An unusual cause of airway obstruction after guided insertion of the ProSeal LMA

EDITOR:
The ProSeal™ laryngeal mask airway (PLMA) insertion using a gum-elastic bougie placed in the oesophagus as a guide has a high first-attempt success rate (>99%) and a potential role in difficult airway management [1]. On those occasions when it fails, the aetiology is usually laryngospasm, severe epiglottic downfolding, glottic/supraglottic compression or cuff infolding [2]. Most of these problems can be identified and rectified by following an algorithm that we recently proposed [3]. We present a case illustrating another cause of failure.

An obese 57-yr-old male (height 165 cm, weight 106 kg) with a history of failed laryngoscope-guided tracheal intubation but easy face mask ventilation presented for elective intra-abdominal surgery. He refused awake tracheal intubation. The airway management plan was to perform optimal laryngoscopy and to insert a tracheal tube if the vocal cords were seen, or a ProSeal LMA if not seen. The patient was pre-oxygenated until the end-tidal O$_2$ was >90%. Induction was with midazolam 2 mg, alfentanil 1 mg and propofol 2.5 mg kg$^{-1}$. Face mask ventilation was easy but required a Guedel airway. Muscle relaxation

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Figure.
Modified algorithm to facilitate the diagnosis and management of airway obstruction with the ProSeal™ laryngeal mask airway.
was with atracurium 50 mg. At laryngoscopy, the epiglottis/glottis/hypopharynx could not be seen and the straight end of the gum-elastic bougie was directed blindly and without resistance along the right posterior pharyngeal wall until the distal portion was 10 cm beyond the laryngopharynx. A size 5 ProSeal LMA was railroaded into position along its drain tube and the cuff inflated with 20 mL of air. Ventilation, however, was impossible with high airway pressures and airway obstruction. The proposed algorithm was followed, but the mechanical obstruction tests and recommended manoeuvres failed to solve the problem. Remembering that ‘whatever remains, however improbable, must be the truth’, the gum-elastic bougie was advanced and resistance was encountered after approximately 10 cm, indicating tracheal placement. The ProSeal LMA was rapidly exchanged for a tracheal tube, which passed easily along the bougie and provided unobstructed ventilation once the bougie was removed. The lowest SSpO2 was 94% and there were no other problems.

An alternative solution would have been to reinsert the bougie along the left posterior pharyngeal wall to reposition it in the oesophagus. Based on an audit of our experience with the gum-elastic bougie-guided technique during routine use, we estimate that the frequency of inadvertent tracheal placement is around 1:5000. In principle, inadvertent tracheal placement is more likely in the difficult airway scenario, as the hypopharynx may not be seen at laryngoscopy. The proposed algorithm has been modified to accommodate this rare but important scenario (Fig.).

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Efficacy of dexamethasone pretreatment for alleviation of propofol injection pain

EDITOR:
Propofol produces a good quality of anaesthesia with rapid recovery. However, pain or discomfort on injection is a very commonly reported adverse event with this agent. A number of drugs including lidocaine, opioids, thiopental, metoclopramide, ondansetron and ephedrine have been used to reduce the incidence of propofol injection pain [1]. Ondansetron, a 5HT3 receptor antagonist, has been shown to be effective in alleviating this pain along with a reduction in postoperative nausea and vomiting [2]. Another drug found to be effective for this purpose, ketorolac, is a non-steroidal anti-inflammatory agent and acts by inhibition of prostaglandin production [3]. It was postulated that a drug having both these mechanisms of action, i.e. 5HT3 receptor antagonism and prostaglandin synthesis inhibition would be able to reduce the incidence of propofol injection pain. Dexamethasone, a corticosteroid, prevents release of serotonin in the gut [4], decreases 5HT3 turnover in the central nervous system and also inhibits prostaglandin synthesis [5]. Thus the present study was conducted to ascertain the efficacy of dexamethasone pretreatment for alleviation of propofol injection pain.

After approval from the Institutional Ethics Committee, a prospective, randomized, placebo-controlled, double-blinded study was planned. Seventy ASA I or II patients, 18–60 yr of age, undergoing elective abdominal surgical procedures under general anaesthesia, were included in the study. Patients taking regular analgesics or sedatives, suffering from acute or chronic pain syndromes, having a history of hypersensitivity to propofol or dexamethasone, or having contraindications to the use of dexamethasone were...
excluded. Informed consent was obtained from all the participants and no premedication was administered on the morning of surgery. In the operating theatre, after instituting monitoring, an 18-G intravenous (i.v.) cannula was inserted in the dorsum of left hand without local anaesthetic infiltration and ringer lactate infusion was started. The patients were randomly allocated to two groups of 35 patients each. In the first group normal saline 5 mL was injected as pretreatment solution whereas in the other group the patients received dexamethasone in a dose of 0.15 mg kg\(^{-1}\) up to a maximum of 8 mg and diluted to a volume of 5 mL. This dose of 0.15 mg kg\(^{-1}\) was chosen as this is the most frequently used dose of dexamethasone for an antiemetic action [6]. The maximum dose was limited to 8 mg as dexamethasone has been shown to have a plateau effect for its antiemetic action at 8 mg [4]. After stopping ringer lactate infusion, the test solution was administered over 10 s without occluding the vein. One minute after administration of the test solution, 25% of the calculated induction dose of propofol (1% w/v, M/S Claris Lifesciences Limited, India) was administered at the rate of 0.5 mL s\(^{-1}\). An independent blinded anaesthesiologist assessed the degree of pain of injection after test solution and propofol injection in accordance with the scale advocated by McCrirrick and Hunter [7] (Table 1). The adverse effects, if any, were noted. The remaining propofol was then injected followed by resumption of Ringer lactate infusion and administration of morphine and vecuronium. Assuming the incidence of pain following i.v. propofol to be 70%, one would need to study at least 31 patients in each group to detect a 50% reduction of propofol injection pain at 80% power (\(\alpha = 0.05\)). Thus it was decided to include 35 patients in each group. The data obtained were analysed statistically using unpaired \(t\)-test for age and weight of the patients and \(\chi^2\)-test for degree of pain. A \(P\) value of \(< 0.05\) was accepted as statistically significant.

The two groups were comparable with respect to age, weight and gender ratio. Twenty-seven patients (77%) reported pain in the saline group whereas only 11 patients (31%) felt pain in the dexamethasone group (\(P = 0.01\)) (Table 1). Six patients complained of moderate to severe pain following dexamethasone compared with 16 after saline. Transient dizziness was experienced by one patient during dexamethasone injection. This subsided within a few seconds and did not require any intervention. Two patients complained of perineal itching whereas two other patients had shooting pain in the perineum immediately following dexamethasone injection. These problems were also self-limiting in nature and subsided within seconds without any treatment.

Thus the present study shows that dexamethasone pretreatment causes significant reduction in propofol injection pain. Though dexamethasone can cause side effects such as increased incidence and severity of infection, adrenal suppression and delayed healing in surgical patients, a single dose has not been reported to cause any such adverse effects [4,6]. However, perineal itching is a frequent side effect during i.v. administration of dexamethasone [8]. Neff and colleagues [9] reported excruciating perineal pain immediately after dexamethasone injection. The mechanism responsible for these phenomena is not well understood but is thought to be related to the phosphate ester of the corticosteroid [8,9]. Slow i.v. infusion of diluted dexamethasone can prevent these side effects.

To conclude, dexamethasone in an antiemetic dose of 0.15 mg kg\(^{-1}\) (maximum of 8 mg, diluted to 5 mL volume) decreases the incidence of propofol injection pain significantly when administered i.v. 1 min before injection of propofol. But it may be associated with perineal itching and pain in some cases. Therefore, it cannot be routinely administered for alleviation of propofol injection pain. However, it can be administered as a slow i.v. infusion before injecting propofol to have this added advantage in patients who are already receiving dexamethasone for other indications.

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<table>
<thead>
<tr>
<th>Degree of pain</th>
<th>Response</th>
<th>Normal saline ((n = 35))</th>
<th>Dexamethasone ((n = 35))</th>
</tr>
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<tbody>
<tr>
<td>None</td>
<td>No response to questioning</td>
<td>8</td>
<td>24</td>
</tr>
<tr>
<td>Mild</td>
<td>Pain reported in response to questioning only without any behavioural signs</td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td>Moderate</td>
<td>Pain reported in response to questioning and accompanied by a behavioural sign or pain reported spontaneously without questioning</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>Severe</td>
<td>Strong vocal response or response accompanied by facial grimacing, arm withdrawal, or tears</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>

Data are numbers of patients.

References


Reduction of pain on injection of propofol using meperidine and remifentanil

EDITOR:

Propofol (propofol 1%; Fresenius, Fresenius Kabi, Austria GmbH) has the disadvantage of pain on injection and several methods have been used to reduce it [1] although the most effective intervention is unknown. Remifentanil (Ultiva™; Glaxo Wellcome, The Upjohn Company, Belgium) is a piperidine-based opioid which acts as a µ-receptor agonist. Its pharmacokinetic profile is unique among the opioids having a very rapid plasma clearance and onset time and a very short half-life of 2–10 min [2]. Two previous studies have examined the effects of remifentanil in preventing propofol injection pain [1,3]. We have conducted a double-blind study to investigate the effect of different doses and timing of remifentanil administration and compare it with meperidine and placebo on the incidence and severity of pain during propofol injection.

The study was approved by the medical Ethics Committee of our institution and written consent obtained from each patient before surgery. We included 225 patients, ASA I–II, unpremedicated, aged 19–75 years scheduled for elective gynaecology, otolaryngology, urology or ophthalmology surgery. Exclusion criteria were pregnancy, concomitant analgesic or sedative medication, patients requiring rapid sequence induction, patients in whom difficult intubation was anticipated, a history of reaction to local anaesthetic agents, anticipated difficulty in venous access, difficulty in communication or weighing less than 50 kg. On arrival in the operating theatre, a 20-G intravenous cannula was inserted in the dorsum of the non-dominant hand after attaching the electrocardiogram, noninvasive blood pressure and pulse oximeter. An infusion of saline was commenced. Patients were randomly allocated to one of five groups. Group R1 (n = 45) and Group R2 (n = 45) received remifentanil immediately prior to propofol (2 mg kg⁻¹) injection at a dose of 1 µg kg⁻¹ min⁻¹ and 0.25 µg kg⁻¹ min⁻¹, respectively. Group R3 (n = 45) received remifentanil (0.25 µg kg⁻¹ min⁻¹) commenced 1 min before propofol (2 mg kg⁻¹) injection. Group M (n = 45) received meperidine (Aldolan; Gerot Pharmazeutika, Vien, Austria) (40 mg in 4 mL) and Group P (n = 45) received saline (4 mL) immediately prior to propofol (2 mg kg⁻¹) injection. The propofol was injected over 30 s. An independent anaesthetist prepared the solutions and the investigator did not know the contents of the solutions. Another independent clinician, unaware of the group to which the patients had been allocated, assessed the level of pain on injection of propofol. A preliminary study had shown that 10 mL (100 mg) propofol was sufficient to induce anaesthesia and pain if it was going to occur. For this reason, we chose 10 mL of propofol for this study.

The severity of injection pain was evaluated using a four-point scale. Expression of pain by strong vocal response or response accompanied by facial grimacing or withdrawal of arm was scored as severe pain. Verbal expression of pain without grimacing or withdrawal of arm was scored as moderate pain. If severe or moderate pain was not observed within 30 s the patient was asked whether they had any discomfort in the arms; if they answered ‘yes’ this was scored as mild pain or if the answer was ‘no’, this was scored as...
Table 1. Patient characteristics data.

<table>
<thead>
<tr>
<th></th>
<th>Placebo group</th>
<th>Group R₁</th>
<th>Group R₂</th>
<th>Group R₃</th>
<th>Group M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients</td>
<td>45</td>
<td>45</td>
<td>45</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>Age (yr)</td>
<td>45.6 ± 15.0</td>
<td>43.9 ± 15.4</td>
<td>43.5 ± 13.4</td>
<td>41.5 ± 16.8</td>
<td>45.3 ± 13.3</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>68.6 ± 13.4</td>
<td>69.8 ± 13.2</td>
<td>72.1 ± 12.4</td>
<td>72.1 ± 12.3</td>
<td>71.9 ± 13.3</td>
</tr>
</tbody>
</table>

Data are expressed as mean ± SD. There were no intergroup differences in age, gender and weight.

Table 2. Incidence of pain.

<table>
<thead>
<tr>
<th>Pain</th>
<th>None</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placebo group</td>
<td>14</td>
<td>17</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Group R₁</td>
<td>36*</td>
<td>7</td>
<td>0</td>
<td>2*</td>
</tr>
<tr>
<td>Group R₂</td>
<td>18</td>
<td>17</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Group R₃</td>
<td>25*</td>
<td>16</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Group M</td>
<td>24</td>
<td>16</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Data are number of patients – the total number in each group was 45. *P < 0.05 vs. placebo.

There were no differences between the different groups regarding gender although the number of female patients were different between the different groups (Table 1). The incidence of injection pain in the different groups and their distribution are given in Table 2. The overall incidence of pain on injection of propofol was 20% (n = 9, P < 0.0001) in Group R₁, 60% (n = 27, P = 0.5) in Group R₂, 44% (n = 20, P = 0.033) in Group R₃, 47% (n = 21, P = 0.054) in Group M and 69% (n = 31) in the placebo group. The incidence of pain was lowest in Group R₁. Using Fisher’s exact test we found a significant reduction in the incidence of pain on injection of propofol in Groups R₁ and R₃ compared with placebo (P < 0.05) (Table 2). The incidence of severe pain was 4% (n = 2, P = 0.02) in Group R₁, 11% (n = 5, P = 0.2) in Group R₂, 7% (n = 3, P = 0.06) in Group R₃, 7% (n = 3, P = 0.06) in Group M and 22% (n = 10) in the placebo group. There was a significant reduction in the overall incidence of pain from propofol injection in Groups R₁ and R₃, and a significant reduction in the severity of pain in Group R₁ compared with placebo. Remifentanil injection 1 µg kg⁻¹ min⁻¹ provided the most effective pain relief.

Administration of meperidine before propofol has previously been shown to reduce pain in the arm [4,5]. Some drugs with opioid activity have a local anaesthetic action and this includes the synthetic opioids of the phenylpiperidine series, meperidine, fentanyl and sufentanil. Remifentanil is also a member of the phenylpiperidine group and could have local anaesthetic effects on nerves.

It was reported that the incidence of pain was declined from 84 to 36% when 1 mg alfentanil was administered followed 15 s later by propofol [6]. It was also shown that alfentanil 30 µg kg⁻¹ given 30 s before propofol abolished pain on injection. Roehm and colleagues showed that the slow administration of remifentanil over 60 s before propofol injection is as effective as lidocaine 40 mg 1 min prior to propofol in reducing the incidence of injection pain [3]. We included a remifentanil 0.25 µg kg⁻¹ min⁻¹ group as a comparator with Roehm’s study. Roehm and colleagues found that the incidence of pain was 30.2%. In this study, we used the same doses of remifentanil in Groups R₂ and R₃ but Group R₃ differed by having a time interval of 1 min between administration of remifentanil and administration of propofol. Our suggestion is that the statistical difference between these two groups may depend on the time interval.

Mencke and colleagues used rocuronium for investigating local reactions and pain, and found that the incidence and the degree of withdrawal reactions in response to the injection of rocuronium were significantly higher in female than in male [7]. On the contrary, we showed that the local reactions and pain on injection are the same between female and male patients.

Opioid receptors are found both in the dorsal root ganglia, the central terminals of primary afferent nerves and in peripheral sensory nerve fibres and their terminals. The reduction in injection pain might be the interaction of remifentanil with peripheral µ-opioid receptors. The site of action of remifentanil in reducing pain on injection of propofol may be either central or peripheral. A central mechanism may be responsible in the results of Group R₃. The increased dose in Group R₁ would markedly increase the concentration of remifentanil and at this concentration, compared with placebo, remifentanil showed some...
analgesic effects in ameliorating propofol injection pain. In our previous study we administered 1 µg kg⁻¹ min⁻¹ remifentanil to unpremedicated patients before propofol and the incidence of pain was reduced from 64 to 32% [1]. In this study, the incidence of pain was 69% in the placebo group. In conclusion, an increased dosage or time interval of remifentanil might be the cause of the decreased injection pain of propofol.

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References

Age and survival after in-hospital cardiopulmonary resuscitation

EDITOR:
There are contradicting results regarding the prognostic importance of age after in-hospital cardiopulmonary resuscitation (CPR) [1]. Only few studies have investigated long-term survival of older patients after a cardiac arrest [2]. We aimed to assess age-related immediate and long-term survival after in-hospital CPR.

The medical records, including special resuscitation forms, of all 479 patients who underwent in-hospital CPR between 1994 and 1999 were retrospectively analysed. Patients who were resuscitated in the intensive care unit (ICU) or in the emergency department were excluded from the study. Of the remaining patients those with a primary cardiac arrest were identified. Cardiac arrest was defined as the absence of palpable pulses or other evidence of the absence of effective circulation requiring cardiac massage or defibrillation. The resuscitation effort was considered successful if there was a systolic blood pressure (BP) ≥80 mmHg at the end of the resuscitation effort.

The resuscitation team of the Weezenlanden hospital consists of physicians from the ICU and the department of cardiology, and specially trained nurses from both wards. Resuscitation forms were reviewed to determine details of the cardiac arrest, patient characteristics data, hospital stay and survival to discharge. In August 2000 the general practitioners (GPs) of the patients discharged from the hospital were contacted to ascertain the patients’ longer term outcomes. The collected outcome data were analysed for immediate survival, survival to hospital discharge and 1-yr survival. The population was dichotomized for further analysis at age ≥70 yr and age <70 yr.

The χ²-test was used to compare categorical data between survivors and non-survivors. Differences between group means were tested by two-tailed t-test. Fischer’s exact test was used if there was an expected cell value of <5. Survival functions were calculated using the Kaplan–Meier product limit method. Mantel–Cox (or log-rank) test was applied to evaluate the differences between survival functions. Statistical significance was defined as a P-value ≤0.05.

During the study period, a total of 282 patients fulfilled the criteria of primary in-hospital cardiac arrest. Main reason for exclusion was cardiac-respiratory insufficiency without cardiac arrest. The mean age was 69 ± 12 yr. One hundred and fifty-six patients (55%) were older than 70 yr. It concerned 173 males (61%) and 109 females (39%). Immediate survival was similar for younger and older patients: <70 yr 50.8% (64/126) vs. ≥70 yr 50.0% (78/156), P = 0.89. Survival to hospital discharge was higher in
younger patients: <70 yr 31.0% (39/126) vs. ≥70 yr 20.5% (32/156), P = 0.04, as was 1-yr survival: <70 yr 26.2% (33/126) vs. ≥70 yr 15.4% (24/156), P = 0.02.

Of the total initial survivors, 71 patients (50%) were discharged alive, and 80% of the discharged patients lived to 1 yr. Thus, the proportion of initial survivors who lived to 1 yr was 40%. Figure 1 shows 1-yr survival of the different age groups. Of the patients who were initially successfully resuscitated, 1-yr survival was significantly better (P = 0.03) in the group <70 yr.

The immediate outcome of resuscitation in our study is comparable with other reports, in which resuscitation was successful in 40–50% of the patients [3], even when heterogeneous groups of patients are included. Possibly, composition of the study population is less important for the immediate success rate of resuscitation.

Several studies show that survival to discharge is age dependent [4]. Particularly patients ≥70 yr had a decreased likelihood of leaving the hospital alive, as was the case in our study. However, others show that age is not predictive of survival [5] or, like Parish and colleagues [1] report that the relationship between age and survival depends on the rhythm at the start of resuscitation. They showed that age was negatively related to survival particularly when the initial rhythm was perfusing or pulseless electrical activity, and was positively related in case of supraventricular tachycardia.

The 1-yr survival in the older group of our study showed a less favourable outcome than in the younger group. This is in contradiction with the long-term outcome of the study of Bari and colleagues, which can possibly be explained by the difference in inclusion of intensive care patients, who have a less favourable outcome in all other studies as well. Multiple co-morbidities may be more important in older patients. In a study of resuscitated octogenarians only 11% of the patients could be discharged alive [6].

There are several important limitations to our study. Our primary goal was to identify whether age was an important factor related to outcome. We did not include the relation to several other factors, such as underlying disorders, unwitnessed cardiac arrest, location of cardiac arrest, pre-arrest history, number of direct current shocks and epinephrine doses, which have all been identified by other authors as predictive for survival after in-hospital cardiac resuscitation [7].

In conclusion, our study shows that the immediate outcome in patients ≥70 yr after resuscitation for in-hospital cardiac arrest is similar to that in younger patients, but that the 1-yr survival rate is worse. Patients who were discharged from the hospital had a good survival after 1 yr, with a moderately, but significantly better outcome in the younger group.

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Figure 1.
One-year survival of patients <70 yr and ≥70 yr after initial successful resuscitation on a general ward.
Improved face mask ventilation in the bearded patient

EDITOR:

Maintenance of airway patency and oxygenation are the main objectives of face mask ventilation. However, certain clinical and anatomical situations can make these difficult [1]. In particular, the presence of a beard impairs the seal between the face mask and the face, often making positive pressure ventilation ineffective even with high fresh gas flow and increased applied pressure on the patient’s face. Langeron and colleagues recommended the shaving of the beard before general anaesthesia [2]. This is unacceptable to most patients. We add a 5 mm layer of echography contact gel (Aquasonic 100; Parker Laboratories Inc., Fairfield, NJ) onto the edge of the mask and this improves the effectiveness of the ventilation in the presence of a beard. The viscous gel impregnates the hairs of the beard creating a semi-liquid joint that gives a better seal permitting the ventilation of the patient in security and comfort with neither air leakage nor excessive pressure on his face. This method is simple, fast, cheap and compatible with most face masks. The gel is water-soluble, has a neutral pH and is easily removed with a damp cloth. We do not know of any complication with the contact gel. We nevertheless take extra care to cover the eyes with a suitable material before the application of the gel and positive pressure ventilation.

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References