Simple blood pressure cuff inflation reduces heart injury from bypass surgery

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The study, led by Professor Gerd Heusch of the Institute for Pathophysiology, and Dr Matthias Thielmann, of the Department of Thoracic and Cardiovascular Surgery, both based at the University School of Medicine Essen, Germany, analysed the effects of a procedure known as remote ischaemic preconditioning on patients undergoing coronary artery bypass graft surgery.

Remote ischaemic preconditioning involves briefly cutting off, and then restoring, the blood supply to an area of the body remote from the heart, such as the arm. Although it has been known for twenty years [1] that remote preconditioning reduces injury to the heart muscle, this is the first randomised control trial to determine whether remote preconditioning affects long-term survival after bypass surgery, as well as its effects on other clinical outcomes, such as heart attack or stroke.

After screening nearly 3000 patients of the West German Heart Centre, the researchers allocated 162 patients scheduled to undergo heart bypass surgery to the intervention group. After induction of anaesthesia ahead of surgery, these patients had their blood supply restricted (ischaemia) for five minutes by having a normal blood pressure cuff inflated on their upper left arm, followed by five minutes to restore blood supply (reperfusion) while the cuff deflated, a cycle that was repeated three times. 167 patients undergoing heart surgery were allocated to the control group, and did not undergo remote preconditioning.

After surgery, the researchers measured patients' blood concentrations of

a substance called troponin I, a biomarker protein which indicates damage to the heart muscle, with higher concentrations indicating more extensive damage. Heart muscle damage is a common consequence of complex heart surgery such as coronary bypass, and is associated with poorer long-term survival and other adverse health outcomes, such as heart attack. As well as measuring troponin I concentrations at the time of surgery, the researchers also followed up patients for up to four years after surgery to determine whether the remote preconditioning affected their long-term health.

The research showed a clear immediate benefit to remote ischaemic conditioning, with patients in the study group having, on average, blood concentrations of troponin I that were 17% lower than those in the control group 72 hours after surgery. However, the long-term data on clinical outcomes were also encouraging, with the researchers finding that one year after surgery, patients who underwent remote ischaemic preconditioning were almost three quarters (73%) less likely to have died of any cause, and even less likely (86%) to have died from a heart attack or stroke, compared to the control group.

According to Professor Heusch, "The results of our study are very encouraging that remote ischaemic preconditioning not only reduces heart muscle injury but also improves long-term health outcomes for heart bypass patients, and we hope that these benefits will be confirmed in larger prospective studies which are currently taking place."

"The beauty of remote ischaemic preconditioning is that it is non-invasive, simple, cheap, and safe," adds Dr Thielmann. "This procedure could be a promising and simple strategy to protect patients' heart muscle during surgery and hopefully improve health outcomes after surgery."

Writing in a linked Comment, Professor Michel Ovize, of the Louis

Pradel Hospital in Lyon, France, highlights the fact that the study results seem to indicate a beneficial effect of remote ischaemic conditioning beyond events directly related to the heart.

"The incidence of non-heart-related events, such as sepsis or stroke, was lower in the remote ischaemic preconditioning group than in the control group, albeit of few events overall. These findings suggest that the effect on the heart might be only one aspect of a much wider effect, and that remote conditioning, unlike local conditioning, might lead to persistent protection," writes Professor Ovize.

More information: [1] See Regional ischemic 'preconditioning' protects remote virgin myocardium from subsequent sustained coronary occlusion, K Przyklenk et al, *Circulation*, Vol 87, No 3 March 1993

Lancet paper: www.thelancet.com/journals/lan … (13)61450-6/abstract

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