LETTERS TO THE EDITOR

Scope
Heart welcomes letters commenting on papers published in the journal in the previous six months. Topics not related to papers published earlier in the journal may be introduced as a letter: letters reporting original data may be sent for peer review.

Presentation
Letters should be:
- initially submitted by fax +44 171 388 0323 or e-mail 100536.2733@compuserve.com (where practicable). Always follow this up by posting the paper copy to us
- not more than 600 words and six references in length
- typed in double spacing (fax copies and paper copy only)
- signed by all authors.

They may contain short tables or a small figure.

Squatting revisited: comparison of haemodynamic responses in normal individuals and heart transplant recipients

SIR—We read with interest the investigation by Hanson *et al* into the haemodynamic effects of squatting after heart transplantation[1] and were impressed with the elegant demonstration that the effects of a squat on blood pressure and stroke volume are similar in heart transplant recipients and in normal subjects.

We are surprised that Hanson *et al* consider the transplanted heart to be denervated at a mean of 16 months after operation. There is clear evidence that at least sympathetic efferent reinnervation of the transplanted human heart occurs. Using injection of tyramine we and others showed sympathetic efferent reinnervation.[2 3] We and others have failed to demonstrate parasympathetic reinnervation using autonomic function testing[4] and intracoronary injection of contrast.[5]

Hanson *et al* conclude that the differences between normal controls and transplant recipients are due to denervation. While this may be true, there are alternative explanations for their findings. Cardiac transplant recipients are survivors of cardiac failure, and the absence of bradycardia in response to hypertension may be partly explained by persisting reduced central baroreflex sensitivity.[6] The response of forearm vascular resistance in the transplant recipients is consistent with this. Thus the absence of bradycardia cannot be taken as evidence of vagal denervation.

The small increase in heart rate of the transplant recipients is also consistent with sympathetic reinnervation in the absence of parasympathetic innervation, and this increase may be stimulated by the effort of squatting, in a similar manner to the effect of sustained handgrip, rather than by a volume reflex. Most cardiac sensory nerves lie in the atria, and thus a significant number remain in the recipient atrial cuff. It cannot therefore be concluded that any effect of atrial volume change on heart rate is direct.

We would also like to suggest that this manoeuvre might be an excellent non-invasive measure of sino-aortic baroreflex sensitivity, because of the rapid change observed in systolic blood pressure, akin to that observed after the strain phase of a Valsalva manoeuvre.[7] We suggest that the haemodynamic effects of squatting provide opportunities for the investigation of baroreflexes in other groups of subjects, and may also be useful in measuring reinnervation after cardiac transplantation. All investigations of reflexes in cardiac transplant recipients should take the possibility of reinnervation into account.

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1 Hanson P, Slane PR, Rueckert PA, Clark SV. Squatting revisited: comparison of haemodynamic responses in normal individuals and heart transplantation recipients. *Br Heart J* 1995;**74**:154–8.
2 Wilson RF, Christensen BV, Olivari MT, Simon A, White CW, Laxson DD. Evidence for structural sympathetic reinnervation after orthotopic cardiac transplantation in humans. *Circulation* 1991;**83**:1210–20.
3 Lord SW, Brady S, Holt ND, Mitchell L, Dark JH, McComb JM. Exercise response after cardiac transplantation: correlation with sympathetic reinnervation. *Heart* 1996;**75**: 40–3.
4 Morgan-Hughes NJ, Kenny RA, Scott CD, Dark JH, McComb JM. Vasodepressor reactions after orthotopic cardiac transplantation: relationship to reinnervation status. *Clin Aut Res* 1994;**4**:1–5.
5 Arrowood JA, Goudreau E, Minisi AJ, Davis AB, Mohanty PK. Evidence against reinnervation of cardiac vagal afferents after human orthotopic cardiac transplantation. *Circulation* 1995;**92**:402–8.
6 Creager MA, Creager SJ. Arterial baroreflex regulation of blood pressure in patients with congestive heart failure. *J Am Coll Cardiol* 1994;**23**:401–5.
7 Airaksinen KEJ, Hartiainen KEJ, Niemela MJ, Huikuri HV, Mussalo HM, Tahvanainen KUO. Valsalva manoeuvre in the assessment of baroreflex sensitivity in patients with coronary artery disease. *Eur Heart J* 1993;**14**: 1519–23.

This letter was shown to the authors, one of whom replies as follows:

SIR—We are aware of recent reports of partial sympathetic reinnervation of the transplanted heart[1 2] and initially we included a discussion of this issue in our paper. Subsequently we deleted that portion to shorten the text and because we did not have data to verify the presence or absence of sympathetic reinnervation in our patients.

It is unlikely that residual impairment of arterial baroreflex sensitivity was a factor in our study. Previous studies from our laboratory showed normal sinoaortic baroreflex control of sympathetic vasomotor tone in heart transplant recipients during orthostatic stress.[3] In addition, baroreflex control of the innervated atrial remnant was also normal.[3]

The small increase in heart rate observed in the heart transplant recipients during squatting is difficult to explain. We agree that it is not possible to exclude an autonomic component, perhaps caused by sympathetic reinnervation.

Finally, we fully concur with the suggestion that the heart rate and blood pressure responses to the squatting manoeuvre may be used to evaluate baroreflex function in various groups of patients.

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1 Wilson RF, Christensen BV, Olivari MT, Simon A, White CW, Laxon DD. Evidence for structural reinnervation after orthotopic cardiac transplantation in humans. *Circulation* 1991;**83**:1210–20.
2 Wharton J, Polak JM, Gordon L, Bannar NR, Springdall DR, Rose DR, Khagani A, Wallwork J, Yacoub MH. Immunohistochemical demonstration of human cardiac innervation before and after transplantation. *Circ Res* 1990;**66**:900–22.
3 Jacobsen TN, Morgan BJ, Scherrer U, Vissing S, Lange R, Johnson N, *et al*. Relative contributions of cardiopulmonary and sinoaortic baroreflexes in causing sympathetic activation in human skeletal muscle circulation during orthostatic stress. *Circulation* 1993;**73**: 367–78.

Serum lipids four weeks after acute myocardial infarction are a valid basis for lipid lowering intervention in patients receiving thrombolysis

SIR,—Carlsson *et al* suggested that serum lipids should be measured 4 weeks after acute myocardial infarction treated with thrombolysis because there were no significant differences between these values and those obtained within 24 hours of onset of symptoms.[1] This may in fact not be valid if the acute measurements were largely taken after and not before thrombolysis, because thrombolysis itself may be associated with a small but significant fall in total cholesterol[2] and concentrations may not return to basal values until several months later.[3] The danger of course is that some patients with spuriously low concentrations may be overlooked. Given that the 4S study clearly supports active intervention for secondary prevention,[4] each hospital should identify their best local practice of targeting patients for intervention. The previously recommended strategy[2] of routinely taking blood for lipid measurement when intravenous access is secured for thrombolysis is easily applied, yields accurate baseline results, and helps to ensure that no patient with hypercholesterolaemia is missed.

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1 Carlsson R, Lindberg G, Westin L, Israelsson B. Serum lipids four weeks after acute myocardial infarction are a valid basis for lipid lowering intervention in patients receiving thrombolysis. *Br Heart J* 1995;**74**:18–20.
2 Chua TP, Fry IDR, Frankell RJ, Lim R. Serum cholesterol concentration before and after streptokinase in acute myocardial infarction. *J Int Med* 1993;**234**:603–5.
3 Ryder REJ, Hayes TM, Mulligan IP, Kingswood JC, Williams S, Owens DR. How soon after myocardial infarction should plasma lipid values be assessed? *BMJ* 1984; **289**:1651–3.
4 Scandinavian Simvastatin Survival Study Group. Randomised trial of cholesterol lowering in 4444 patients with coronary heart disease: the Scandinavian Simvastatin Survival Study (4S). *Lancet* 1994;**344**:1383–9.

This letter was shown to the authors, one of whom replies as follows:

SIR,—Dr Bennie refers to a study from Chua *et al* including 26 male patients. Chua *et al* reported a 0·4 nmol/l fall in serum cholesterol concentration from a pre-streptokinase treatment concentration of 7·0 nmol/l. They concluded that serum cholesterol concentrations may be underestimated when they are measured after streptokinase treatment. However, the clinical importance of this underestimation of the lipid concentration is of less importance than the time lost when patients wait 3–6 months before start-