Mitral Valve Phase Contrast Imaging Is a More Reproducible Method of Determining Cardiac Rest Periods for Whole-Heart Coronary Magnetic Resonance Angiography in Congenital Heart Disease than 4 Chamber Cine.

Maria Batsis, MD; F. Gerald Greil, MD, PhD; Animesh Tandon, MD, MS; Tarique Hussain, MD, PhD
University of Texas Southwestern Medical Center, Dallas, TX, USA; Children's Medical Center of Dallas

Background

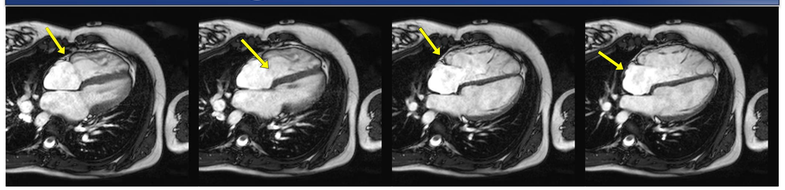
Whole heart coronary magnetic resonance angiography (CMRA) offers detailed cardiac morphology in congenital heart disease (CHD), and is performed during the cardiac rest periods. Currently, the rest periods are assessed visually using a high-temporal resolution, 4-chamber (4 CH) cine.

We evaluated the reproducibility of determining the rest periods using the 4 CH cine to a novel approach using mitral valve inflow phase contrast (MVIPC) imaging.

Material and Methods

- Consecutive patients with CHD undergoing CMRA who had both 4 CH & MVIPC at 60 phases were retrospectively evaluated.
- Two independent observers evaluated the end-systolic & mid-diastolic intervals with both methods (Figs. 1 and 2).
- Inter- & intra-observer variability for each method were scored, as well as CMRA quality (Scale 1 to 4; with 4 representing best quality) (Fig. 3).
- A linear mixed-effect model was used to compare variability between the methods & account for patient random effects & for within-patient variability.

Figure 1. 4 CH cine



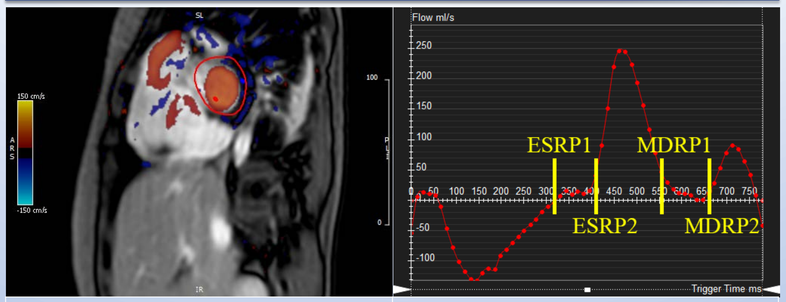
Arrow shows the right AV groove and RCA. The cessation of movement of this point represents the beginning of the end systolic rest period (ESRP1).

Arrow shows the tricuspid valve opening at the end of the end systolic rest period (ESRP2).

Arrow shows the RCA at the end of rapid inflow. Cessation of movement at this point represents the beginning of the mid diastolic rest period (MDRP1).

Arrow shows the atrial wall contracting, representing the beginning of atrial systole and the end of the mid-diastolic rest period (MDRP2).

Figure 2. MVIPC



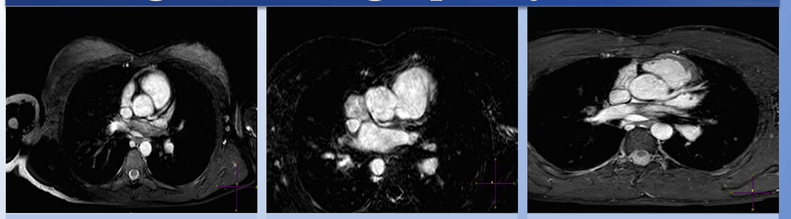
Mitral valve inflow phase contrast image with color mapping showing flow during diastole.

Mitral valve inflow profile. Markers indicate the inflection points used to determine ESRP1, ESRP2, MDRP1, and MDRP2.

Results

- 25 CMRAs were analyzed (mean age 14.76±6.3 years).
- The MVIPC method showed that:
  - Inter-observer variability was 5.4% lower (95% CI 3.7, 7.2%, ***p*<0.0001**) than the 4 CH.
  - Intra- observer variability was 3.9% lower (95% CI 2.4, 5.4%, ***p*<0.0001**).
- The time taken to determine the rest periods was equal for both methods (4 CH 57.6±26.0 sec, MVIPC 52.5±36.3 sec, ***p*=0.4**).

Figure 3. Image quality scores



IQR score 3 | **IQR score 3** | **IQR score 4**

- Image quality scores were comparable to the published literature (median= 3, IQR 3-4).

Conclusion

- **MVIPC** is as fast but **more reproducible** than the previously described technique on **4 CH cine** for defining cardiac rest periods for CMRA in CHD.

Disclosures: Maria Batsis, MD: Nothing to disclose.
Tarique Hussain, MD, PhD: Nothing to disclose.