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## Renal oxygen delivery during cardiopulmonary bypass

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hospital period and no long-term follow-up is available. Renal function measurements in cohorts of cardiac surgical patients should extend the hospital period to provide insight into the mechanism of changes in renal parameters, and the possible bearings on the long-term effects of cardiac surgery with CPB on renal function.

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- 1 Loef BG, Henning RH, Navis G, et al. Changes in glomerular filtration rate after cardiac surgery with cardiopulmonary bypass in patients with mild preoperative renal dysfunction. *Br J Anaesth* 2008; **100**: 759–64
- 2 Lema G, Urzua J, Jalil R, et al. Renal protection in patients undergoing cardiopulmonary bypass with preoperative abnormal renal function. *Anesth Analg* 1998; **86**: 3–8
- 3 Brown JR, Cochran RP, Leavitt BJ, et al. Multivariable prediction of renal insufficiency developing after cardiac surgery. *Circulation* 2007; **116**: 139–43
- 4 Di Mauro M, Gagliardi M, Iaco A, et al. Does off-pump coronary surgery reduce postoperative acute renal failure? The importance of preoperative renal function. *Ann Thorac Surg* 2007; **84**: 1496–503
- 5 Witczak BJ, Hartmann A, Geiran OR, Bugge JF. Renal function after cardiopulmonary bypass surgery in patients with impaired renal function. A randomized study of the effect of nifedipine. *Eur J Anaesthesiol* 2008; **25**: 319–25
- 6 Lema G, Meneses G, Urzua J, et al. Effects of extracorporeal circulation on renal function in coronary surgical patients. *Anesth Analg* 1995; **81**: 446–51

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## Renal oxygen delivery during cardiopulmonary bypass

Editor—I read with interest the study by Loef and colleagues,<sup>1</sup> on renal function in selected patients undergoing cardiac surgery with cardiopulmonary bypass (CPB). It is reassuring to discover that there was no significant evidence of deterioration in glomerular filtration rate (GFR). A deleterious patient or treatment characteristic could theoretically have caused a significantly lower GFR after operation and there was an attempt to select out such patients. I am nevertheless concerned for several reasons about the omission of data on oxygen delivery/DO<sub>2</sub> (e.g. haemoglobin level, pump flow) before, and at the time of CPB. First, the medullary zone of the kidneys has for some time been assumed to be prone to hypoperfusion

because it is an area of high metabolic rate ‘on the verge of hypoxia’. Recent research on rats has suggested that this may be more specifically the juxta medullary zone.<sup>2</sup> Reduced oxygen delivery (calculated by the oxygen delivery equation) therefore gives a physiological basis for potential renal damage. Low intraoperative haematocrit occurs as a result of blood loss, haemodilution, and low starting haemoglobin and directly affects oxygen delivery during cardiac surgery. Ranucci and colleagues<sup>3</sup> demonstrated that lowered haematocrit is linked to development of renal dysfunction. Blood transfusion data have not been declared, but red cell transfusion has also been identified as a risk factor for adverse outcome after cardiac surgery.<sup>4</sup> In addition, Karkouti and colleagues<sup>5</sup> identified that a preoperative haemoglobin level below 9 g dl<sup>-1</sup> is an independent risk factor for adverse outcome after cardiac surgery. I would also like to comment that although pump flow is stated at 2.2 litre min<sup>-1</sup> kg<sup>-1</sup> in the paper, in our department it is customary to reduce this by approximately 5% per °C of cooling according to mixed venous oxygen estimation and I wonder if this was the case in this study. Ranucci has commented that increasing pump flow when haematocrit falls can counteract the effect of reduced O<sub>2</sub> carrying capacity, so if pump flow was not reduced I wonder if this has had a beneficial effect. It certainly would be of interest in the future to have a similarly conducted study which includes a group with anaemia to permit comparison of outcome, as anaemic patients do present for cardiac surgery relatively commonly.

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Editor—We thank Dr Morrice for addressing several issues that may explain the maintenance of renal function after CPB in our patient population. At our institution, pump flow is routinely maintained at a fixed level during mild hypothermia. Further, haematocrit levels during CPB are targeted at 20–25%; if necessary because of haemodilution, blood donation is instituted at the start of bypass. Because of our procedure, we agree with Dr Morrice that the fixed pump flow during CPB, providing increased DO<sub>2</sub>, may offer an explanation for the protection of renal function. However, our study was not designed to establish the effects of oxygen delivery on perioperative renal function and the data requested are unavailable. Indeed, it would be of interest in the future to have a similar study conducted to evaluate the influence of oxygen delivery on renal function during CPB. In view of the ease of recruiting patients and the duration of the trial, it would be worthwhile to explore whether such a study would benefit from the use of sensitive markers for glomerular and tubular function.<sup>6</sup>

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- 1 Loef BG, Henning RH, Navis G, et al. Changes in glomerular filtration rate after cardiac surgery with cardiopulmonary bypass in patients with mild preoperative renal dysfunction. *Br J Anaesth* 2008; **100**: 759–64
- 2 Whitehouse T, Stotz M, Taylor V, Stidwill R, Singer M. Tissue oxygen and hemodynamics in renal medulla, cortex & cortico-medullary junction during hemorrhage–reperfusion. *Am J Physiol Renal Physiol* 2006, doi:10.1152/ajprenal.00475.2005
- 3 Ranucci M, Romitti F, Isgro G, et al. Oxygen delivery during cardiopulmonary bypass and acute renal failure after coronary operations. *Ann Thorac Surg* 2005; **80**: 2213–20
- 4 Kuduvali M, Oo AY, Newall N, et al. Effect of peri-operative red blood cell transfusion on 30-day and 1-year mortality following coronary artery bypass surgery. *Eur J Cardiothorac Surg* 2005; **27**: 592–8
- 5 Karkouti K, Wijeyesundera DN, Beattie WS, for the Reducing Bleeding in Cardiac Surgery (RBC). Risk associated with preoperative anemia in cardiac surgery: a multicenter cohort study. *Circulation* 2008; **117**: 478–84
- 6 Loef BG, Henning RH, Epema AH, et al. Effect of dexamethasone on perioperative renal function impairment during cardiac surgery with cardiopulmonary bypass. *Br J Anaesth* 2004; **93**: 793–8

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## Debate about non-heart beating organ donation

Editor—The paper by Thomas and colleagues<sup>1</sup> and the associated editorials<sup>2,3</sup> were extremely helpful in the ongoing debate about non-heart beating organ donation (NHBOD). Our institution serves an ethnically diverse community and the subject of organ donation has had to be handled with great care for both cultural and religious reasons.

The introduction of NHBOD was viewed with some concern by members of both the medical and the nursing team. Excellent support from UK Transplant coordination staff and in-house bereavement staff has helped to overcome some of these genuine concerns. Discussions concerning treatment withdrawal are separated completely from those concerning organ donation and are conducted by different members of the team. The introduction of an adapted Liverpool Care Pathway into intensive care<sup>4</sup> for end of life care as a standard approach to treatment withdrawal has helped to guide all staff and relatives through a difficult process. The hospital policies regarding the movement of bodies after death on a hospital bed, and the proximity of the intensive care unit to the operating

theatre, has meant some adaptation in the withdrawal of treatment in cases where the wish for NHBOD has been expressed. This occurs in a spacious anaesthetic room in the theatre suite, which can accommodate family members for the time it takes for the withdrawal process to run its course. It is now not our practice to return patients to the intensive care unit if the time-frame for NHBOD is too long and the opportunity for donation has been missed. This has required education of theatre staff about the clear differences between NHBOD and organ donation where brain stem death is established.

However, despite the progress made in procuring organs by NHBOD, it has been pointed out that it is not the whole solution<sup>5</sup> and the fact remains that there is still a wider debate to be had about the longer term plan for organ donation in the UK which for the time being will be played out largely at the local level.

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- 1 Thomas I, Caborn S, Manara AR. Experiences in the development of non-heart beating organ donation scheme in a regional neurosciences intensive care unit. *Br J Anaesth* 2008; **100**: 820–6
- 2 Smith M, Murphy P. A historic opportunity to improve organ donation rates in the UK. *Br J Anaesth* 2008; **100**: 735–7
- 3 Bell MDD. Non-heart beating organ donation: in urgent need of intensive care. *Br J Anaesth* 2008; **100**: 738–41
- 4 Liverpool Care Pathway Central Team UK. *LCP in Intensive Care*. LCP Non-Cancer Briefing Paper 2007; 12–14. Available from www.mcpcil.org.uk
- 5 Murphy P, Manara A, Bell D, Smith M. Controlled non-heart beating organ donation: neither the whole solution nor a step too far. *Anaesthesia* 2008; **63**: 526–30

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## Successful treatment with landiolol for the recurrence of significant ST-segment depression during early postoperative period

Editor—Tachycardia-induced ischaemia is more prevalent in patients with coronary artery disease during early postoperative period.<sup>1</sup> As tachycardia increases the oxygen demand in myocardium with limited coronary blood flow, heart rate reduction is an essential treatment to attenuate myocardial ischaemia. Landiolol, an ultra-short-acting  $\beta$ -blocker, has been widely used to treat perioperative tachyarrhythmias in Japan. We report a case in which postoperative myocardial ischaemia denoted by significant ST-segment depression on electrocardiogram (ECG) monitoring was successfully treated with landiolol.

A 61-yr-old man (56 kg, 162 cm) underwent right carotid endarterectomy under general anaesthesia. Although the