maintain the mean arterial pressure between 70 and 80 mm Hg, which should have minimal effects on wall tension, thus on decrease in cardiac index. We hope that our answers and additional data will clarify the questions raised by Dr Edsell and hope that our study can draw many interests regarding this area.

J. K. Shim
Y. S. Choi
Y. L. Kwak*

Seoul, Republic of Korea
*E-mail: ylkwak@yuhs.ac


doi:10.1093/bja/aep118

Preventive closure of a patent foramen ovale before total hip replacement

Editor—We read with interest the reviews on bone cement implementation syndrome¹ 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 intratriatral 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 intratriatral 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 (Cardiastar refillable balloon, 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 anti-aggregant 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 intratriatral 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 ⁶ 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.
Low-dose infusion with ‘surgical transverse abdominis plane (TAP) block’ in open nephrectomy

Editor—I read with interest and would like to commend the study by Forastiere and colleagues showing a simple, efficient, and cost-effective method of postoperative pain relief with wound infusion of local anaesthetic after open nephrectomy.

There are two interesting aspects of the study I would like to comment on. First, despite the evidence of effectiveness of local anaesthetic subcutaneous wound infusion after laparotomy being controversial, the authors used it as one of the study arms along with the muscular layer infusion. This probably does not allow one to judge as to which catheter infusion provided the actual postoperative benefits. Secondly, two of the many unanswered questions in previous studies are the ideal volume and concentration of local anaesthetics used. The overall dosage of ropivacaine used in this study would equate to a total of 480 mg day$^{-1}$ through both catheters for a period of 48 h. This can be compared with the safe allowable daily dosage being a maximum of 200 mg, and could be challenged on drug safety issues and risk of toxicity. However, there were no reports of toxicity in the study, despite ropivacaine levels not being measured.

I would like to describe a case of an 83-yr-old female patient, who underwent open nephrectomy for tumour. She received a thoracic epidural, inserted before general anaesthesia for intraoperative analgesia, with 10 ml of bupivacaine 0.125% and diamorphine 1 mg. Since it was not feasible to continue epidural after operation, a 16 gauge epidural catheter was inserted through the top end of the wound at closure and placed between the transverse abdominis and internal oblique muscle layers. The technique as we like to refer to as ‘surgical TAP block’ was commenced after operation with 5 ml h$^{-1}$ of bupivacaine 0.15% infusion using an elastomeric pump for 36 h. The patient postoperative pain relief was excellent with no recourse to any strong opioid until the catheter was removed on request after 36 h. We agree with the authors that further studies need to look at comparing the S-C plane with the muscular plane catheters for efficacy with various local anaesthetic dosages. We hope that our report will be of some benefit in basing dosage regimes in further studies relating to open nephrectomy.

R. Harish
Swansea, UK
E-mail: hsirah02@hotmail.com

Editor—We thank Dr Harish for the opportunity to clarify some aspects of the multimodal analgesia in our study. We showed that two catheters placed between the muscles and

---

Fig 1 TOE 4-chamber view centred on the right atrium (RA) and interatrial septum showing the Cardiastar$^R$ device (thin arrow) occluding the foramen ovale area. The large arrow points to a large embolus (clot or bone marrow) passing through the RA during femoral reaming. Arrowheads point to the curvature of the interatrial septum that attests for a positive pressure gradient between RA and left atrium (LA), making paradoxical embolism possible in the case of a patent foramen ovale. RV: right ventricle.