

Cardiac MRI and 2D, 3D echocardiography, and SPECT for assessment of LV function & volume in STEMI

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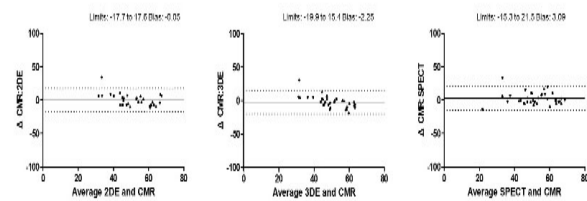
Background/Aims: For evaluating left ventricular (LV) function and volumes, cardiac magnetic resonance imaging (CMR) is considered as a standard method. This study aimed to compare the agreement of LV ejection fraction (EF), LV end diastolic volume (LVEDV) by multi-modality imaging in patients with ST elevation myocardial infarction (STEMI).

Methods: 58 patients with STEMI were prospectively enrolled. All patients underwent 2D, 3D echocardiography (2DE, 3DE), and single-photon emission computed tomography (SPECT) within 3 days at initial presentation and 6 month follow-up. Seventeen patients underwent CMR in both initial and follow up.

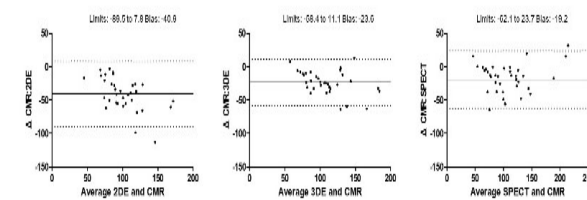
Results: In Bland-Altman analysis, the mean difference of LVEF was generally small for CMR vs. 2DE (-0.05%), 3DE (-2.25%) and SPECT (3.09%), despite wide limits of agreement among all imaging modalities. The mean LVEDV was consistently higher when CMR was compared with 2DE (40.9 ml), 3DE (23.6 ml), SPECT (19.2 ml), and the limits of agreement were wider. The correlation of LVEF and LVEDV among imaging modalities was found statistically significant ($p < 0.001$ for all).

Conclusions: These results suggest that LVEF measured by four imaging tools demonstrated a small bias in patients with STEMI, but wide limits of agreement. LVEDV measured by CMR was significantly higher compared to other imaging modalities with wide limits of agreement. The difference of LVEF and LVEDV with various imaging modalities should be considered in design of clinical trial and routine clinical practice.

(A) Ejection fraction (%)



(B) LV end diastolic volume (ml)



(C) LV end systolic volume (ml)

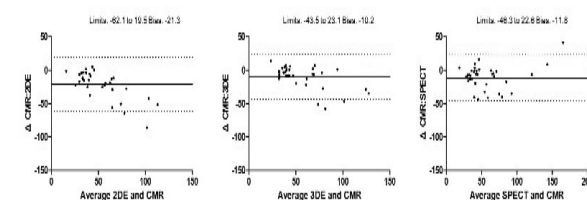


Table 1 Baseline characteristics.

Variable	Mean (SD)
Age (year)	58.3 (8.2)
Male	55 (94.7)
Body mass index (kg/m ²)	25.3 (4.7)
Risk factors	
Hypertension	39 (67.2)
Diabetes mellitus	13 (22.4)
Cerebrovascular accident	7 (12.1)
Smoking	39 (67.2)
History of	
Myocardial infarction	51 (87.9)
Stroke	10 (17.2)
Coronary artery disease	7 (12.1)
Left anterior descending artery	45 (77.5)
Left circumflex artery	4 (6.9)
Right coronary artery	34 (58.6)
Initial systolic BP (mmHg)	155.9 (40.9)
Initial diastolic BP (mmHg)	98.3 (19.7)
Initial pulse rate (beat per minute)	81.2 (14.8)
Time to first treatment	39 (67.2)
Infarct related area	
Heart mass (g)	1,345.8
Heart diameter (mm)	3,044.4
Heart length (mm)	10,743.9

Values are expressed as mean ± SD or number of patients (%).
BP, blood pressure.

Table 3 Correlation among measurements among SPECT, 2D echocardiography, 3D echocardiography and CMR.

		MR		
LVEF		2D Echo	2D Echo	SPECT
	2D Echo	0.707		
	SPECT	0.707	0.713	
	CMR	0.713	0.713	0.713
LVEDV				
	2D Echo	0.707		
	SPECT	0.707	0.708	
	CMR	0.707	0.708	0.707
LVESV				
	2D Echo	0.707		
	SPECT	0.707	0.708	
	CMR	0.707	0.707	0.707

All P values for correlation are < 0.0001.

LVEF, left ventricular ejection fraction; Echo, echocardiography; SPECT, single-photon emission computed tomography; CMR, cardiac magnetic resonance; LVEDV, left ventricular end-diastolic volume; LVESV, left ventricular end-systolic volume.

Table 2 Left ventricular ejection fraction and left ventricular volume as determined by SPECT, echocardiography and CMR.

Variable	2DE	3DE	SPECT	CMR
LVEF (%)	51.3 (14.7)	48.3 (11.7)	53.3 (11.7)	51.3 (11.7)
LVEDV (ml)	40.9 (14.7)	23.6 (11.7)	19.2 (11.7)	40.9 (14.7)
LVESV (ml)	40.9 (14.7)	23.6 (11.7)	19.2 (11.7)	40.9 (14.7)

LVEF, left ventricular ejection fraction; SPECT, single-photon emission computed tomography; CMR, cardiac magnetic resonance; LVEDV, left ventricular end-diastolic volume; LVESV, left ventricular end-systolic volume.

*P < 0.05 compared to CMR, *P < 0.05 compared to SPECT, *P < 0.05 compared to 3DE.

Table 4 Intraclass correlation among measurements.

	w12		w14	
	ROC	95%CI	ROC	95%CI
LVEF	0.85	0.713-0.700	0.885	0.830-0.762
LVEF/	0.721	0.304-0.89	0.592	0.33-0.778

ICC, intraclass correlation; CI, confidence interval; LVEF, left ventricular ejection fraction; LVEDV, left ventricular end-diastolic volume; LVESV, left ventricular end-systolic volume.