

Assessment of Right Ventricular Function Using Contrast Echocardiography

Summary

Vanderbilt Medical Center researchers have developed a non-invasive and reproducible method of assessing right-ventricular function using contrast-echocardiography. The right-ventricular transit time (RVTT) measures the time needed for echocardiographic contrast to travel from the RV to the bifurcation of the main pulmonary artery. Coupled with the pulmonary transit time (PTT), the time needed for contrast to traverse the entire pulmonary circulation, RVTT is part of a family of diagnostic parameters that can report on RV-specific performance as well as the RV's function relative to that of the pulmonary circuit as a whole.

Background

Quantification of RV function is vital to the diagnosis and treatment of cardiopulmonary disorders in a myriad of circumstances including heart failure, pulmonary hypertension, prior to cardiac surgery, and in the evaluation for ventricular assist devices/heart transplantation. However, existing methods of RV functional assessment are, in the aggregate, limited by regionality (i.e. using regional measurements as a surrogate for the function of the entire ventricle), availability, cost, image quality, and contraindications in certain medical conditions.

Advantages

- Major new application for echocardiographic contrast, which has primarily been used for LV opacification thus far
- Conducive to serial/longitudinal measurements (i.e. to assess response to treatment of RV function)
- Unlike cardiac MRI, there are no contraindications for patients with renal dysfunction or pacemakers, defibrillators, and other implantable devices
- Potential for real-time output in graphical or numeric format without off-line post-processing

Intellectual Property Status

- A U.S. Provisional Patent Application has been filed

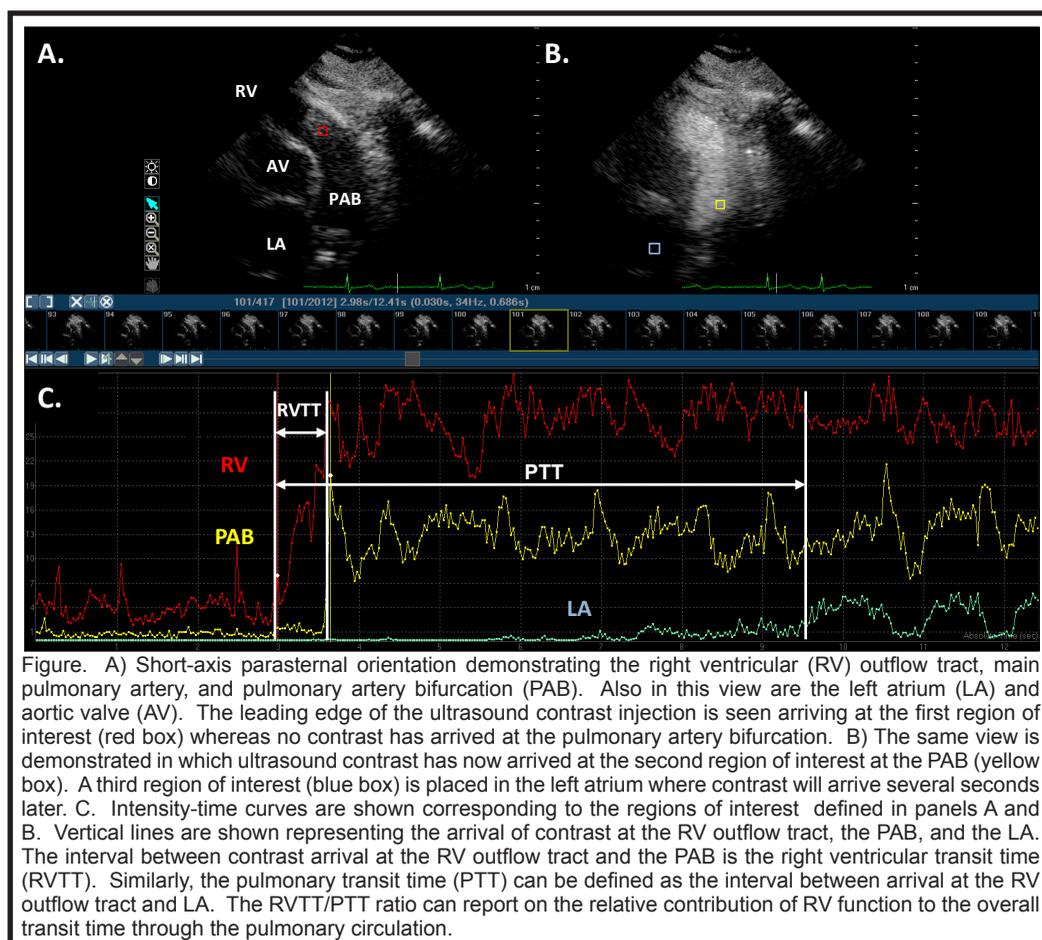


Figure. A) Short-axis parasternal orientation demonstrating the right ventricular (RV) outflow tract, main pulmonary artery, and pulmonary artery bifurcation (PAB). Also in this view are the left atrium (LA) and aortic valve (AV). The leading edge of the ultrasound contrast injection is seen arriving at the first region of interest (red box) whereas no contrast has arrived at the pulmonary artery bifurcation. B) The same view is demonstrated in which ultrasound contrast has now arrived at the second region of interest at the PAB (yellow box). A third region of interest (blue box) is placed in the left atrium where contrast will arrive several seconds later. C. Intensity-time curves are shown corresponding to the regions of interest defined in panels A and B. Vertical lines are shown representing the arrival of contrast at the RV outflow tract, the PAB, and the LA. The interval between contrast arrival at the RV outflow tract and the PAB is the right ventricular transit time (RVTT). Similarly, the pulmonary transit time (PTT) can be defined as the interval between arrival at the RV outflow tract and LA. The RVTT/PTT ratio can report on the relative contribution of RV function to the overall transit time through the pulmonary circulation.

