

contraindication to regional anaesthesia, a careful neurological history and examination must be conducted to document any deficits.

General anaesthesia may be required if the neuraxial blockade proves difficult, fails or is inadequate. The difficult intubation trolley and flexible fiberoptic intubating bronchoscope should be available in the operating theatre. Cervical spine ankylosis, temporomandibular ankylosis and cricoarythenoid arthritis may lead to difficult intubation. Loss of normal neck flexion and extension, coupled with osteoporosis, may lead to fracture with minor trauma from airway manipulation. A thorough airway assessment including range of movement of neck, head and cervical spine, and predictors of ease of intubation such as Mallampati scoring should be undertaken.

Successful management of a parturient with ankylosing spondylitis with a difficult airway and difficult 'back' is challenging and requires a multidisciplinary approach. It involves the rheumatologist, obstetrician, anaesthetist and neonatologist. Neuraxial anaesthesia can be considered and a lateral approach should be used. A normal dose of spinal local anaesthetic can achieve an adequate level of block, although epidural catheter insertion may be difficult.

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Clinical evaluation of the Capnomask™ in the supine vs. prone position during monitored anaesthesia care

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EDITOR:

A large number of interventional radiologic procedures are performed under monitored anaesthesia care (MAC). This entails the administration of low doses of intravenous (i.v.) anaesthetic drugs, oxygen via a nasal cannula or face mask and standard monitoring in spontaneously breathing patients [1]. Despite its benefits in improving patient comfort, procedural sedation/analgesia may potentially worsen airway patency, leading to apnoea, hypoventilation and hypoxia. Capnography monitoring can detect early signs of respiratory depression during MAC [2]. The Capnomask™ (GHW group, Meylan, France) is a

newly developed oxygen face mask with an end-tidal CO₂ (ETCO₂) sampling line intended for use in spontaneously breathing patients under light sedation. We examined its feasibility for capnography monitoring and patients' tolerance in the supine and prone positions during MAC.

Forty-five patients (ASA II–III, 24 males/21 females, age: 65.5 ± 12.9 yr, height: 164 ± 8.1 cm and weight: 66.4 ± 9.7 kg) scheduled for radio-guided percutaneous vertebroplasty or nucleotomy were prospectively included. The Capnomask™ was placed on the patient's face with oxygen delivery (6 L min⁻¹) and the CO₂ sampling line was connected to a capnometer. All the patients received i.v. midazolam (0.03 mg kg⁻¹) and alfentanil (15 mcg kg⁻¹ h⁻¹). Non-invasive blood pressure (BP), heart rate (HR), ETCO₂, pulse oxymetry (SpO₂) and respiratory rate (RR) were noted at steady state in the supine and 5 min after placement in the prone position. Sedation

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Table 1. Cardiorespiratory variables assessed during monitored anaesthesia care

Variable	Supine position	Prone position	P value
ETCO ₂ (mmHg)	32.8 ± 2.7	24.7 ± 2.0	<0.001
SpO ₂ (%)	97–99	95–98	n.s.
RR (cycles/min)	14 ± 1.5	11.3 ± 2.8	<0.001
SBP (mmHg)	131 ± 7.8	128 ± 15	n.s.
HR (beats min ⁻¹)	63.7 ± 8.5	63 ± 6.8	n.s.
Tympanic temperature (°C)	36.5 ± 1.5	37 ± 0.5	n.s.
Patients' tolerance score (mm)	80 ± 20	70 ± 20	0.02

ETCO₂: end-tidal CO₂; SpO₂: pulse oxymetry; RR: respiratory rate; SBP: systolic blood pressure; HR: heart rate.

Data are expressed as mean ± SD or as a range. The Mann–Whitney test was used for statistical analysis with $P < 0.05$ considered as significant.

(i.e. the patient's response to verbal command) was rated as mild (spontaneous), moderate (after tactile stimulation) or deep (not easily aroused). The patients' tolerance of the CapnomaskTM was evaluated, in the recovery room, using a 100 mm visual analogue scale (0 = uncomfortable to 100 = extremely comfortable).

Additionally, the CapnomaskTM was also used in 20 patients (ASA II–III, 11 males/9 females, age: 55.6 ± 11.9 yr, height: 164.5 ± 5.8 cm and weight: 62.7 ± 8.5 kg), with arterial catheters, recovering from general anaesthesia. Their blood gas analysis permitted us to calculate the difference between arterial and ETCO₂ partial pressures ((a-ET) PCO₂) in the supine position.

The main cardiorespiratory changes during the procedures are presented in Table 1. The data were similar in the two positions except for the PETCO₂, RR and patient tolerance where a significant difference was observed. The (a-ET) PCO₂ was within the usual reported range of 3–9 mmHg. Sedation was mild in 38 out of 45 (84%) patients and moderate in seven out of 45 (16%) patients. Transient apnoea was detected, within 5 s, in two patients during the procedure with rapid recovery after verbal stimulation. Two patients had nausea and one patient vomited after the procedure. Each of these incidents was effectively treated with i.v. ondansetron (Zophren[®]; GlaxoWellcome, Marly-le-Roi, France) 4 mg. The rest of the study was uneventful.

Our data suggest that the CapnomaskTM is feasible for oxygen delivery and CO₂ sampling during MAC. Moreover, it permitted the early detection of apnoea during the procedure. However, PETCO₂ and patient satisfaction were significantly lower in the prone than in the supine position.

The differences in PETCO₂ between the two positions could plausibly be explained by the improper size of the CapnomaskTM or sampling line obstruction or leakage [3]. Indeed we used a unique adult size for all the patients despite their morphological differences. This was the only size available at the inception of our study. However, the same mask was used in the two positions for each patient.

The CapnomaskTM is particularly useful for MAC procedures because it offers the possibility of capnographic monitoring in non-intubated spontaneously breathing patients. Other devices, including nasal cannulae and face masks, have previously been used for the same purpose [4–6]. Each type of device has its advantages and limitations. The nasal sampling tubes are more comfortable, permitting very low-flow oxygen delivery rates [6]. However, they are easily dislodged from the proper position or occluded against the nasal mucosa. Moreover, when the patients convert to mouth breathing, the nasal devices simply do not work. The CapnomaskTM is a face mask that samples expired CO₂ from both the nose and the mouth. In their document on 'Practice Guidelines for sedation and analgesia by Non-Anesthesiologists', the Task Force American Society of Anesthesiology stated that the primary causes of morbidity associated with sedation/analgesia are drug-induced respiratory depression and airway obstruction [7].

A major limitation of this study is the fact that arterial CO₂ measurements were only done in the supine position. Since our main intention was to detect respiratory depression, it was not necessary for us to know the precise value of the arterial PCO₂ in this setting.

In conclusion, the CapnomaskTM is feasible for CO₂ sampling during MAC. However, its reliability and tolerance are significantly reduced in the prone position. The main advantage of the device is the early detection of apnoea, not the exact ETCO₂ measurement.

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Subcutaneous hydration: a potentially hazardous route

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EDITOR:

Subcutaneous hydration, also called hypodermoclysis, is commonly used in elderly patients. We report a case of colonic perforation in order to raise awareness that this technique is not fully harmless.

Case report

An 86-yr-old lean (45 kg, 165 cm) female was admitted to our emergency department with abdominal pain and vomiting. Her past medical history included untreated hypertension and advanced dementia. She was living in an institution. Symptoms had begun 1 week previously with difficulties in feeding and drinking. Parenteral hydration was started with a subcutaneous infusion of normal saline via a 24-G short needle in the right inferior quadrant of the abdomen. No immediate complication was reported during the puncture. Confusion developed a few hours later and bilious vomiting appeared the day after. She was then transferred to our institution for investigation.

Pain and diffuse tenderness were the only abnormalities reported at physical examination. Abdominal wall inspection noted a needle puncture hole without fluid loss or inflammation in the right iliac fossa. Neither her general nor haemodynamic status were altered. Temperature was 36.3°C. Acute renal failure was the only observed biological abnormality. Abdominal computed tomography (CT) scan showed subcutaneous emphysema,

global intestinal distension and pneumoperitoneum (Fig. 1). Punctiform caecal perforation close to the skin needle site was discovered during a laparotomy and led to caecal resection with ileostomy and colostomy. General peritonitis required amoxicillin/clavulanic acid administration. The patient fully recovered and was returned to her institution 2 weeks later.

Discussion

Hydration and electrolyte balance in the elderly is a real challenge. Management in institutions adds the

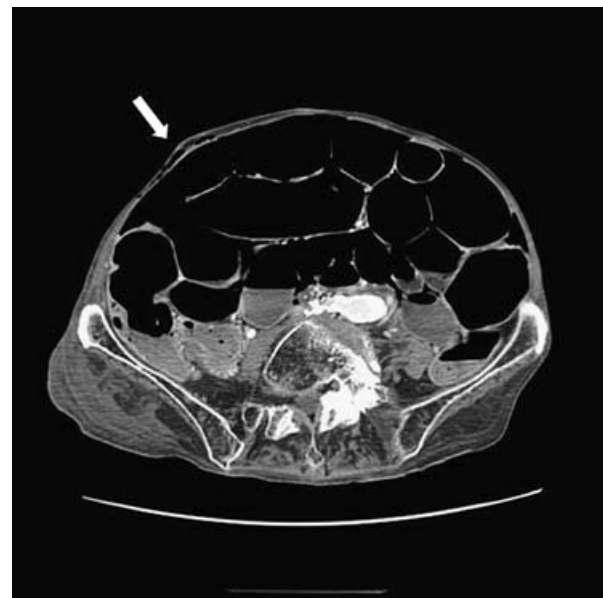


Figure 1. Abdominal computed tomography (CT) scan with contrast injection shows subcutaneous emphysema (arrow) and pneumoperitoneum.

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