

# Echocardiographic assessment of right ventricular systolic function by tricuspid annular plane systolic excursion

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This PhD dissertation was accepted by the Faculty of Health Sciences of the University of Copenhagen, and defended on June 22, 2007.

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Dan Med Bull 2007;54:242

## ABSTRACT

This PhD dissertation is based on three original manuscripts. The work was performed at the Departments of Cardiology, Copenhagen University Hospital Gentofte and Rigshospitalet, and at the Echocardiography Laboratory, Mayo Clinic Rochester, MN, USA.

RV function is significantly related to symptoms and survival in patients with severe systolic left heart failure, whereas little is known of the importance of RV function in heart failure in general.

Echocardiography is an established tool for the assessment of patients suspected of heart failure, and is preferred over other modalities for its non-invasive, cost-effective and environmentally friendly characteristics. Assessment of RV function, however, has been limited by the lack of valid geometrical assumptions of the complex RV shape. TAPSE is the simpler approach to assessment of the systolic shortening of the RV sinus.

This thesis investigated the hypothesis that, given TAPSE is a valid measure of RV ejection fraction, TAPSE would have incremental prognostic information in an unselected population of symptomatic patients with heart failure, independent of left ventricular function, co-existing chronic obstructive pulmonary disease or pulmonary hypertension.

The accuracy of TAPSE as a measure of RV ejection fraction was assessed using MRI as gold standard, finding only a moderate, but significant correlation between the two ( $r=0.48$ ,  $p<0.01$ ), which was not inferior to other more advanced echocardiographic or radionuclide techniques.

In 817 patients hospitalized for heart failure, TAPSE below 14 mm was associated with increased mortality; and TAPSE was significantly related to adverse outcome, hazard ratio of 0.74 per doubling of TAPSE,  $p=0.0004$ , independent of the presence of chronic obstructive pulmonary disease or previously diagnosed heart failure. Left ventricular ejection fraction was not a significant predictor of mortality in the multivariate analysis. Secondary pulmonary hypertension was also associated with increased mortality, and in the subgroup of patients where measures of TAPSE as well as estimates of RV pressure were available, TAPSE remained an independent predictor of mortality.

TAPSE is simple, feasible estimate of RV function. Decreased TAPSE is associated with increased mortality in patients hospitalized for heart failure, independent of previously diagnosed heart failure or chronic obstructive pulmonary disease. Left ventricular function appears to be a less important prognostic indicator when heart failure symptoms are present. TAPSE contains prognostic in-