

POSTER PRESENTATION

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Quantification of the severity of tricuspid regurgitation from cardiac magnetic resonance cine images

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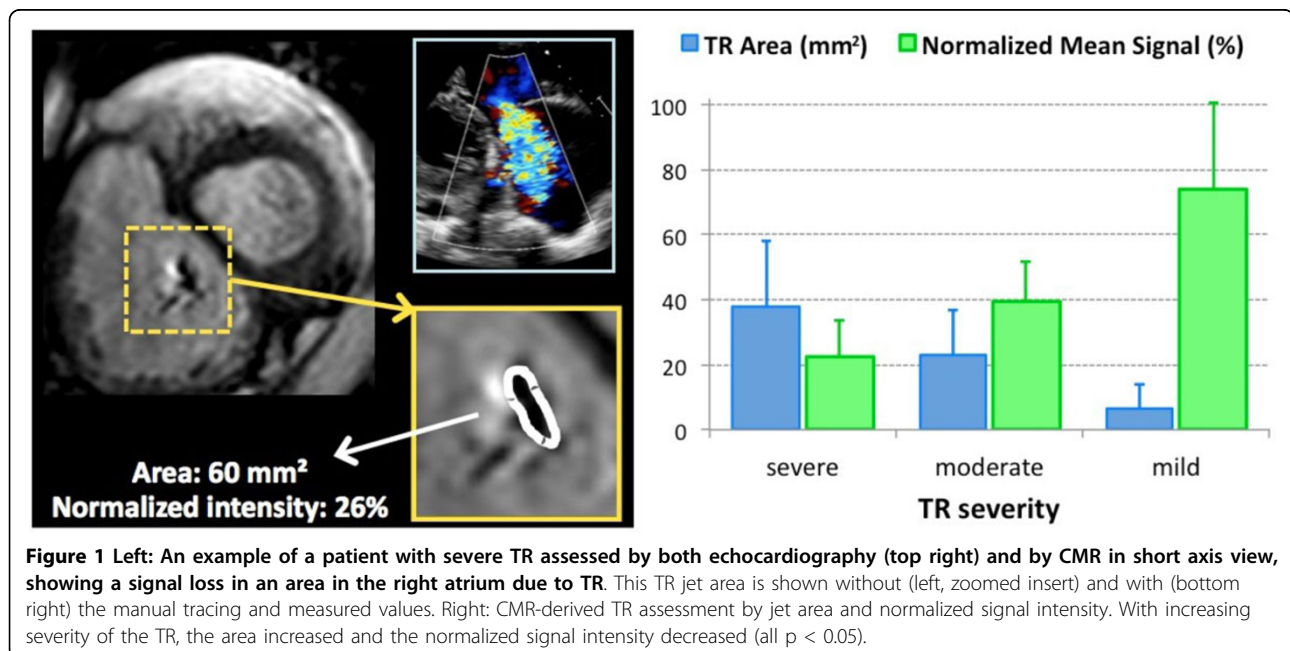
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Background

Today, there is no accepted approach to evaluate tricuspid regurgitation (TR) using cardiovascular magnetic resonance (CMR). Contrary to 4-chamber imaging planes, which often do not show the entire regurgitant jet, these jets are readily visualized in short-axis views in the right atrium (RA). We hypothesized that the size and signal intensity (SI) of the cross-sectional jet area in the short-axis views would reflect TR severity.

Methods

We studied 61 patients with \geq mild TR on echocardiography, who underwent CMR within 24 hours. The severity of TR was determined by color Doppler vena contracta (VC): severe ($VC \geq 7$ mm; $N = 20$), moderate ($3 < VC < 7$ mm; $N = 21$) and mild ($VC \leq 3$ mm; $N = 20$). CMR TR jet area and mean SI (normalized by that in the RA cavity away from the jet) were measured in a single short-axis frame that depicted maximum area.



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		Derivation group (N=21)		Test group (N=40)				
		AUC	Optimal cutoff	Sensitivity	Specificity	PPV	NPV	Accuracy
TR area	Severe from moderate	0.69	>20 mm ²	0.85	0.81	0.69	0.92	0.83
	Moderate from mild	0.96	<13 mm ²	0.85	0.81	0.69	0.92	0.83
Normalized signal intensity	Severe from moderate	0.93	<36%	1.00	0.74	0.65	1.00	0.83
	Moderate from mild	1.00	>52%	0.69	0.89	0.75	0.86	0.83
TR Area AND Normalized signal intensity	Severe from moderate			0.85	0.93	0.85	0.93	0.90
	Moderate from mild			0.62	0.96	0.89	0.84	0.85

Figure 2 Diagnostic accuracy of CMR-derived parameters of TR severity: area under ROC curves (AUC) and optimal cutoff values obtained in a derivation group of 21 patients (middle section), and the sensitivity, specificity, positive and negative predictive values (PPV, NPV) obtained by prospectively testing these cutoffs in an independent test group of 40 patients (right-hand section).

Receiver-operating characteristic (ROC) analysis was performed on a subgroup of 21 patients for each parameter to determine its diagnostic accuracy for differentiating degrees of TR and the optimal cutoffs, which were then independently tested in the remaining 40 patients.

Results

Measurable regions of signal loss depicting TR jets were noted in 51/61 patients (84%), while 9/10 remaining patients had mild TR by echocardiography. With increasing severity of TR, jet area progressively increased from 6.7 ± 7.5 to 23 ± 14 to 38 ± 20 mm², while the normalized SI decreased from 74 ± 26 to 39 ± 12 to $22 \pm 11\%$ (all $p < 0.05$). ROC analysis resulted in high AUC values in the derivation group and showed in the test group good accuracy (0.83 for both parameters), which was further improved by combining parameters.

Conclusions

Severity of TR can be quantitatively assessed on short-axis CMR images in agreement with echocardiography. Pending future validation, this methodology may become part of the clinical CMR protocol without the need for acquiring additional images.

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