Correlation between Basic Echocardiogram and Cardiac Magnetic Resonance of the Right Ventricle in Repaired Tetralogy of Fallot

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Background:

Cardiac magnetic resonance (CMR) has become a standard tool to evaluate the right ventricle (RV). In repaired tetralogy of Fallot (rTOF), the right ventricular volume load is considered to be one of the key criterions for the pulmonary valve replacement. The objective of this study is to define whether the conventional echocardiographic measurement could be use as a parameter to define the right ventricular dilatation in comparison with the CMR measurement.

Methods

Patients with rTOF underwent CMR and echocardiogram. From the 4-chamber view and parasternal view in long axis, the right atrium (RA), RV and left ventricle (LV) dimensions were measured during diastole and indexed by body surface area. The RV echocardiographic measurement was compared and correlated with the RV volume index obtained from CMR. The sensitivity and specificity of the echocardigraphic threshold value predict the RV volume were determined.

Results

A total of 91 patients (mean age 14, range 12-18, 64 male) were recruited. The echocardiographic measurement of RV end diastolic diameter index (RVEDDi) and RV/LV dimension ratio and the RA dimension were correlated with the RV end diastolic volume index (RVEDVi) obtained by CMR as followed:

Correlation with RVEDVi ≥ 150 mL/m²	p
RA area index ≥ 10 cm2/m2	0.01
RVEDDi ≥ 1.55 cm2/m2	< 0.01
RV/LV ratio ≥ 0.55	< 0.01

The RVEDD index ≥ 1.55 cm/m² had 81% sensitivity and 60 % specificity to predict RVEDVi ≥ 150 mL/m² with area under the curve of 0.79. The ratio of the RV/LV dimension ratio ≥ 0.5 had 86% sensitivity and 60 % specificity to predict RVEDVi ≥ 150 mL/m² with area under the curve of 0.79. While the RA area index ≥ 10 cm/m² had 65% sensitivity and 69% specificity to predict RVEDVi ≥ 150 mL/m² with area under the curve of 0.73.

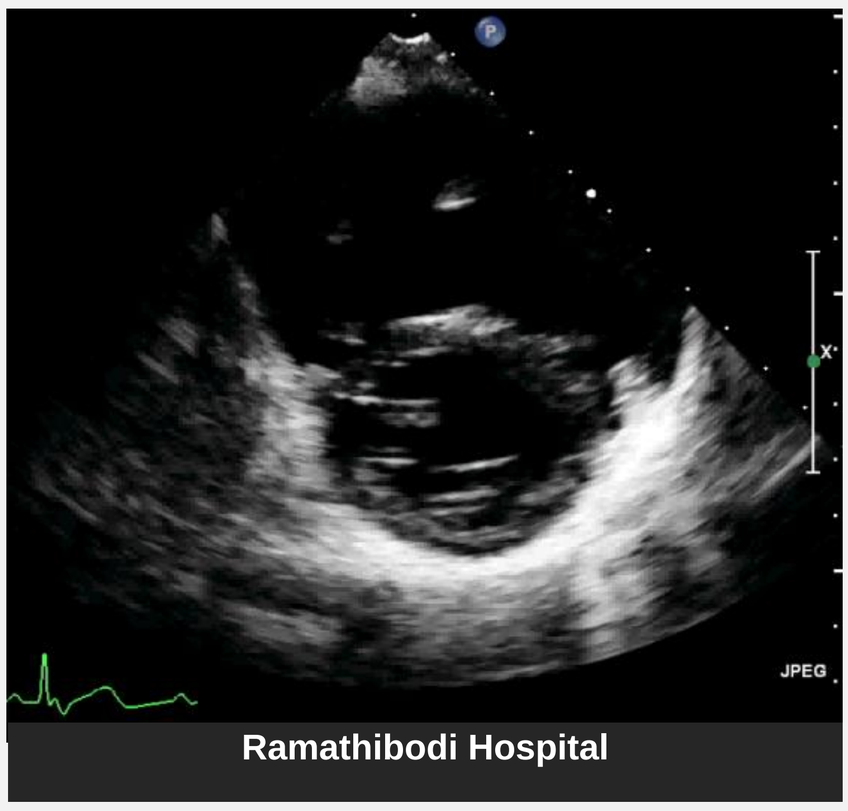

Fig 1 :Right ventricular end diastolic diameter (parasternal long axis view) measurement by echocardiogram

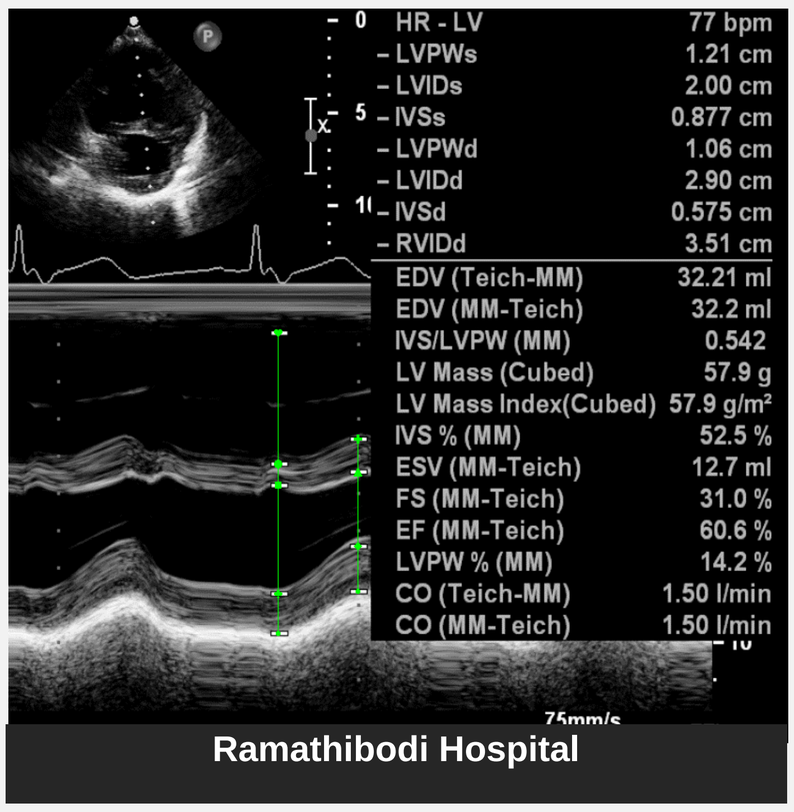

Fig 2: RV and LV end-diastolic diameter measurement

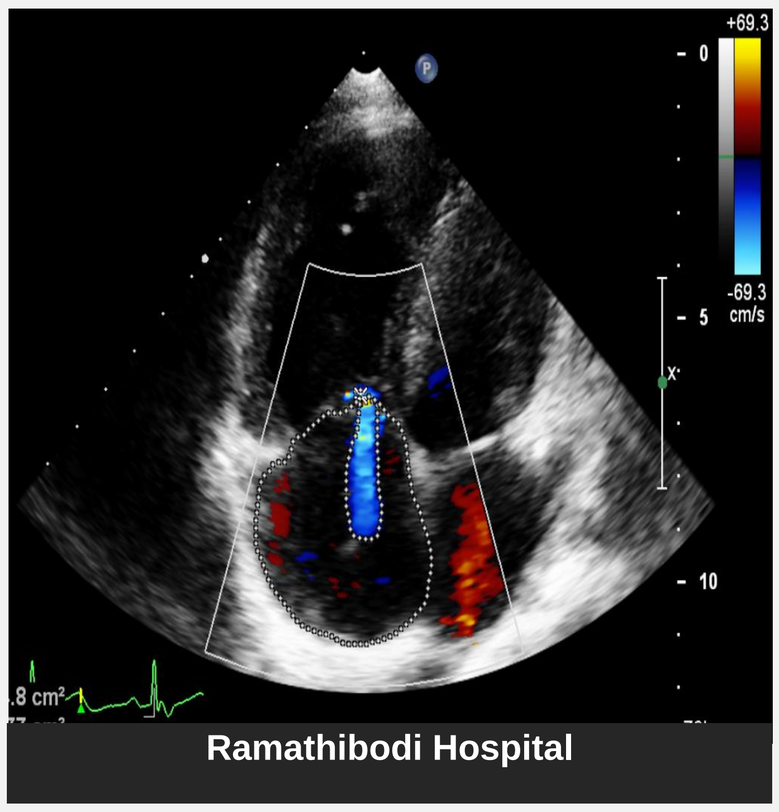

Fig 3: Right atrium area in (apical 4 chamber view) measurement by echocardiogram

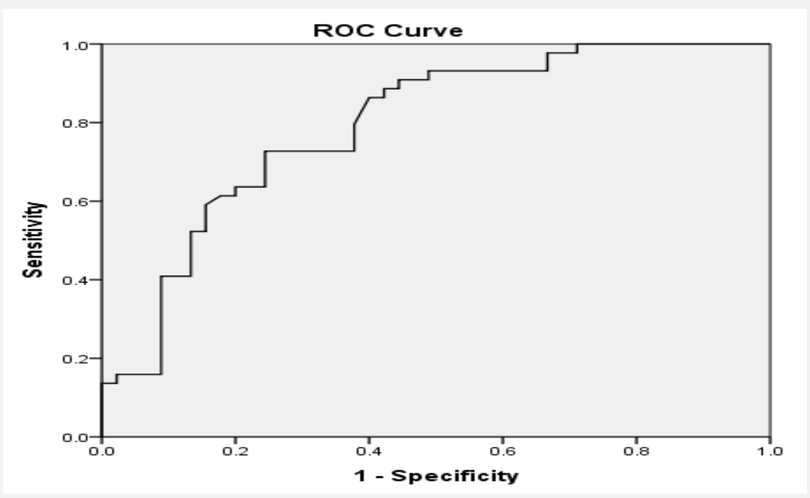

Fig 4:
Coordination of the curve test result variables: RV/LV ratio by echocardiogram and right ventricular end-diastolic volume index (RVEDVi) by CMR

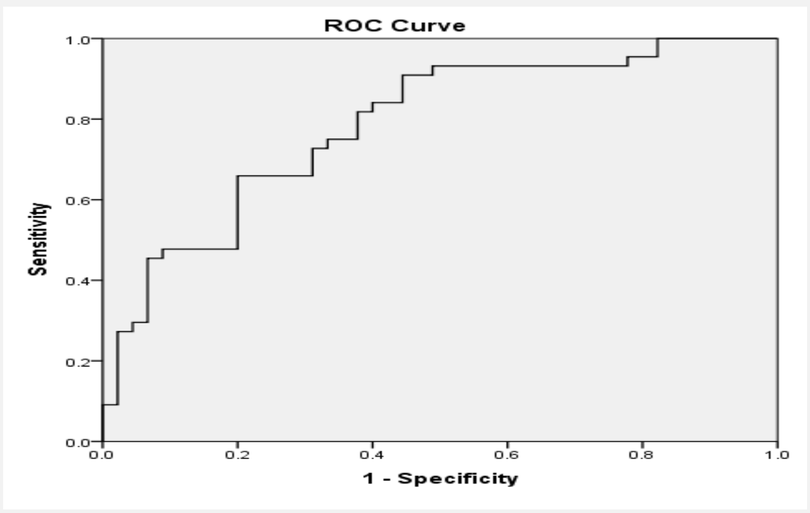

Fig 5:
Coordination of the curve test result variables: RVEDDi by echocardiogram and right ventricular end-diastolic volume index (RVEDVi) by CMR

Discussion

Our study demonstrates the utility of echocardiography to assess RV dimension and size in patients with rTOF. The simple RV measurement by echocardiogram specifically the RVEDDi and RA/LV ratio are fairly good correlated with RV volume obtained from the CMR. Therefore, echocardiographic RV dimensions could be used as screening for the RV volume load in rTOF prior to the CMR. Utilization echocardiogram screening may reduce the unnecessary CMR.

Conclusion

The basic echocardiogram parameter could be used to assess the right ventricle volume load in rTOF with reasonable correlation with CMR. The RV/LV ratio has a better prediction of the RV volume in comparison with the RVEDDi and RA area index.