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LUND UNIVERSITY

PO Box 117  
221 00 Lund  
+46 46-222 00 00

# Cardiovascular magnetic resonance derived pressure volume loop variables in patients with ST-elevation myocardial infarction provide physiological information beyond ejection fraction



**LUND**  
UNIVERSITY  
Cardiac MR Group

Theodor Lav<sup>a</sup>, David Nordlund MD PhD<sup>a</sup>, Robert Jablonowski MD PhD<sup>a</sup>, Ardavan Khoshnood MD PhD<sup>b</sup>, Ulf Ekelund MD PhD<sup>c</sup>, Dan Atar MD PhD<sup>d,e</sup>, David Erlinge MD PhD<sup>f</sup>, Henrik Engblom MD PhD<sup>f</sup>, Håkan Arheden MD PhD<sup>a</sup>

<sup>a</sup>Clinical Physiology, Department of Clinical Sciences Lund, Lund University and Skane University Hospital, Lund, Sweden <sup>b</sup>Emergency Medicine, Department of Clinical Sciences Malmö, Lund University, Skane University Hospital, Malmö, Sweden <sup>c</sup>Emergency Medicine, Department of Clinical Sciences Lund, Lund University and Skane University Hospital, Lund, Sweden <sup>d</sup>Dept. of Cardiology, Oslo University Hospital Ullevål, Oslo, Norway <sup>e</sup>Institute of Clinical Medicine, University of Oslo, Norway <sup>f</sup>Cardiology, Department of Clinical Sciences Lund, Lund University and Skane University Hospital, Lund, Sweden

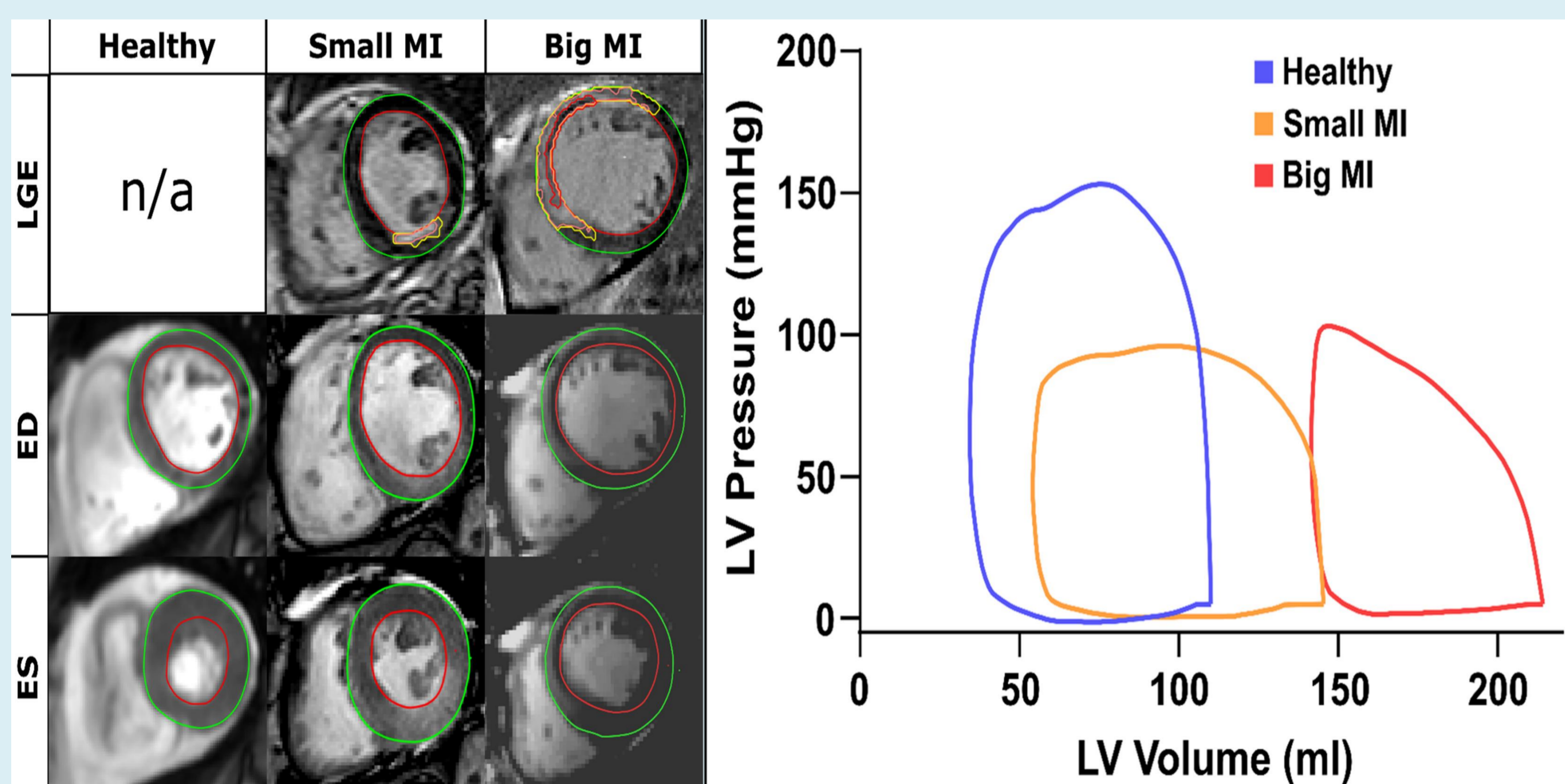
## Background

A novel non-invasive method for generation of pressure volume loops (PV-loops) using brachial blood pressure and cardiovascular magnetic resonance (CMR) imaging has recently been presented and validated (1).

The aim was to investigate if PV-loop variables could provide incremental diagnostic information beyond conventional measurements in patients with acute myocardial infarction (MI).

## Method

- 100 patients with ST-elevation MI and CMR 2-6 days after MI
- 75 healthy volunteers with CMR
- Non-invasive PV-loops were measured by volumetric CMR data and brachial sphygmomanometric pressure (1)
- Maximal elastance ( $E_{max}$  = contractility), stroke work and ventriculoarterial coupling ( $E_a/E_{max}$ ) were measured from the PV-loops (see **Figure 1** for examples)
- Infarct size was assessed by late gadolinium enhancement
- Myocardium at risk was assessed by contrast-enhanced steady state free precession



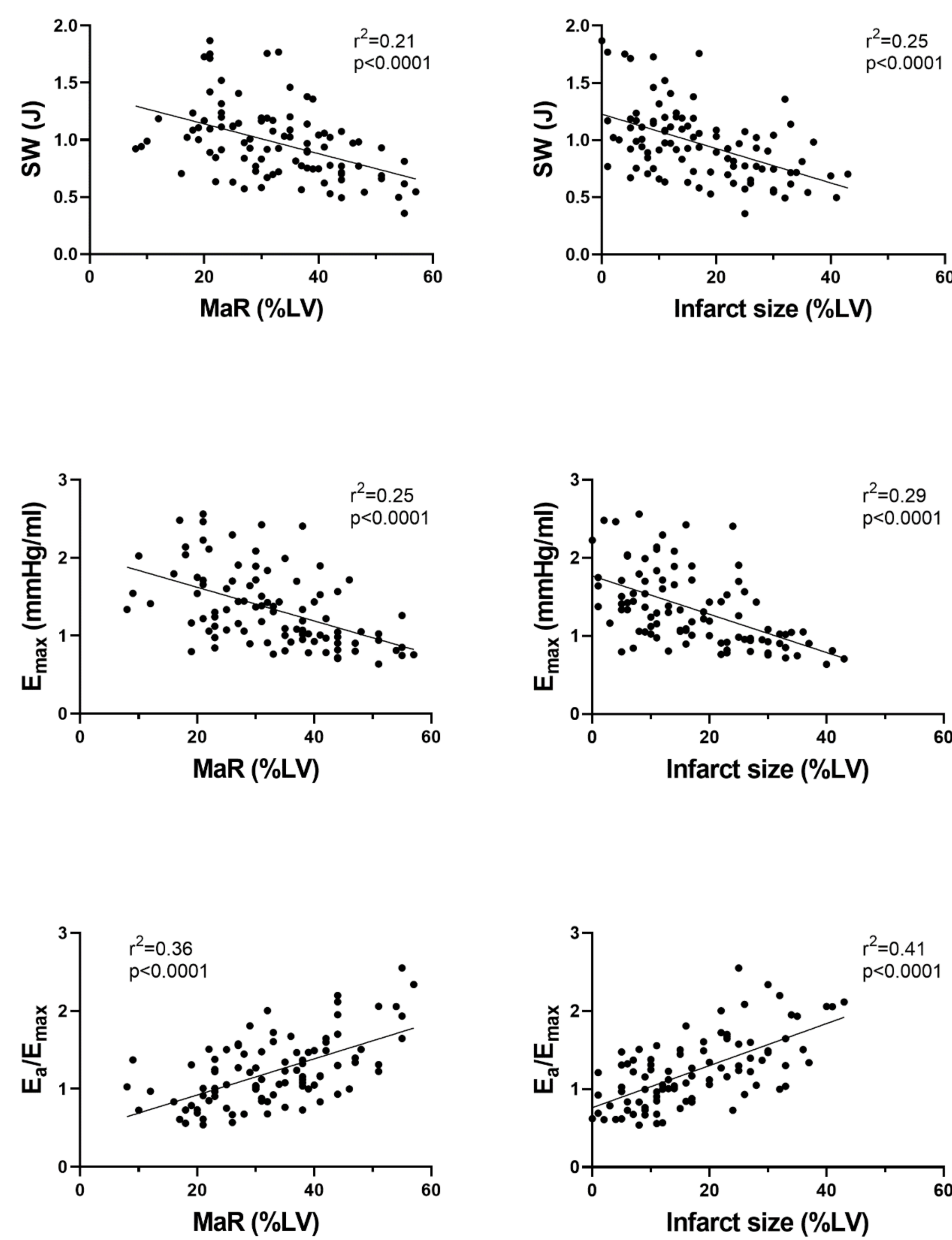
**Figure 1.** Example of PV-loops in patients with myocardial infarction.

Variables	Myocardial infarction	Healthy volunteers	P-value
Contractility, mmHg/mL	1.34±0.48	1.50±0.41	0.024
Ventricular arterial coupling	1.27±0.61	0.73±0.17	<0.001
Stroke work, J	0.96±0.32	1.38±0.32	<0.001
EDV, mL	166.5±34.0	174.3±32.9	0.131
EF, %	48.6±10.0	61.0±5.9	<0.001

**Table 1.** PV-loop variables in patients with myocardial infarction and healthy volunteers.

## Results

All PV-loop variables differed significantly in patients with acute myocardial infarction compared to healthy volunteers (**Table 1**). Furthermore, contractility, stroke work and ventriculoarterial coupling correlated to infarct size ( $E_{max}$ :  $r^2=0.29$ ,  $E_a/E_{max}$ :  $r^2=0.41$ , stroke work:  $r^2=0.25$ ) and myocardium at risk ( $E_{max}$ :  $r^2=0.25$ ,  $E_a/E_{max}$ :  $r^2=0.36$ , stroke work:  $r^2=0.21$ ) as shown in **Figure 2**.



**Figure 2.** Stroke work, contractility and ventriculoarterial coupling versus myocardium at risk (left column) and infarct size (right column).

## Conclusion

Non-invasive cardiovascular magnetic resonance derived PV-loop variables such as contractility, stroke work and ventriculoarterial coupling provide incremental diagnostic information beyond cardiac dimensions and ejection fraction early after acute myocardial infarction.

## References

- (1) Seemann et al. Circ Cardiovasc Imaging 2019;12(1)