Postoperative sore throat and ketamine gargle

Editor—We investigated, in a double-blind randomized control study, the effect of a ketamine gargle to attenuate postoperative sore throat (POST) in 44 adult ASA I or II patients undergoing elective gynaecological procedures. The patients had 30 s gargling with either 20 ml of normal saline (Group C: control, n=22) or ketamine 40 mg in 20 ml normal saline (Group K: ketamine, n=22). Anaesthesia was induced with fentanyl, propofol, and rocuronium, 5–10 min after gargling. Maintenance of anaesthesia was with oxygen–air mixture and sevoflurane. Titrated boluses of morphine were given according to clinical requirements during surgery.

The same anaesthetist performed all intubations and extubations.

During surgery, blood samples were collected at intervals for ketamine and norketamine analysis. At the end of the study period, serum samples from five patients in Group K, randomly selected, were assayed by liquid chromatography and mass spectrometry.

After extubation, POST was assessed at 0 (on arrival at the post-anaesthetic care unit), 2, and 24 h using a four-point grading scale (none, 0; mild, 1; moderate, 2; and severe, 3).

POST was significantly reduced in Group K compared with Group C (P<0.05) at 0 and 2 h after surgery but not at 24 h (P=0.498). There was significantly less moderate-to-severe POST in Group K at 0 h.

Ketamine gargle has been reported to attenuate POST for 24 h post-surgery.1 We observed significant reduction in POST at 0 and 2 h post-surgery but not at 24 h.

The reported ketamine level to relieve tourniquet pain after an i.v. bolus was >100 ng ml⁻¹.2 The analgesic effect from oral administration of ketamine was at a lower mean plasma concentration of ketamine 40 ng ml⁻¹, presumably due to the higher norketamine levels (160 ng ml⁻¹).3

In this study, blood samples were obtained during intraoperatively, but POST was assessed post-surgery when ketamine concentrations are likely to be lower. Systemic absorption and the possibility of swallowing the residual solution would contribute to the ketamine in the blood.

The highest average ketamine and norketamine concentrations, 16.16 and 11.43 ng ml⁻¹, respectively (Table 1), were detected during surgery but would have decreased after the surgery. These low levels suggested that it was unlikely that systemic absorption played a major role for the reduction of POST. A topical effect is possible.

We conclude that pre-induction ketamine gargle can attenuate POST in the early postoperative period. Drug levels detected were much lower than reported measurements for analgesia after oral and parenteral administration.

Conflict of interest

None declared.

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3 Grant IS, Nimmo WS, Clements JA. Pharmacokinetics and analgesic effects of i.m. and oral ketamine. Br J Anaesth 1981; 53: 805–10

Cystic fibrosis patient awaiting lung transplantation ventilated with neurally adjusted ventilatory assist

Editor—We report the case of a 22 yr woman with end-stage cystic fibrosis (CF) awaiting lung transplantation who was successfully ventilated with neurally adjusted ventilatory assist (NAVA) after failure of standard pneumatic triggering pressure support.

The patient presented with infective exacerbations of the airways resulting in severe acute respiratory insufficiency. She required tracheal intubation and sedation because of severe respiratory acidosis and hypoxaemia. On recovery from her septic exacerbation, after 10 days, we proposed lung transplantation as an emergency. In order to avoid a prolonged period of diaphragmatic inactivity we decided to stop sedation.1 At that time, her level of intrinsic positive end-expiratory pressure (iPEEP) was 17 cm H₂O with a thoraco-pulmonary static compliance of 16 ml cm H₂O⁻¹. Initially, we tried pressure support ventilation (PSV) with

Table 1 Average serum ketamine and norketamine levels from five patients in Group K. *Baseline=just before ketamine gargle

<table>
<thead>
<tr>
<th>Time interval (min)</th>
<th>Average serum ketamine (ng ml⁻¹)</th>
<th>Average serum norketamine (ng ml⁻¹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (baseline)*</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>12–22</td>
<td>16.16</td>
<td>0</td>
</tr>
<tr>
<td>44–60</td>
<td>13.67</td>
<td>8.17</td>
</tr>
<tr>
<td>82–103</td>
<td>8.64</td>
<td>11.63</td>
</tr>
</tbody>
</table>

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an inspiratory pressure of 39 cm H₂O and an expired end-tidal volume (Vₜₑ) of 400 ml. The best PEEP to limit asynchronism because of her important iPEEP was 15 cm H₂O. The expiratory trigger was increased to 50% of the peak inspiratory flow in order to limit delayed cycling. Unfortunately, her ventilatory frequency was increased above 35 bpm while her Vₜₑ was significantly decreased. We decided to use NAVA, a mode that provides PSV in proportion and synchronization to the electrical activation of the diaphragm (Edi). As previously described, Edi was obtained through a nasogastric tube with a multiple array of electrodes placed at its distal end (Edi catheter, Maquet Critical Care, Solna, Sweden). NAVA mode was started on a Servo-I ventilator (Maquet Critical Care). The amount of pressure instantaneously applied by the ventilator to the airway opening throughout inspiration is determined by the processed Edi, expressed in microvolts, multiplied by a user-controlled gain factor (‘NAVA level’), whose unit is cm H₂O µV⁻¹. We measured her highest Edi value (Edi_max) daily with no pressure support (NAVA level 0.1), Edi_max was an estimation of her maximal diaphragmatic activity. On day 1 of NAVA ventilation, Edi_max was around 23 µV. A recent study suggests a NAVA level with Edi values around 50–70% of the Edi_max sufficiently unloads the work of breathing and avoids over assistance. Thus, a NAVA level was set to 2.5 cm H₂O µV⁻¹ in order to obtain an Edi between 50% and 70% of Edi_max. NAVA was well tolerated; respiratory frequency was maintained below 30 bpm with a normal pH. This new mode was maintained for 4 days until transplantation. The day of transplantation Edi_max was 32 µV and NAVA level was 0.8 cm H₂O µV⁻¹ with an Edi around 19 µV. Four hours after lung transplantation, NAVA was used and only 6.6 µV were required with a NAVA level of 1.8 and a PEEP of 4 cm H₂O to maintain adequate alveolar ventilation and patient comfort (Fig. 1). The trachea was extubated 6 h after lung transplantation.

Once patients with CF are intubated, long periods of diaphragmatic inactivity have to be minimized. With standard pneumatic triggering PSV, it is difficult to adapt the patient’s demand in severe CF because of a high iPEEP and to avoid the occurrence of patient/ventilator asynchronism with triggering dysynchrony and cycling on and off delays. By identifying the neural respiratory time start and the proportional assist ventilation, the use of NAVA in patients with iPEEP improved patient/ventilator synchronization and provided greater respiratory comfort. NAVA may be of use in patients with end-stage CF where mechanical ventilation is a real challenge for anaesthetists. The use of NAVA provided safe, adequate pressure support assist with continuous diaphragm activity and greater respiratory comfort until lung transplantation.

**Conflict of interest**

None declared.

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