

**Quantifying tricuspid regurgitation
of patients with congenital heart disease
routinely by magnetic resonance**

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INTRODUCTION

Tricuspid regurgitation is an important clinical entity in congenital heart disease. However, to date tricuspid regurgitation cannot be quantified reliably. Especially in patients with increased RV pressure tricuspid regurgitation is very difficult to estimate.

Therefore, we sought to define a reliable way to quantify tricuspid regurgitation routinely in congenital heart disease by combining two previously described Cardiovascular Magnetic Resonance (CMR) methods.

METHODS

39 consecutive patients (13 female, mean age 32 ± 19 years) with congenital heart disease and assumed tricuspid regurgitation referred to CMR for routine clinical evaluation were included to the study.

Tricuspid regurgitation was quantified by calculating the arithmetic mean of two measurement methods, direct and indirect measurements. Tricuspid regurgitation was measured directly by deducting retrograde from antegrade flow through the tricuspid valve. Retrograde and antegrade flow through the tricuspid valve were independently measured by two CMR phase contrast measurements. These two CMR phase contrast measurements were carefully angled perpendicular to the direction of retrograde or antegrade flow, respectively. Furthermore, each of these two CMR phase contrast measurements had an individual velocity encoding.

Tricuspid regurgitation was measured indirectly using antegrade and retrograde flow through the pulmonary artery and RV stroke volume. Flow through the pulmonary artery was measured by CMR phase contrast flow. RV stroke volume was measured using a standard stack of CMR multi-phase, multi-slice cine sequences.

Agreement of indirect and direct measurements was evaluated by Passing-Bablok Regression.

RESULTS

There was no significant systematical deviation of both tricuspid regurgitation measures at the zero level (intercept:0.00). The proportional error per tricuspid regurgitation unit was less than 1% (slope:1.008, 95% confidence interval: 0.87-1.18). Therefore, a measured tricuspid regurgitation of, for example, 60% can with a probability of 95% in fact be expected between 52% and 71%. Accordingly, a measured tricuspid regurgitation of 10% was with probability of 95% between 9% and 12%.

CONCLUSIONS

By combining direct and indirect tricuspid regurgitation measurements, tricuspid regurgitation can be quantified in consistent and therefore a clinically relevant way.

High grade tricuspid regurgitation can be excluded even in patients with increased RV pressure.