

POSTER PRESENTATION

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Inter -observer variability in manual measurement of aortic root dimensions in pediatric patients: benefits of using a semi-automated tool

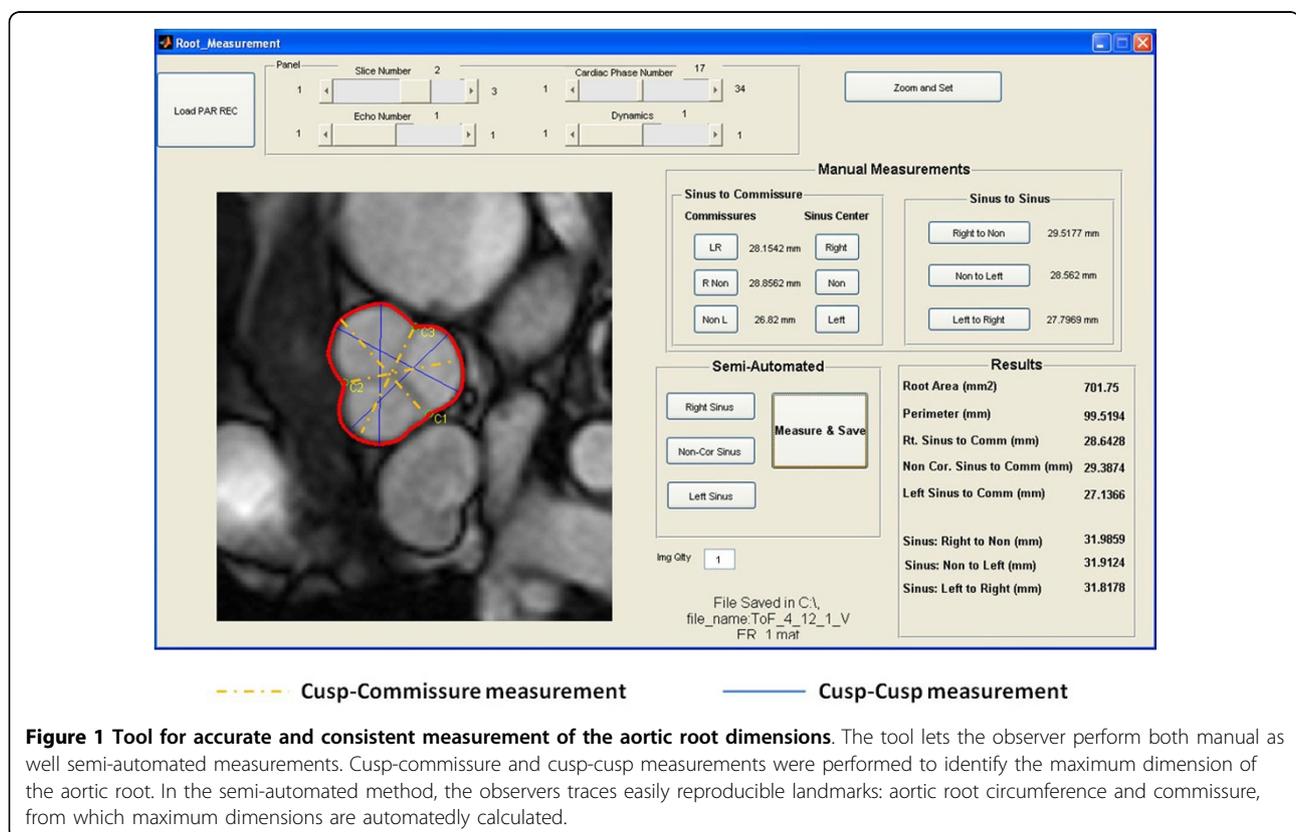
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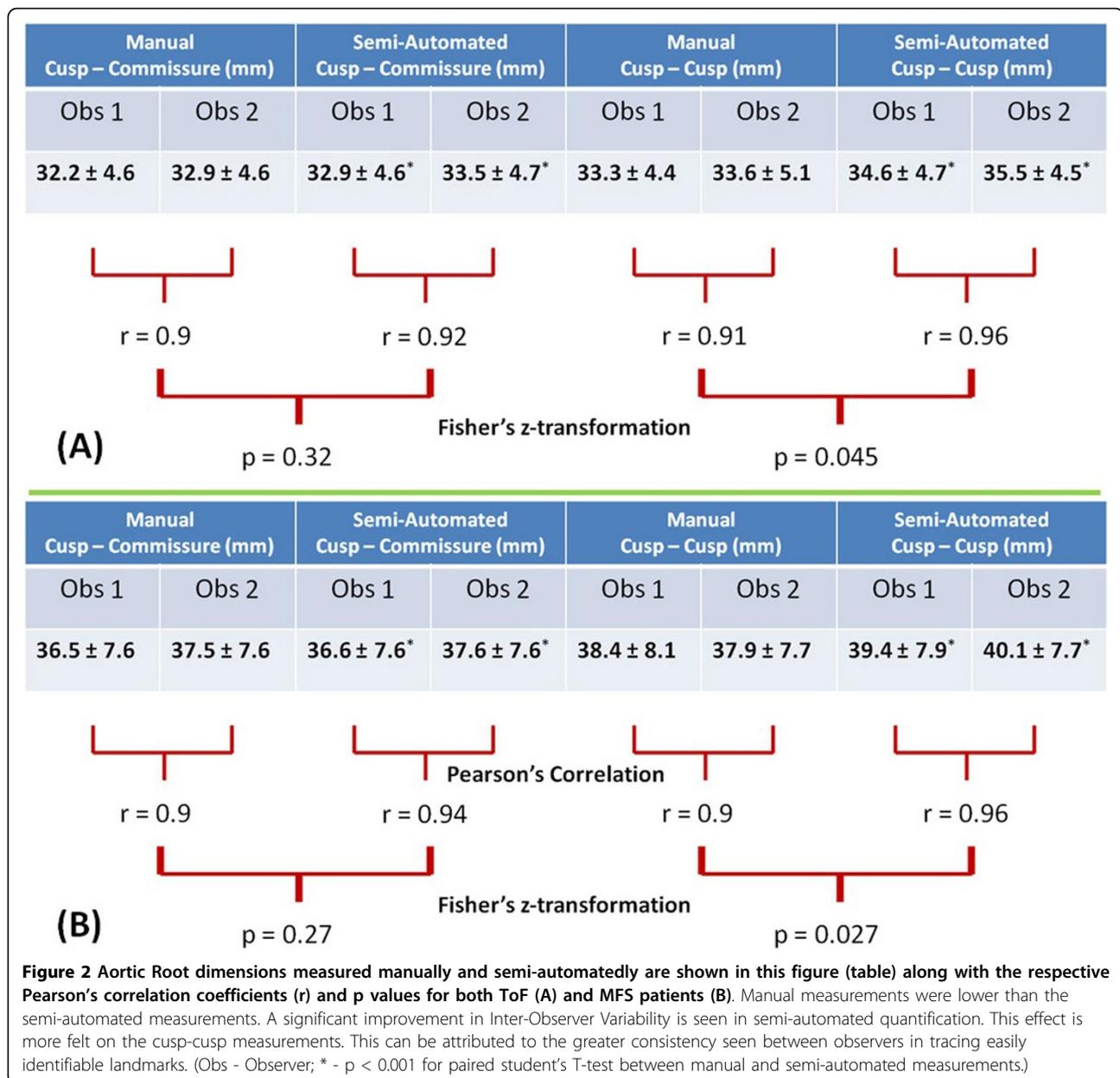
Background

Accurate measurement of maximal aortic root dimensions is important for informed decision making on the timing/nature of aortic valve replacement surgeries in pediatric patients. Currently, the observer manually measures

the following metrics to quantify maximum aortic root dimensions: 1) Cusp to Commisure (Cu-Co), and 2) Cusp to Cusp (Cu-Cu) lengths. This introduces significant inter-observer variability (IOV), especially if a followup study is performed in a different institution than the previous



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study. Hypothesis: A simple post-processing tool that allows the observer to perform semi-automated measurements using reproducible landmarks will enable accurate quantification of maximal aortic root dimensions as well as decrease IOV, thereby leading to reproducibility of measurements.

Methods

An image analysis tool was developed using Matlab™ that can automatically measure the Cu-Cu and Cu-Co lengths from easily reproducible landmarks traced by an observer namely: 1) location of the commissures, and 2) the external margin of the sinuses and aortic

circumference (Figure 1). The observer also performed these measurements manually for comparison using the same tool. Study Design: In this retrospective study, cine bSSFP CMR data (temporal resolution: 40 ms, spatial resolution: 1.5*1.5*5 mm) of the aortic root of 11 patients with Tetralogy of Fallot (Age: 16.6 ± 7.5 years, LV EF: 59 ± 5.5%) and 15 patients with Marfans' Syndrome (Age: 12.8 ± 8 years, LV EF: 59 ± 6%) were analysed by two experienced observers. Data Processing: Anonymized MR images of the aortic root in the short-axis view were analyzed in early systole and Cu-Co, and Cu-Cu lengths were measured. IOV was computed using Pearson's correlation coefficient (*r*) and Fisher's z-transformation (*z*).

Results

The manual measurements under-estimated aortic root dimensions (Figure 2). The *r* values (inter-observer agreement) were better for the semi-automated in both ToF and MFS patients. The *p*-values for *z*-transformation were a) 0.32 for Cu-Co; 0.045 for Cu-Cu measurements in ToF patients; and b) 0.27 for Cu-Co; 0.027 for Cu-Cu measurements for MFS patients. The *p* values for Cu-Cu measurements indicate a significant difference between the manual measurements and the semi-automated tool.

Conclusions

Manual measurements under-estimate aortic root dimensions and present a statistically significant higher IOV when compared to semi-automated measurements. Using an automated tool will reduce the visual subjectivity induced by different observers. We demonstrate that a simple semi-automated tool consistently captures the maximum dimension of the aortic root when compared to the conventional method, and significantly improves IOV. While its benefit might not be substantial in a single center studies, this will be useful in detecting subtle interval change on serial studies conducted at varying imaging centers.

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