Diastolic dysfunction and off-pump coronary artery bypass

Editor—I would like to thank Shim and colleagues1 for their interesting paper exploring the relationship between diastolic dysfunction and haemodynamic derangement during off-pump coronary bypass (OPCAB) surgery. However, there are some important differences between the groups that I feel should have been discussed. The \(E\) group tended to be older (66 vs 62) with a greater incidence of hypertension (13 of 25 vs 19 of 25 patients). Perhaps unsurprisingly, therefore, they were also more likely to be on antihypertensive medications. Although, in isolation, none of these differences reached statistical significance, they may have made the groups to behave clinically different. The \(E\) group received a significantly greater amount of norepinephrine \((P=0.029)\). This may, in part, have been influenced by preoperative antihypertensive medication and not diastolic dysfunction. In addition, norepinephrine itself can cause a decrease in cardiac output. The paper rightly highlights the importance of diastolic dysfunction in OPCAB, but a discussion of these potential confounders should have been included.

M. Edsell
London, UK
E-mail: markedsell@doctors.org.uk

Editor—We thank Dr Edsell for his constructive comments on our manuscript.1 As he pointed out, increasing age and hypertension are well-known risk factors of diastolic dysfunction. The cause of diastolic dysfunction with age is largely unknown, but it is most likely that the age-related changes in the ventricle’s passive elastic properties cause decrease in the rate of ventricular relaxation.2 Similar mechanism can also be applied in patients with hypertension. Therefore, it is not surprising that older patients with hypertension would have greater incidence of diastolic dysfunction manifested as elevated \(E_{\prime}\), since \(e'\) reflects the rate of myocardial relaxation. Thus, possibilities exist that these two variables could be confounders. However, no statistical significance was reached with regard to these variables between the groups, and the ventricular wall thicknesses during diastole between the groups were also similar [posterior wall 9.6 (1.4) mm vs 10.1 (1.6) mm, \(P=0.430\), interventricular septum 9.8 (1.4) mm vs 10.2 (2.0) mm, \(P=0.407\), in the \(E_{\prime}\) <8 and >15 group, respectively]. Furthermore, none of the studies addressing the risk factors for haemodynamic deterioration and conversion to cardiopulmonary bypass during OPCAB surgery has identified age or hypertension as risk factors,3–5 and we feel that the results of our study clearly validate the prognostic importance of \(E_{\prime}\) in terms of intraoperative haemodynamic changes during OPCAB surgery. As to the use of greater amount of norepinephrine in the \(E_{\prime}\) >15 group and the possible association with antihypertensive medications and decreased cardiac index, our answers are as follows. The numbers of patients taking antihypertensive medications were all similar, especially with regard to the angiotensin-converting enzyme inhibitor which is associated with increased hypertensive episodes during anaesthesia than the beta-blockers or calcium channel blockers.6 Moreover, greater amount of norepinephrine in the \(E_{\prime}\) >15 group was used during grafting of left circumflex artery [64 (56) vs 29 (29) \(\mu\)g, \(P=0.016\)] and right coronary artery [58 (36) vs 20 (27) \(\mu\)g, \(P=0.019\)] and after sternum closure [28 (46) vs 8 (20) \(\mu\)g, \(P=0.049\)]. Before that the amount used was similar between the groups and thus the association with antihypertensive medication should be negligible. Also, norepinephrine was used to
Preventive closure of a patent foramen ovale before total hip replacement

Editor—We read with interest the reviews on bone cement implementation syndrome\(^1\) and patent foramen ovale.\(^2\) The possibility of paradoxical embolism with potential brain damage during total hip replacement (THR) is mentioned by the authors.\(^1\) However, the specific management of such patients was not discussed in the ‘anaesthetic risk reduction’ section of their review. Although there is no general agreement regarding the prevention of paradoxical embolism, we believe that closure of an atrial septal defect (ASD) may be a logical strategy before THR in patients at very high risk.

A recent case provided us with echocardiographic evidence that preoperative ASD occlusion could provide real protection against paradoxical embolism during THR. A 74-yr-old lady evaluated at the anaesthetic consultation before elective right hip replacement reported having suffered two consecutive cerebellar ischaemic strokes in 2001. At that time, transoesophageal echocardiography (TOE) revealed interatrial septum aneurysm with a patent foramen ovale (PFO). A massive shunt with rapid, complete opacification of the left atrium was demonstrated after injection of ultrasound contrast medium in a peripheral vein. Since all other investigations were negative, it was considered highly probable that the iterative strokes were due to a paradoxical embolism originating from the interatrial septum aneurysm. The cerebellar syndrome recovered progressively and neurological status returned to normal after several weeks. Cardiologists recommended anticoagulation using fluindione, but decided that foramen ovale closure was not necessary. The question of the relevance of foramen ovale closure was raised again during the anaesthetic consultation. Considering the high risk of venous embolism associated with THR, the patient was undergoing preoperative transcatheter closure of the PFO to avoid paradoxical systemic embolus during surgery. The percutaneous closure of the PFO (Cardiotag\(^6\), 30 mm) was successful and echocardiographic control at 3 months revealed that only minor shunting (<10 bubbles) persisted during the Valsalva manoeuvre. Oral anticoagulation was interrupted and replaced by platelet antagonistic therapy using clopidogrel (75 mg day\(^{-1}\)) and aspirin (100 mg day\(^{-1}\)) in the first 3 months after foramen ovale closure. Clopidogrel was then stopped and hip arthroplasty was carried out successfully under aspirin therapy alone. Intraoperative TOE revealed numerous echogenic emboli passing through the right atrium during femur reaming and prosthesis sealing. At the same time, the interatrial septum bulged into the left atrium, indicating that the pressure gradient was in favour of the right-to-left shunting and, therefore, in favour of paradoxical embolism (Fig. 1). The patient suffered neither neurological deficit nor ischaemic problems in the postoperative period, and remains well 1 yr after the surgery.

Percutaneous closure of a PFO is recommended for secondary prevention in patients with previous transient ischaemic attacks, stroke, or peripheral embolism.\(^3\)\(^4\) Paradoxical embolism to the brain after orthopaedic surgery in patients with PFO has previously been reported.\(^5\)\(^–\)\(^7\) However, there is no recommendation regarding what should be done in such patients before THR, which puts them at high risk for systemic emboli. In our patient, the history of repeated cerebellar strokes suggested that paradoxical embolism had already occurred, and therefore, the risk of recurrence during hip replacement was very high. The intraoperative echocardiographic observations reassured us that this approach was likely to have been useful. We suggest that percutaneous foramen ovale closure may be a reasonable preliminary step before THR in patients with the previous history of stroke and PFO. Large prospective trials are warranted to confirm the validity of this approach.