

## Introduction

- The systemic right ventricle (RV) in congenital heart disease (CHD) is susceptible to progressive dilation and dysfunction
- Echocardiographic (2DE) means for serial monitoring of the RV would be of great value. We utilized 2DE with knowledge-based reconstruction (KBR), a newly developed tool for volumetric and functional assessment of the RV for evaluation of the systemic RV

## Methods

- Patients with transposition of great arteries (TGA) repaired with an atrial switch or congenitally corrected TGA (CCTGA) and without implanted pacemakers were prospectively recruited for same day 2DE-KBR and cardiac magnetic resonance (CMR, 1.5T)
- RV Images were acquired in various 2D imaging planes using a 3D space localizing device attached to a 3 MHz imaging probe and 3D reconstruction performed using database assistance and dedicated software
- Using the KBR 3D volumetry, RV end diastolic volume (EDV), end systolic volume (ESV) and ejection fraction (EF) were calculated
- Volumetric CMR analysis was used as a reference standard. Paired-samples t test and Bland-Altman analysis were respectively used to evaluate intermodality reproducibility, and inter- and intra-observer variability

## Results

- Twenty patients (10 female, 10 male) with systemic RV (15 atrial switch TGA, 5 CCTGA) were studied
- There was good agreement of 2DE-KBR and CMR measurements
- The mean RV EDV (ml) was  $224.9 \pm 37.6$  with 2DE-KBR and  $210.5 \pm 53.0$  with CMR ( $r = 0.80$ )
- The Mean RV ESV (ml) was  $127.7 \pm 30.0$  with 2DE-KBR and  $121.5 \pm 38.0$  with CMR ( $r = 0.85$ )

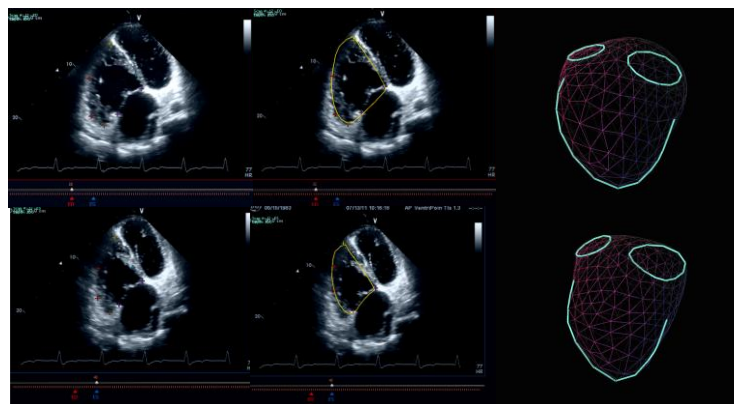


Figure 1 Three dimensional reconstruction of the systemic RV in a 26-year old patient with atrial switch repair for d-transposition of great arteries. The yellow lines denote KBR point placement of the RV endocardium on each image.

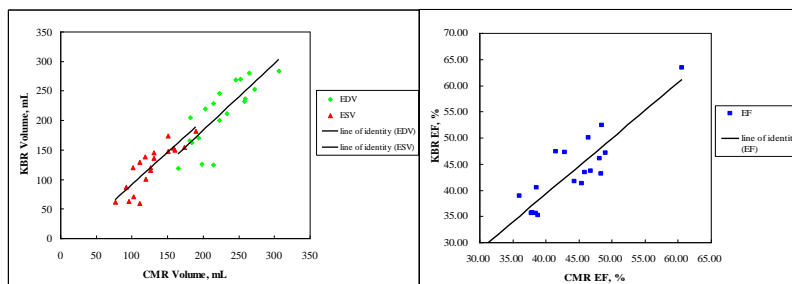


Figure 2 Graphs show regression relationships of KBR and CMR. A: Regression relationship of KBR and CMR for RV EDV and ESV. B: Regression relationship of KBR and CMR for RV EF.

- The mean EF was  $43.5 \pm 6.5$  % with 2DE-KBR and  $43.0 \pm 7.7$  % with CMR ( $r = 0.898$ )
- For 2D-KBR, the inter-observer variability were 4.6%, 3.5%, 4.8% and repeatability were 95.3%, 96.1%, 95.6% respectively for EDV, ESV and EF
- The intra-observer variability were 3.1%, 2.3%, 3.2%, and repeatability were 96.5%, 97.3%, 96.3% respectively for EDV, ESV and EF

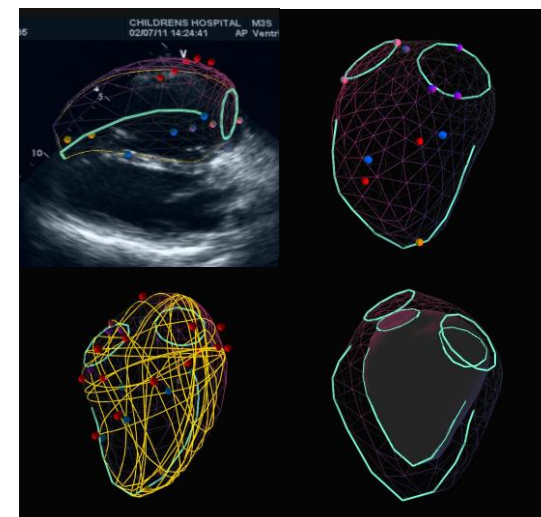


Figure 3 KBR RV reconstruction model

## Conclusions

These results demonstrate clinical feasibility of quantifying systemic RV volumes and function using 2DE-KBR in adolescents and young adults with repaired CHD, and good agreement of measurements with CMR