axes, non-planar angle (NPA), sphericity index, angle between the aortic annulus and AP axis (AAoAP angle). All measurements were indexed by BSA.

Results A total of 18 participants were recruited. Both groups were comparable in age (10.67 ± 3.45 years) and BSA (1.13 ± 0.27 m²). All acquisitions could be analysed with need of minimal editing of the annulus after automated detection, leaflets couldn't be analysed in the AVSD group. Significant differences between both groups were found in the NPA with an increase in the nonplanarity for the patients with a repaired AVSD (144.5 vs. 132.9; $P < 0.01$) and

a more circular shape represented by a higher sphericity index (0.99 vs. 0.85; $P = 0.01$). No difference was found in indexed height, area and diameters were similar between both groups.

Conclusions The specific and exclusive shape of the MVA in patients with repaired AVSD was revealed in the patients studied, resulting in a loss of the saddle shape structure. Those results could help in the comprehension of anatomic changes of the mitral valve annulus occurring after AVSD surgery.

Keywords Congenital Heart Diseases; Children; 3D echocardiography; Mitral Valve Annulus; Atrioventricular Septal Defect

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P11 4D Flow versus Conventional 2D MRI for Measuring Pulmonary Flow after Tetralogy of Fallot Repair



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Background After tetralogy of Fallot (TOF) repair, pulmonary regurgitation and right ventricular function must be monitored. Conventional (2D) cardiac magnetic resonance (CMR) is currently the clinical reference method for measuring pulmonary regurgitation. However, 4D CMR has been reported to provide a more comprehensive flow analysis than 2D CMR. We aimed to compare 4D CMR to 2D CMR for assessing pulmonary regurgitation and flow, as well as aortic flow, in children and adults after surgical repair of TOF.

Methods Retrospective analysis of patients with repaired TOF admitted for cardiac MRI with 4D flow acquisition from 2016 to 2018. Linear regression was used to assess correlations and Bland-Altman analyses were performed.

Results The 60 included patients had a mean age of 18.2 ± 10.4 years (range, 2–54 years).

Significant correlations between the two techniques were found for pulmonary regurgitant fraction ($R^2 = 0.6642$, $P < 0.0001$), net pulmonary flow ($R^2 = 0.6782$, $P < 0.0001$), forward pulmonary flow ($R^2 = 0.6185$, $P < 0.0001$), backward pulmonary flow ($R^2 = 0.8192$, $P < 0.0001$), and aortic valve flow ($R^2 = 0.6494$, $P < 0.0001$). The Bland-Altman analysis showed no significant bias, narrow limits of agreement, and few scattered points. The correlation between pulmonary and aortic flow was better with 4D CMR than with 2D CMR ($R^2 = 0.8564$, $P < 0.0001$ versus $R^2 = 0.4393$, $P < 0.0001$, respectively). Interobserver reliability was good.

Conclusion These results establish the feasibility and reliability of 4D CMR for assessing pulmonary flow in a large paediatric and adult population with repaired TOF. 4D CMR may be more reliable than 2D MRI for pulmonary flow assessment after TOF repair.



Fig. 1 Modelisation of AVSD left atrioventricular valve annulus (upper) and normal mitral valve annulus (inferior).

Keywords Tetralogy of Fallot; Cardiac magnetic resonance; 4D Flow imaging

Disclosure of interest The authors declare that they have no competing interest.

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P12

Liquid pediatric formulation of sildenafil citrate: Preparation and stability evaluation



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Sildenafil citrate, neonatal pulmonary antihypertensive, not being marketed as a pediatric drug, an extemporaneous liquid preparation of this drug could be proposed for a pediatric use.

The objective of this study is therefore to prepare a solution of Sildenafil citrate, in a simple syrup (1.25 mg/ml), from Sildenafil Tablets (VIACTAL® 50 mg), according to a common practice "dosage adjustment" allowing to adjust doses in pediatrics.

A physicochemical and microbiological stability study of this solution was carried out at 5°C. The results of this study have shown that Sildenafil citrate syrup solutions stored in the refrigerator are stable for a period of 04 weeks: unchanged color and odor, no crystallization observed, no pH variation, unchanged active substance concentration and no microbial contamination detected. However, after opening the vials, these preparations must be used within 07 days.

Keywords Liquid pediatric formulation; Stability; Sildenafil citrate

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P13

Right ventricle end-systolic remodeling index in patients with atrial septal defect and severe pulmonary arterial hypertension



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Background Outcome of patients with atrial septal defect (ASD) and severe pulmonary arterial hypertension (PAH) relates to right ventricular (RV) function. Magnetic resonance imaging (MRI) remains the gold standard for evaluating the RV function but it is not used routinely. We investigated the relationship between MRI and multiple echocardiography parameters, including the Right Ventricle End-Systolic Remodeling Index (RVESRI), a new prognostic marker in patients with PAH.

Methods Twenty-three patients with ASD and severe PAH (median age 49 year old [39–59], SpO₂ 92% [90–95], WHO functional class II or III, mean pulmonary artery pressure 51 mmHg [40–59]) were included between 2014 and 2018. All patients underwent MRI and echocardiography assessment. Echocardiographic measurements of

RV remodeling and function included TAPSE, RV fractional area change (RVFAC), peak systolic velocity of the tricuspid valve (S'TV), right atrial (RA) area, RV strain, Systolic to diastolic ratio, eccentricity index and RVESRI, defined by septum length divided by lateral wall length (Fig. 1). Pericardial effusion was noted.

Results Median RV ejection fraction (EF) evaluated with MRI was 46% [34–59]. RV dysfunction (RVEF < 45%) was observed in 43% of patients. Median RVFAC and RVESRI were 29.6% [23–34] and 1.6 [1.4–1.7] respectively. By spearman correlation, RVFAC and RVESRI were significantly correlated to RVEF (Rho 0.62, $P < 0.007$ and Rho -0.51 , $P < 0.02$ respectively). By linear regression, RVFAC and RVESRI were also correlated to RVEF ($R^2 = 0.36$, $P < 0.003$ and $R^2 = 0.34$, $P < 0.08$). Pericardial effusion was associated with RV dysfunction ($P < 0.008$) and a lower RVFAC ($P < 0.01$). TAPSE, S'TV and RV strain were not correlated with RVEF.

Conclusion RVFAC, RVESRI and pericardial effusion were markers of RV dysfunction in patients with ASD and severe PAH. RVESRI appears as a simple and reliable parameter for follow-up. Its prognostic value in patients with CHD remains to be demonstrated.

Keyword ASD-pulmonary hypertension-echocardiography

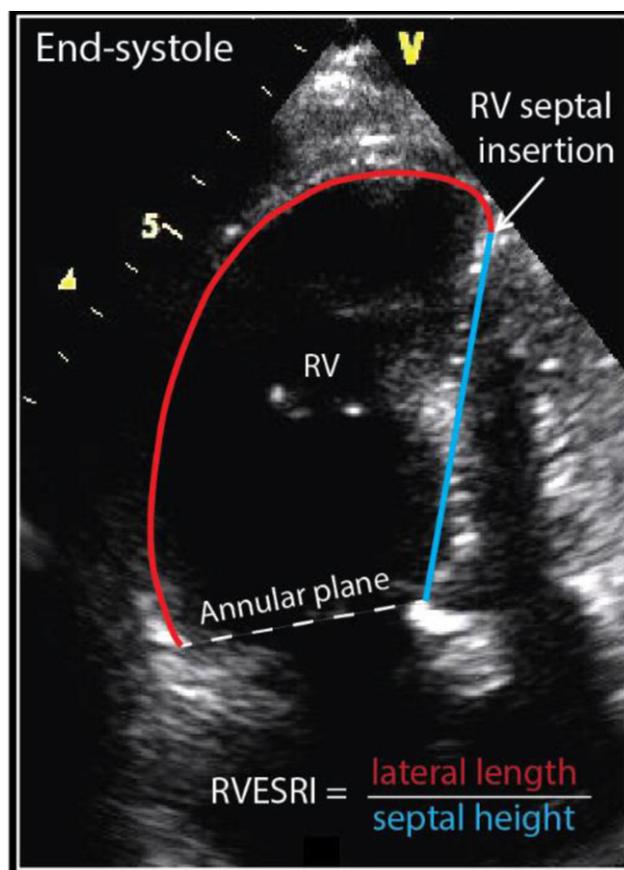


Fig. 1 Right ventricular end-systolic remodeling index (RVESRI) represent a simple ratio of end-systolic lateral length and septal height.

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