Karolinska Institutet, Department of Medicine, Cardiology Unit,
Karolinska University Hospital, Stockholm, Sweden

# Effects of postconditioning in ST-elevation myocardial infarction:
## Assessment of myocardium at risk and infarct size

AKADEMISK AVHANDLING

som för avläggande av medicine doktorsexamen vid Karolinska Institutet
offentligen försvaras på engelska språket i Thorax Aula,
Karolinska Universitetssjukhuset i Solna,
fredagen den 16 december 2011 klockan 09.00
av

Peder Sörensson

Karolinska Institutet

**Huvudhandledare**
Professor John Pernow
Enheten för kardiologi
Institutionen för medicin, Solna
Karolinska Institutet

**Bihandledare**
Docent Håkan Arheden
Avdelningen för klinisk fysiologi
Institutionen för kliniska vetenskaper
Lunds Universitet

Professor Lars Rydén
Enheten för kardiologi
Institutionen för medicin, Solna
Karolinska Institutet

Med dr Nawsad Saleh
Enheten för kardiologi
Institutionen för medicin, Solna
Karolinska Institutet

**Fakultetsopponent**
Professor Hans Eric Bøtker
Department of Cardiology,
Aarhus University Hospital Skejby,
Aarhus University, Denmark

**Betygsnämnd**
Docent Stefan James
Enheten för kardiologi
Inst. för medicinska vetenskaper
Uppsala Universitet

Professor Peter Aspelin
Enheten för radiologi
Institutionen för klinisk vetenskap,
intervention och teknik
Karolinska Institutet

Professor Lena Jonasson
Enheten för kardiologi
Institutionen för medicin och hälsa
Linköpings Universitet

Stockholm 2011

## ABSTRACT

**Background**

Myocardial infarction remains a major health problem, despite recent improvements in detection and treatment. Infarct size is a major determinant of future mortality and morbidity. Management strategies aimed at limiting infarct size, beyond what is achieved with early revascularization in combination with platelet stabilization, could be of great prognostic importance. Although opening of the infarct-related artery is mostly beneficial, it also initiates harmful processes that contribute to the final infarct size, so called reperfusion injury. When performing studies aiming at myocardial protection, it is important to have methods that accurately quantify ischemic but viable myocardium and the final infarct size. Postconditioning, a method that consists of cycles of brief reperfusion and ischemia during early stages of revascularization, seems to limit reperfusion injury. Further knowledge is important for understanding how efficient this technique is and if the protection leads to long-lasting benefits.

**Methods and results**

*Study I* investigated if postconditioning in addition to primary percutaneous coronary intervention (PCI) would limit infarct size and improve left ventricular ejection fraction (LVEF), compared with standard PCI. This was determined with cardiovascular magnetic resonance (CMR) after one week in 76 patients with ST-elevation myocardial infarction (STEMI). There was no difference in infarct size and LVEF within the total study population. Postconditioning did, however, have a beneficial effect on final infarct size and LVEF in patients with the largest volumes of myocardium at risk (MaR).

*Study II* investigated if the results from study I were consistent during long-term follow-up in 68 patients. In order to quantify infarct size and LVEF, the patients were re-examined with CMR at three and 12 months. There was no difference between patients who were postconditioned and those who underwent ordinary PCI in the complete study group. Postconditioned patients in the upper quartile of MaR did, however, still have less myocardial damage and improved LVEF after one year.

*Study III* compared MaR estimated with a new modified contrast-enhanced CMR sequence one week after admission with the reference standard method, myocardial perfusion single-photon emission computed tomography (SPECT), in 16 patients with STEMI. There was a good correlation between the two methods.

*Study IV* investigated 21 patients with STEMI one week after revascularization with CMR. T2-weighted (edema) images were compared with contrast-enhanced CMR sequence for the assessment of MaR. A strong agreement was found between the two methods.

**Conclusions**

Postconditioning did not decrease infarct size or improve LVEF one week or 12 months after the procedure in all patients with first time STEMI subjected to this method. Patients with large MaR seemed, however, to have a consistent benefit over time in the form of smaller infarct sizes and improved LVEF. There is a strong agreement between the newly developed contrast-enhanced CMR sequence compared with both reference standard SPECT and T2-weighted edema images. The implication is that the new technique can be used for quantification of MaR and final infarct size in patients with STEMI, through a single investigation performed several days after the event.


ISBN 978-91-7457-538-5