

CORRESPONDENCE

**Remote Ischemic Preconditioning and Cardiac Surgery**

DR. HAUSENLOY AND COLLEAGUES REPLY: Landoni et al. and Wagner et al. suggest that the use of propofol or opioids, respectively, may have contributed to the failure of RIPC to improve clinical outcomes after cardiac surgery. Although we cannot rule out this possibility, the current data are not conclusive. The evidence that RIPC may be less effective with the use of propofol is limited to two small clinical studies.^{1,2} In several experimental studies, propofol itself has been reported to confer cardioprotection; one of these studies used a clinically relevant porcine model of cardiopulmonary bypass surgery.³ Furthermore, there is no clear relationship between propofol use and the cardioprotective efficacy of RIPC. Several clinical studies show RIPC cardioprotection despite the presence of propofol, and others show no benefit with RIPC, even without the use of

propofol. Similarly, there is no obvious relationship between opioid use and cardioprotection conferred by RIPC. Many clinical studies show cardioprotective effects of RIPC with the use of opioids administered at the time of induction of anesthesia, maintenance of anesthesia, or both.

Other factors that may have affected the cardioprotective efficacy of RIPC in cardiac surgery should also be considered. RIPC protects against acute myocardial ischemia–reperfusion injury, but in cardiac surgery the causes of myocardial injury are multifactorial and include direct handling of the heart, coronary microembolization, and inflammation. RIPC may be less effective in patients who undergo coronary-artery bypass grafting with concomitant valve surgery. Coexisting conditions such as older age, diabetes, and hypertension may attenuate cardioprotection associated with RIPC. Data are lacking on the most appropriate number and duration of cycles of RIPC. Finally, the use of other medications such as beta-blockers, statins, antianginal agents such as nicorandil, and nitrates during cardiac surgery may also interfere with the cardioprotective effects of RIPC.

The ERICCA and RIPHeart studies did not

show improved clinical outcomes with RIPC after cardiac surgery. However, RIPC still may have therapeutic potential in patients with acute myocardial infarction, in whom the magnitude of myocardial injury is more substantial than the injury that occurs during cardiac surgery.

Derek J. Hausenloy, M.B., Ch.B., Ph.D.

Duke–National University of Singapore
Singapore, Singapore
d.hausenloy@ucl.ac.uk

Luciano Candilio, M.D.(Res.)

Derek M. Yellon, Ph.D., D.Sc.

University College London
London, United Kingdom

Since publication of their article, the authors report no further potential conflict of interest.

1. Kottenberg E, Thielmann M, Bergmann L, et al. Protection by remote ischemic preconditioning during coronary artery bypass graft surgery with isoflurane but not propofol — a clinical trial. *Acta Anaesthesiol Scand* 2012;56:30-8.
2. Bautin AE, Galagudza MM, Datsenko SV, et al. Effects of remote ischemic preconditioning on perioperative period in elective aortic valve replacement. *Anesteziol Reanimatol* 2014;3:11-7. (In Russian.)
3. Lim KH, Halestrap AP, Angelini GD, Suleiman MS. Propofol is cardioprotective in a clinically relevant model of normothermic blood cardioplegic arrest and cardiopulmonary bypass. *Exp Biol Med (Maywood)* 2005;230:413-20.

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