

Meeting abstract

## 214 RV free wall tagging for the assessment of RV myocardial function in congenital heart disease

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### Introduction

Serial assessment of the function of the right ventricle (RV) can play a key role in the management of patients with congenital heart disease, but measurements of RV volumes are time consuming and hard to measure reproducibly because of complex borders with extensive trabeculation.

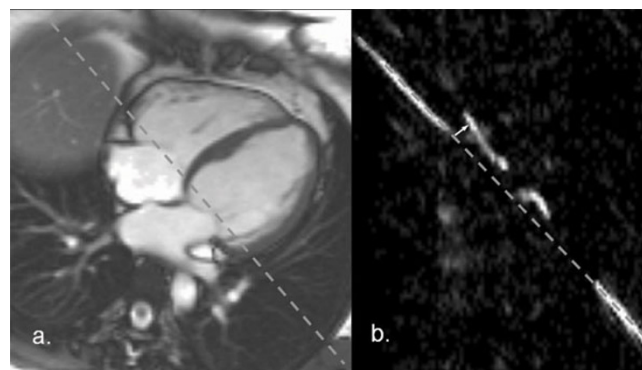
### Purpose

Contraction of the free wall of a healthy RV normally results in marked apical displacement of the right atrio-ventricular junction during systole. We postulated that CMR tagging of the basal free wall of the RV might provide a relatively quick, reproducible and largely automated measurement for serial comparison of RV myocardial function. Here we present our initial experience with this approach.

### Methods

A four chamber steady state free precession cine image was acquired followed by a breath hold cine gradient echo-planar tagging sequence in the same plane, using a modification of the technique of Kozerke [1] to mark a line across the basal RV and LV myocardium with a labelling pre-pulse (figure 1). Movements of the labelled myocardium were then tracked automatically by multi-resolution image registration [2] and the end points cubic spline interpolated between time points so that the position of the RV free wall, and its displacement, could be derived at any required time-point in the cardiac cycle.

Ten adult patients (5 Tetralogy of Fallot, 3 Transposition of the great arteries with Mustard repair and 2 atrial septal defects) were imaged using this sequence. The amount of displacement of the RV basal free wall tag from end diastole to end systole was determined as above. For comparison, measurements obtained from the automated software analysis were correlated with manual measure-



**Figure 1**  
RV volume measurements for serial comparison in congenital heart are time consuming and difficult. Here we present initial results of automated analyses of tagged CMR measurements of the systolic displacements of myocardium in the basal free wall of the RV. Four chamber cine (a) and corresponding linear tag (b) showing maximal end systolic displacement of the part of the tag line marking the RV free wall (arrow).

ments made by two independent observers, each making two sets of measurements, from tissue displacements visualised and measured manually (without tagging) in standard four chamber cine images.

## Results

The medians (and 25<sup>th</sup>, 75<sup>th</sup> percentiles) of automated tagging analysis versus manual measurements of basal myocardial displacement were: 16.3(13.1, 21.3)mm versus 18.8(14.3, 23.4)mm by observer 1, and 17.2(13.7, 20.1)mm by observer 2. There was little intraobserver variability between repeated manual measurements of RV free wall displacement ( $r = 0.92$  observer 1,  $r = 0.90$  observer 2). However, interobserver measurements did not relate as strongly,  $r = 0.68$ . Automated and manual correlation was not consistent between observers,  $r = 0.71$  observer 1 and  $r = 0.89$  observer 2.

## Conclusion

It was possible to measure RV free wall movement using this tagging sequence. The sequence allows rapid post-processing that is not likely to be affected by interobserver variability and has potential for serial assessment of basal RV free wall myocardial displacement and potentially velocities of displacement, which could be valuable in relation to serial follow up in adult congenital heart disease.

## References

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