Ventricular function evaluation with transthoracic 3D real-time echocardiography in patients with congenital...

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VENTRICULAR FUNCTION EVALUATION WITH TRANSTHORACIC 3D REAL-TIME ECHOCARDIOGRAPHY IN PATIENTS WITH CONGENITAL HEART DISEASE AND UNIVENTRICULAR HEART PHYSIOLOGY: COMPARATIVE STUDY WITH MAGNETIC RESONANCE

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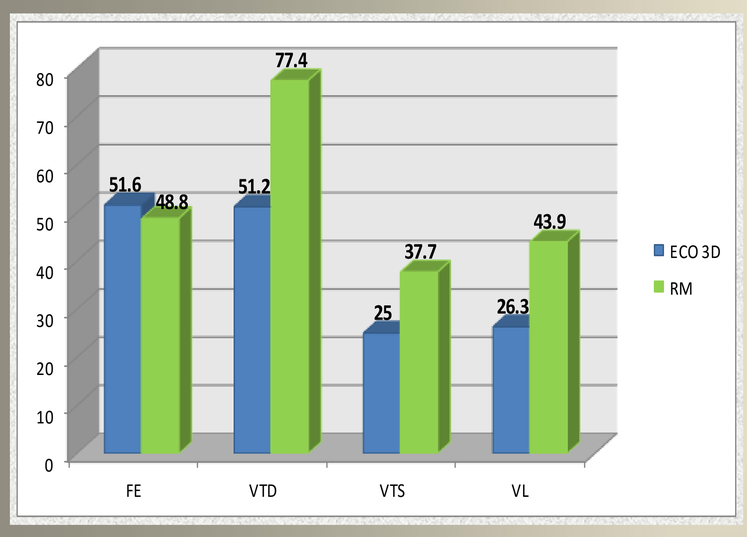
INTRODUCTION: In patients with congenital heart disease and univentricular heart physiology is very important to evaluate the ventricular function for therapeutic decision-making. However, the functional evaluation with conventional 2D echocardiography is limited because to complicated morphologies in complex heart defects.

OBJETIVE: To compare ventricular function parameters obtained by real-time 3D echocardiography and MR in a group of patients with congenital heart disease and univentricular heart physiology.

***MATERIAL AND METHODS*:** Prospective double-blind study with patients younger than 18 years old with diagnosis to complex congenital heart disease and univentricular heart physiology. 59 patients included they were performed 3D real-time Echocardiography evaluating ventricular systolic function parameters: telediastolic, telesistolic and stroke volume (Qlab Advanced Special Software – Philips Ie 33 ultrasound machine). With maximum difference no more than 10 days the same parameters was performed with cardiac magnetic resonance imaging in 31 patients, these were made by two expert observers (Table 1)

***ESTATISTIC ANALYSIS*:** The continuous variables were expressed as mean ± SD or mean and ranges in accordance the type of distribution of the variable and categorical variables as percentage. The type of distribution of continuous variables was evaluated using the method Kolmogorov Smirnov. The correlation between the values of ventricular function by 3D echocardiography and magnetic resonance imaging was assessed using the intraclass correlation coefficient. (The best correlation when its value Is > 0.90, good when it is between 0.71 to 0.90, moderate between 0.51 to 0.70, from 0.31 to 0.50 no good result. And the result is not valid when it is <0.3. Bland y Altman graphic to compared EF with 3D Echocardiography and Cardiac Resonance ($p < 0.05$)

***RESULTS*:** These includes 31 patients studied with 3D real-time Echo and MR (Graphic 1)



Graphic 1: EF correlation between MR versus 3D Real –Time Echo in 31 patients). EF: Intraclass correlation coeficient (ICC) EF: 0.65 (0.28-0.83) p 0.02.

TDV: 0.53 (0.03-0.77) p 0.021.

TSV: 0.49 (-0.069-0.758) 0.037.

SV: 0.525 (0.016-0.77) 0.023.

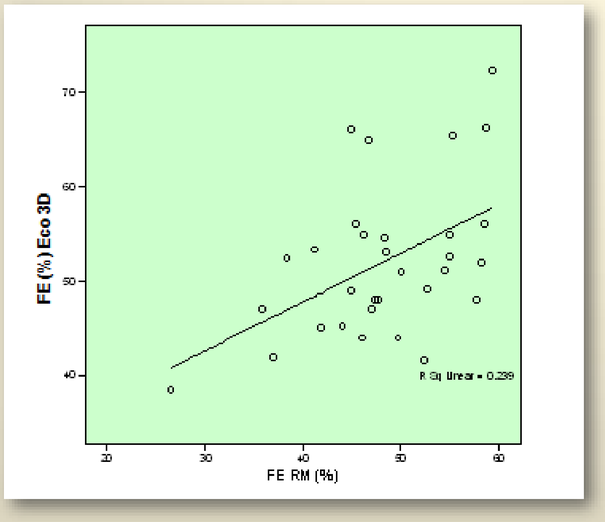


Figure 1: BLAND Y ALTMAN (EF correlation between RM (X) versus 3D Real –Time Echo (y) in 31 patients)

***CONCLUSIONS*:** The absolute difference in EF with 3D Real –Time Echo compared with MR it was 2.8%. However a moderate correlation was found for TDV, TSV and SV, the results were 26.6%, 12.7% and 16.6%. Respectively and whereas for the SV it was poor correlation. In the group of patients with tricuspid atresia (20). A similar correlation was maintained in all parameters of ventricular function between both methods, determining the best result in this group. its main advantage is its lower cost compared with MR, non-invasive, reproducible and less time acquisition image processing and analysis.

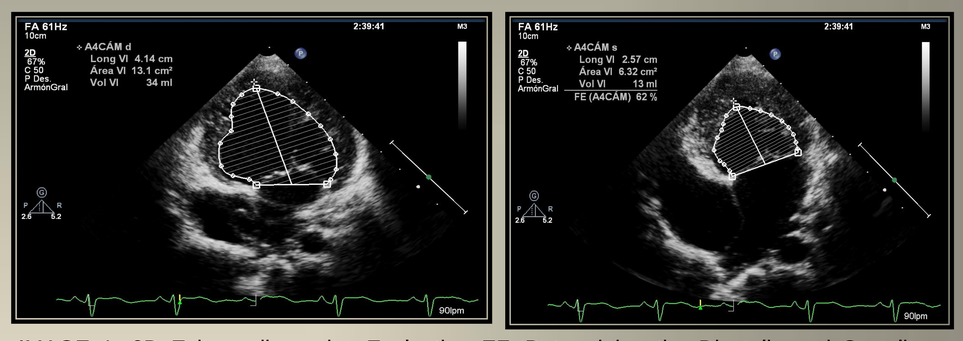


IMAGE 1: 2D Echocardiography. Evaluation EF. Determining the Diastolic and Systolic Volume (Main ventricle left morphology)

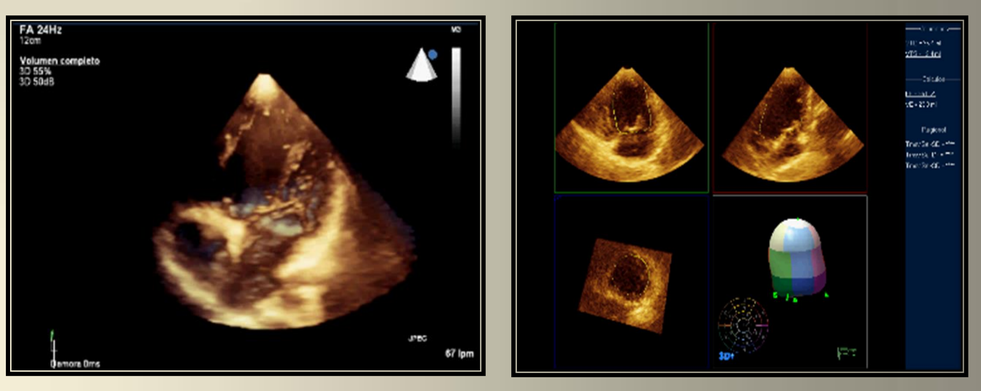


IMAGE 2. Real Time 3D Echocardiography. Evaluation of Ejection fraction (EF). Diastolic, Systolic and Stroke Volume (Main ventricle left morphology)

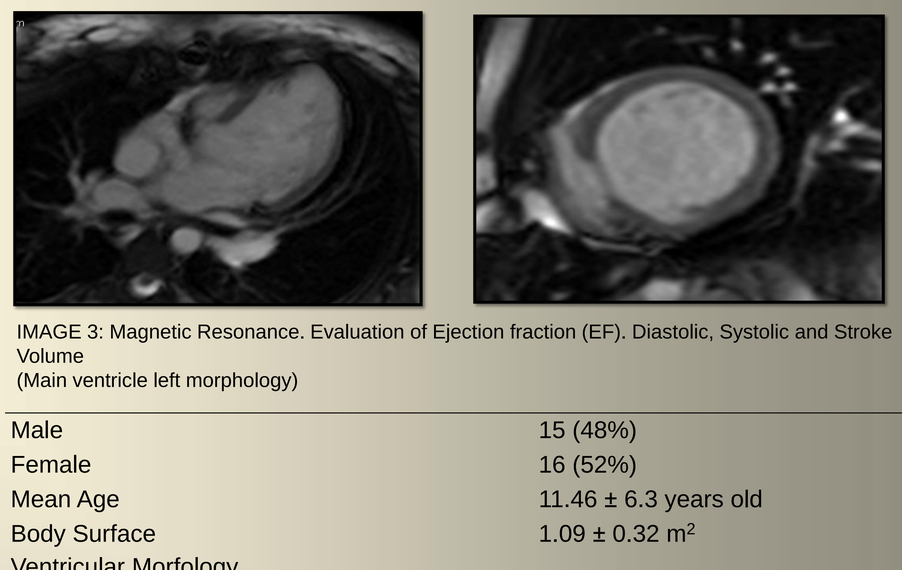


IMAGE 3: Magnetic Resonance. Evaluation of Ejection fraction (EF). Diastolic, Systolic and Stroke Volume
(Main ventricle left morphology)

Male	15 (48%)
Female	16 (52%)
Mean Age	11.46 ± 6.3 years old
Body Surface	1.09 ± 0.32 m^2
Ventricular Morfology	
- Left	22 (71%)
- Right	5 (16%)
- Undetermined	4 (13%)
Congenital Heart Defect	
- Tricuspid Atresia	20 (65%)
- Double inlet left ventricle	2 (6%)
- Dextroisomerism + Unbalanced Atrioventricular septal Defect	5 (16%) 4 (13%)
Surgical Procedures	
- Fontan	10 (37%)
- Glenn	7 (26%)
- Pulmonary Artery Bandage	4 (15%)
- Systemic Pulmonar Fistula	3 (11%)
- Others (Two PDA closure; and a case Coartecomy)	3 (11%)
Atrioventricular Valves	
- Normal	22 (71%)
- Mild Insufficiency	7 (23%)
- Moderate Insufficiency	2 (6%)
TOTAL: 31	100%

Table 1: Demographic characteristics in 31 patients