Adequate IABP placement can maximize blood flow through the coronary artery and minimize the risks of both embolization to cerebral vessels and occlusion of the LSCA. Improper positioning of an IABP can cause fatal complications, such as vascular complications and decreased perfusion of vessels of the aortic arch or an affected limb.

The aims of the present study were (i) to evaluate whether the distance from the puncture site of the femoral artery (FA) to either the sternal angle (PA) or left second intercostal space at the mid-clavicular line (PI) was a reliable bedside predictor of the correct position for IABP; and (ii) to assess whether the distance from either the puncture site of the FA to the sternal notch (PN) or the sum of distances from the puncture site at the FA to the umbilicus and the distance from the umbilicus to the sternal angle (PUA) may be a better bedside predictor of optimal IABP placement.

Values for PA, PI, PN, and PUA were measured before the insertion of the IABP (Fig. 1). For IABP insertion, the right FA was punctured 2 cm below the inguinal crease, after palpating the femoral arterial pulse. Insertion of IABP was guided by transoesophageal echocardiography. In general, the tip of the balloon was positioned 2 cm distal to the origin of the LSCA. If the LSCA could not be visualized using transoesophageal echocardiography, the tip of the IABP catheter was placed at the level of the inferior margin of the aortic arch before measuring the distance of insertion of the IABP (L).

A total of 101 patients undergoing IABP insertion were studied. The measured values of PA, PI, PN, PUA, and L were 544.6 (26.4), 537.4 (27.5), 574.8 (26.2), 568.9 (30.6), and 571.5 (28.4), respectively. Whereas PA, PI, and PN were all significantly different from L (\(P<0.05\)), the difference between PUA and L was not significant (\(P=0.054\)). In addition, the t-statistics of PA, PI, PN, and PUA were −18.754, −21.802, 3.014, and −1.953, respectively. This means that either PA or PI is significantly shorter than L, and that PN is longer than L.

Of the four anatomic landmarks investigated here, only the PUA successfully predicted the correct IABP position. This suggests that PUA may be a useful bedside predictor for the optimal positioning of IABP in emergency situations. However, our study showed that the PA and PI were statistically different from L. The sternal notch, the superior border of the manubrium at the sternum between the clavicular notches, is used for evaluation of the aortic arch. It can be very easily palpated by the hand. Given that the actual length of PN is longer than the PA or PI, we anticipated that the PN may be a more appropriate bedside predictor of IABP tip positioning because it might reflect the anatomical structure that results when the descending aorta proceeds backward along the lumbar vertebra. To our disappointment, however, the PN was longer than L.

In conclusion, both (i) the sum of the distance from the site of puncture of the FA to the umbilicus and (ii) the distance from the umbilicus to the sternal angle may be reliable bedside predictor of correct position for IABP in emergency situations.

Declaration of interest
None declared.

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Subcutaneous emphysema and buccopharyngeal submucosal emphysema after retroperitoneal laparoscopic surgery and upper airway obstruction

Editor—Airway control is one of the most important tenets of anaesthetic practice. We report a case of buccopharyngeal submucosal emphysema and subcutaneous emphysema after retroperitoneal laparoscopic surgery, involving an iatrogenic upper respiratory obstruction and affecting respiration.

A 55-yr-old man (ASA I) was undergoing a retroperitoneal laparoscopic unroofing of renal cysts. Renal cyst was documented on ultrasound study. The preoperative physical examination and laboratory examination were essentially normal. Anaesthesia monitoring consisted of ECG, peripheral pulse oxygen saturation (SpO2), arterial pressure (AP), and end-tidal carbon dioxide tension (PETO2). Anaesthesia was induced using fentanyl 0.3 mg, disoprofl 150 mg, and vecuronium 8 mg, and the trachea was intubated. Anaesthesia was maintained with sevoflurane, disoprofol, fentanyl, and vecuronium. The retroperitoneal clearance was insufflated with CO2 to a pressure of 14 mm Hg. During the anaesthesia and operative period, lasting nearly 230 min, the vital signs remained within normal limits. The PETO2 ranged from 4.0 to 7.5 kPa. The peak inspiratory airway pressure ranged from 18 to 33 mm Hg. After the end of the surgery, the tracheal tube was removed followed adequate reversal of muscle power. Soon thereafter, the patient started to snore and the SpO2 declined to 86%, PETO2 increased. Using the jaw-thrust method and adopting mask pressure breathing assistor with high-flow oxygen immediately, SpO2 could be...
maintained at 95% level, but the patient still snored seriously. Physical examination showed that the patient could freely uplift his head for more than 5 s, and had a strong handshake with the normal train-of-four ratio. Although snoring persisted, the patient could not tolerate oropharyngeal airway. Marked subcutaneous crepitus was now obvious, especially in the area of the cheek, neck, chest, abdomen, and limbs. Subcutaneous emphysema was apparent. After monitoring NAP, heart rate, $S_{\text{PO}}$, and arterial blood gas analysis in the operating theatre, and using mask pressure breathing assist with high-flow oxygen on and off for 2 h, the subcutaneous crepitus started to reduce significantly, and also the snoring started to resolve with the return of adequate breathing. The upper respiratory tract obstruction is a risk factor that may result in serious consequences. During the post-anaesthesia recovery period, many factors may lead to upper respiratory tract obstruction. In this patient, retroperitoneal insufflated with $CO_2$ induced buccopharyngeal submucosal emphysema, which was found after operation, led to respiratory tract obstruction. The reasons for buccopharyngeal submucosal emphysema and upper respiratory tract obstruction in this case could be the long time of retroperitoneum laparoscopic surgery, and high airway pressure. The $E_{\text{CO}}$ increased implying $CO_2$ absorption. The patient had no previous history of obstructive airway disease, and because the muscle power had returned to normal, the snoring could only be attributed to upper airway emphysema. According to reports in the literature, subcutaneous emphysema can lead to pneumopericardium and pneumomediastinum. In this case, maxillary subcutaneous emphysema was severe, and submucosal emphysema as a complication occurred at the same time.

**Declaration of interest**

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**Effects of sevoflurane and propofol anaesthesia on cerebral oxygenation during normocapnia and mild hypercapnia: a pilot study**

Editor—In clinical practice, patients undergoing laparoscopic surgery are at risk of mild-to-moderate hypercapnia and $CO_2$-mediated cerebral haemodynamic effects. Regional cerebral oxygen saturation ($rSO_2$) has also been used to monitor disturbances of cerebral perfusion, which may reflect tissue oxygen use. Sevoflurane and propofol have been widely used as anaesthetic agents for this surgery. Recent evidence has suggested that the effect of these anaesthetics on cerebral oxygenation may differ. However, their effects on cerebral oxygenation have not been investigated in the mild hypercapnia period well enough yet. Therefore, we examined the effects of propofol and sevoflurane anaesthesia on $rSO_2$ during normocapnia and mild hypercapnia period on patients undergoing laparoscopic cholecystectomy. With Ethics Committee approval and informed consent, 60 patients, ASA I–II, 18–65 yr were recruited. They received a remifentanil infusion at a rate of 0.3 $\mu g$ kg $^{-1}$ min $^{-1}$, and were randomized into two equal groups. Haemoglobin concentrations did not differ between the groups. For the induction and the maintenance of anaesthesia, sevoflurane (vital capacity breathing with 8% sevoflurane 6 litre min $^{-1}$ airflow of 100% oxygen induction) and propofol (2 mg kg $^{-1}$, 3 $\mu g$ ml $^{-1}$ target plasma concentration) were used in Group SR and in Group PR, respectively. Rocuronium 0.6 mg kg $^{-1}$ was administered to facilitate tracheal intubation. For the maintenance of anaesthesia, sevoflurane concentration was changed by 0.2% and the target plasma concentration of propofol was changed by 0.5 $\mu g$ ml $^{-1}$ to maintain BIS values at 40–50. Vital signs (Datex Ohmeda S5) and $rSO_2$ (INVOS 5100) were measured before (baseline) and after anaesthesia in normocapnia and mild hypercapnia period on patients undergoing laparoscopic cholecystectomy. With Ethics Committee approval and informed consent, 60 patients, ASA I–II, 18–65 yr were recruited. They received a remifentanil infusion at a rate of 0.3 $\mu g$ kg $^{-1}$ min $^{-1}$, and were randomized into two equal groups. Haemoglobin concentrations did not differ between the groups. For the induction and the maintenance of anaesthesia, sevoflurane (vital capacity breathing with 8% sevoflurane 6 litre min $^{-1}$ airflow of 100% oxygen induction) and propofol (2 mg kg $^{-1}$, 3 $\mu g$ ml $^{-1}$ target plasma concentration) were used in Group SR and in Group PR, respectively. Rocuronium 0.6 mg kg $^{-1}$ was administered to facilitate tracheal intubation. For the maintenance of anaesthesia, sevoflurane concentration was changed by 0.2% and the target plasma concentration of propofol was changed by 0.5 $\mu g$ ml $^{-1}$ to maintain BIS values at 40–50. Vital signs (Datex Ohmeda S5) and $rSO_2$ (INVOS 5100) were measured before (baseline) and after anaesthesia in induction, immediately after low pressure (8 mm Hg) and high pressure (15 mm Hg) $CO_2$ pneumoperitoneum, every 5 min during $CO_2$ insufflation, and every 1 min during the hypercapnia period (end-tidal carbon dioxide tension 6–7.3 kPa). The lungs were mechanically ventilated with a mixture of oxygen and air. When hypercapnia occurred, minute ventilation was increased to maintain normocapnia. Parametric data were analysed by repeated-measures analysis of variance and the Student’s $t$-test for multiple comparisons where appropriate. Non-parametric data were