In retrospect we should have formally tested both the motor and sensory block in this patient, but in our busy clinical practice, we, as many others, often do not formally test unless there is a problem with the block. We monitored the block in the recovery room and were happy that the patient had anaesthesia over the shoulder. He complained of a ‘numb’ shoulder and therefore we did not feel the requirement for any further testing.

Patients have been reported to develop brachial plexus analgesia with an intrapleural block but it remains that the block changed between the first two injections of local anaesthetic and the third. We appreciate that different patient positioning, drug mass, injectate volume and patient position can give rise to a different block but the same doctor administered the top up injections on the second and third occasion. The patient was in the same position and the only difference was an additional 5 ml of lidocaine. It is important to recognize that the patient noticed a very different feeling to that of the previous day and morning and alerted the nurses on the ward to this.

As for the use of the triceps muscle contraction, this has been previously well described for localization of the brachial plexus so we do not feel that this shows any further proof that this was not a migration. We believe that this was a true migration of a brachial plexus catheter and would like to continue to warn people of this potentially serious complication.

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Relationship between bispectral index and effect-site EC₅₀ for propofol

Editor—We read with interest the study by Iannuzzi and colleagues regarding the correlation between propofol effect-site concentration and the bispectral index (BIS). In their article, the authors noted that the higher effect-site concentrations they obtained were because of the achievement of steady state conditions and the pharmacokinetic model used.

We constructed a graph (Fig. 1) using the effect-site concentrations and the corresponding BIS reported by Iannuzzi and colleagues, together with the values from the two previous studies quoted in their paper. To this, we added data from an on-going study in our institution where unpremedicated patients were given a constant rate infusion of propofol at 25 mg min⁻¹. In our study, the effect-site concentrations were predicted using the pharmacokinetic parameter set described in Marsh and colleagues, and an effect-site equilibrium rate constant (kₑ) of 0.8 min⁻¹. After 15 patients, we found the effect-site concentration at which 50% of the patients (Cₑ₅₀) had loss of eyelash reflex to be 1.82 µg ml⁻¹. The corresponding BIS value was 84.1. The values for loss of response to verbal command were 2.35 µg ml⁻¹ and 75.2.

As shown in the graph, an increase in the predicted Cₑ₅₀ appears to be related to a decrease in BIS. This occurred despite the fact that the data were obtained from four studies using different pharmacokinetic parameter sets and different dosing regimens. Furthermore, a concentration–effect relationship could be derived using a sigmoid $E_{max}$ model. The concentration where the BIS was 50% of maximal (EC₅₀) was 4.14 µg ml⁻¹.

In the absence of real-time measurement of propofol concentrations, anaesthetists have to rely on predicted concentrations to guide their dosing regimens. The patient’s...
general condition and the manner in which the drug is to be delivered are likely to influence the predictive ability of any one parameter set. Patients having a slowly increasing plasma propofol concentration (e.g. a constant rate infusion) may require values that are different from patients who achieve a high concentration rapidly (e.g. a target controlled infusion). However, as long as an appropriate pharmacokinetic set is used, the predicted effect-site concentration should correlate well with the BIS.

The different effect-site concentrations reported in the above-mentioned studies are most likely attributable to the different pharmacodynamic end-points used.

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Editor—There are a quite a number of studies regarding the relationship between EEG derived indexes and anaesthetic drugs in the literature. All demonstrate that a decrease in BIS correlates with an increase in the Ce propofol. I agree with Lim and colleagues that a lack of consensus regarding the definition of clinical endpoints and pharmacokinetic-dynamic parameters to test the ability of an EEG derived index is a potential problem.

I believe that the difference noted in the data sets extrapolated from different papers are a result of the use of different clinical endpoints and different pharmacokinetic models. The unpublished data presented here add more heterogeneity to the scenario because they are comparing different clinical endpoints from previously cited papers and are using a constant infusion total i.v. anesthesia technique rather than a target controlled infusion.

I believe that clinical judgement should always accompany the increasing application of technology in clinical anaesthesia.

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Editor—In patients with acute respiratory distress syndrome (ARDS) hypoxia can be aggravated by intracardiac right-to-left shunt through a patent foramen ovale.1 Positive pressure ventilation and PEEP may increase shunting.1 We report a patient in whom high dose norepinephrine seemingly triggered an acute right-to-left shunt, successfully treated with inhaled nitric oxide (NO).

A 57-yr-old female was admitted to another hospital with a 1-week history of fever and dyspnoea. Previous medical history included a breast tumour treated with surgery, radiotherapy and chemotherapy 3 yr earlier. She was in respiratory distress with tachypnoea (35 breaths per minute), cyanosis and peripheral oxygen saturation of 88% breathing ambient air. Blood pressure was 87/55 mm Hg and heart rate 113 bpm. Blood analysis demonstrated $87 \times 10^9$ leucocytes per litre, with 74% promonocytes. Acute myeloid leukaemia was later confirmed. Chest X-ray showed bilateral pulmonary infiltrates. Fluid resuscitation, antibiotics and hydroxyurea were started. The patient required tracheal intubation and ventilation 24 h after admission. Over the next day her condition worsened with rapid increase in oxygen need and progressive hypotension despite therapy with fluid and norepinephrine. She was transferred to our centre. She remained hypotensive with norepinephrine at 1 µg kg$^{-1}$ min$^{-1}$, and hypoxic ($P_{aO_2}/F_{I_O_2}$ ratio of 59 mm Hg) despite ventilation with 100% $F_{I_O_2}$ at 32 cm H$_2$O PEEP and plateau-pressure of 10 cm H$_2$O. Hydrocortisone was started (100 mg bolus followed by 200 mg/24 h). Transpulmonary thermodilution curve (PiCCO-monitor, Pulsion Medical Systems, Munich, Germany) revealed a double-hump suggesting intracardiac right-to-left shunt (Fig. 1A). This was confirmed by

![Fig 1 Transpulmonary thermodilution curve before and during NO treatment. (A) Double hump sign characteristic of right-to-left intracardiac shunt before start of NO therapy. (B) Reduction of double hump sign by adding NO. (C) Disappearance of the double hump sign during recovery. Doses of NO and norepinephrine (norepi) and PEEP values are shown.](image-url)


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