Sufentanil as a component of outpatient anesthesia

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Fifty ASA I and II patients were studied using a combination of sufentanil, atracurium, thiamylal and nitrous oxide for outpatient anesthesia. This technique provided rapid awakening with a time to open eyes of 1.76 minutes and a time to orientation of 7.91 minutes. The major disadvantage was the high incidence of nausea and vomiting (54%). Despite this side effect, patient acceptance was good.

As outpatient surgery gains popularity, there is an increasing need for reliable and potent but short-acting anesthetic drugs with minimal side effects. Sufentanil, in small doses, combined with thiamylal, nitrous oxide, oxygen and atracurium theoretically could provide such short, safe, effective anesthesia of predictable duration. The objective of this open study was to determine the efficacy and safety of this combination of drugs in patients who were expected to be admitted, operated upon and discharged from the hospital the same day.

Methods

Fifty ASA I and II patients between the ages of 14 and 64 scheduled as outpatients for gynaecological laparoscopy, arthroscopic surgery of the knee, or multiple odontectomies were studied. All patients were unpremedicated and were monitored with a blood pressure cuff, electrocardiogram and a MiniStim™ peripheral nerve stimulator. Inspired oxygen concentration was monitored with an Oxycheck™ in-line oxygen monitor. Blood pressure was measured approximately once every five minutes during surgery, but much more frequently at induction and emergence of anesthesia. The first blood pressure and pulse rate recorded in the operating room was considered to be the baseline reference value. Anesthesia was induced with sufentanil 0.4 µg/kg (diluted to 10 µg/ml), atracurium 0.4 mg/kg, and thiamylal 4.0 mg/kg, administered in that order within one minute.

The patients were then ventilated by mask with 50% nitrous oxide and 50% oxygen and tracheal intubation was performed when train of four was 80% depressed. Anesthesia was maintained with 67% nitrous oxide and 33% oxygen, and supplementary doses of sufentanil 0.1 µg/kg were administered if the blood pressure or pulse increased more than 15% over the preanesthetic level or if the patient moved. Additional atracurium was administered in a dosage of 0.1 mg/kg if the train of four returned to control or the patient moved. At the end of surgery, muscle relaxation was reversed, as necessary, with edrophonium 10-30 mg and atropine 0.4-1.2 mg until train of four returned to preoperative control levels. Awakening was considered to have occurred when the patient opened his or her eyes to spoken commands. Extubation was performed after the patient was awake with adequate tidal volume and respiratory rate. The patients were then transported to the recovery
room and evaluated there by nurses according to R.E.A.C.T. scores, a recovery room evaluation tool.

A follow-up phone interview was conducted with each of these patients 24 hours postoperatively to investigate the occurrence of nausea, vomiting and recall. Data collected was included in this study.

Results
In the patients studied, the induction of anesthesia was uneventful except for two cases of mild chest wall rigidity which resolved within 30 seconds with the onset of progressive neuromuscular blockade. Two patients had transient premature ventricular contractions (PVCs) at the time of intubation. Additionally, a mild rash proximal to the injection site occurred in four patients immediately after induction and resolved without treatment.

Cardiovascular parameters, as reported in Table I and Figure 1, were remarkably stable. The MAP increased on intubation from 90.8 to 97.8 torr, but returned to control by the time of incision. There was no significant change in pulse rate at intubation, although it decreased significantly from 77.8 to 61.8 BPM (p<.001) after incision. There were six cases of mild intraoperative hypertension (>10% rise in MAP over baseline) having a mean increase of 17 torr. This hypertension was not responsive to supplemental doses of sufentanil.

In all cases, the initial dose of 0.4 μg/kg was sufficient for the first 40 minutes of surgery. After 40 minutes, supplementation was necessary and, by 60 minutes, all patients had received at least one supplementary dose of 0.1 μg/kg, for a mean total dose of 0.53 μg/kg/hr. An average of 1.18 supplements per hour were required. A breakdown of the three procedures is shown in Table II. There was no significant difference in doses required between the three procedures.

Table I
Hemodynamic responses

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<tbody>
<tr>
<td>SYST torr</td>
<td>121.5±19.4</td>
<td>109.9±19.2</td>
<td>127.4±20.8</td>
<td>118.7±21.5</td>
<td>140.2±18.9</td>
<td>130.3±20.4</td>
<td>143.3±25.0</td>
<td>134.9±16.1</td>
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<tr>
<td>DIAST torr</td>
<td>75.5±10.3</td>
<td>70.3±11.6</td>
<td>83.0±12.7</td>
<td>80.1±12.8</td>
<td>91.6±9.5</td>
<td>87.3±9.8</td>
<td>91.7±10.2</td>
<td>77.5±8.8</td>
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<tr>
<td>PULSE bpm</td>
<td>77.8±16.4</td>
<td>77.6±16.6</td>
<td>79.2±18.7c</td>
<td>61.8±8.5b</td>
<td>71.0±17.1</td>
<td>57.5±7.9</td>
<td>94.3±19.2</td>
<td>91.6±14.9b</td>
</tr>
<tr>
<td>MAP torr</td>
<td>90.8±12.0</td>
<td>83.5±13.6</td>
<td>97.8±14.8b</td>
<td>93.0±14.9c</td>
<td>107.8±11.2</td>
<td>101.7±12.8</td>
<td>108.9±14.3</td>
<td>96.7±9.3b</td>
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</tbody>
</table>

Data given as mean ± SD. Baseline = first measurement on arrival in O.R.
Post induc. = immediately after induction.
Post intub. = immediately after intubation.
Post incis. = immediately after incision.
Pre supp. = immediately before supplemental sufentanil.
Post supp. = 3-5 minutes after supplementation.
Post ex tub. = immediately after extubation.
Recov. room = first BP upon arrival.

Student’s T-test
a p <.001 significantly different from control
b p <.01 significantly different from control
c not significantly different from control
After the discontinuation of N₂O, awakening occurred in an average of 1.76 minutes. Orientation, the point at which the patient was aware of person and place, usually occurred in the operating room in an average of 7.91 minutes (Table II). There was only one case of postoperative respiratory insufficiency which was treated with 0.2 mg of naloxone after extubation in the operating room. R.E.A.C.T. scores were 9 or 10 in all cases on admission to the recovery room. No further narcotic administration was required for pain. However, one patient did appear dysphoric and agitated for about ten minutes.

Postoperative nausea occurred in 54% of these patients with emesis occurring in 44%. (Table III). The authors of this article considered that laparoscopy and odontectomy would be associated with a higher incidence of nausea and vomiting as compared to arthroscopy; however, this was found not to be the case as seen in Table III.

Follow-up phone conversations with these patients indicated that 48 of them were pleased with the anesthetic. Of the other two, one suffered emesis while being driven home and the other complained of feeling “washed out” for several days. Patients were questioned about their awareness during the procedure, a concern due to the small doses of sufentanil used. In no case did any patient have any recall.

Discussion

Most previous reports of the clinical use of sufentanil are based upon the administration of large doses (up to 30 μg/kg) for cardiac and neurosurgery.2 Smaller doses of 1-2.6 μg/kg have also been used effectively for general surgery.3 The authors’ induction dose of sufentanil of 0.4 μg/kg was clearly sufficient to provide analgesia for short surgical procedures, but supplementation of 0.1 μg/kg one or more times was required in longer cases. This mean dose of 0.53 μg/kg for an average 60.1 minute case is still less than doses reported in previous studies. It appears that sufentanil better suppresses the effects of surgical stimulation, which is reflected in lower median norepinephrine levels.4

Stable cardiovascular parameters with sufentanil have been reported previously. Flacke found significantly lower rate pressure products and catecholamine levels with sufentanil, as compared to fentanyl, meperidine or morphine.5 The reported decrease in pulse rate in the authors’ study is statistically significant but neither altered the course of surgery nor required treatment.

Even though these patients received such low doses of sufentanil, analgesia persisted throughout the recovery room period without significant respiratory depression. This profound, long-lasting analgesic effect of sufentanil has been reported previously by Clark et al.6 Only one patient out of the 50 studied required naloxone. Because hypertension, ventricular arrhythmias, pulmonary edema, and cardiac arrest can occur with the administration of naloxone, the authors feel that a low dose sufentanil technique which minimizes the use of naloxone is advantageous.

Atracurium was used instead of succinylcholine to avoid the well-known incidence of myalgia. Post-succinylcholine myalgia as high as 89% has been reported, depending on the patient population studied and 66% in outpatients.7 The authors agree with Ghoneim that patient movement can occur without warning4 and feel adequate neuro-

### Table III

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Number of cases</th>
<th>Nausea</th>
<th>Vomiting</th>
</tr>
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<tbody>
<tr>
<td>Arthroscopy</td>
<td>20</td>
<td>11 (55.0%)</td>
<td>10 (50.0%)</td>
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<tr>
<td>Laparoscopy</td>
<td>17</td>
<td>10 (58.8%)</td>
<td>7 (41.2%)</td>
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<tr>
<td>Odontectomy</td>
<td>13</td>
<td>6 (46.2%)</td>
<td>5 (38.5%)</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>27 (54.0%)</td>
<td>22 (44.0%)</td>
</tr>
</tbody>
</table>

### Table II

<table>
<thead>
<tr>
<th>Anesthesia time minutes</th>
<th>Average weight kg</th>
<th>Average total sufentanil μg/kg</th>
<th>Average total sufentanil μg/oper</th>
<th>Time to awakening minutes</th>
<th>Time to orientate minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arthroscopy</td>
<td>79.5 ±18.4</td>
<td>63.0 ±15.9</td>
<td>0.59 ±.11</td>
<td>49.25 ±11.23</td>
<td>1.28 ±1.04</td>
</tr>
<tr>
<td>Laparotomy</td>
<td>44.6 ±11.6</td>
<td>63.2 ±12.4</td>
<td>0.44 ±.05</td>
<td>27.95 ±5.40</td>
<td>1.63 ±0.85</td>
</tr>
<tr>
<td>Odontectomy</td>
<td>50.8 ±18.4</td>
<td>62.8 ±12.6</td>
<td>0.54 ±.09</td>
<td>33.92 ±9.13</td>
<td>2.36 ±1.40</td>
</tr>
<tr>
<td>Total</td>
<td>60.1 ±22.7</td>
<td>71.0 ±16.9</td>
<td>0.53 ±.11</td>
<td>38.02 ±13.0</td>
<td>1.68 ±1.18</td>
</tr>
</tbody>
</table>
muscular blockade as monitored by peripheral nerve stimulator is an essential element of this technique.

The greatest advantage of sufentanil for outpatient surgery is the short time to awakening. Pollard's "Clinical Evaluation of IV vs. Inhalation Anesthesia in Ambulatory Surgery Units" found that times to awakening and orientation were both significantly shorter with fentanyl than with isoflurane anesthesia. The authors' data suggests that sufentanil, as an alternative for outpatient anesthesia, produces shorter awakening times (1.8 vs. 4.7 min), and shorter times to orientation (7.9 vs. 9.1 min) when compared to Pollard's study with fentanyl.

(Table II)

The greatest disadvantages of this anesthetic technique seem to be nausea and vomiting. Ep-stein reported 40.5% nausea and 32.4% emesis with fentanyl, somewhat less than reported here. Wetchler reported that droperidol has proved to be effective when low dosages (0.625-1.25 mg) are used in reducing recovery time and incidence and severity of emesis when administered intra-anesthetically. Therefore, droperidol would seem to be a valuable addition to the authors' sufentanil technique. Alexander showed that patients who received nitrous oxide and fentanyl had a significantly greater incidence of nausea and emesis than patients who had received either the combination of isoflurane and fentanyl or just isoflurane alone, and they concluded that the nitrous oxide may play a significant role in the production of this nausea and emesis.

The local rash seen immediately post-induction is thought to be due to the well-known histamine-releasing property of atracurium, or possibly the thiamylal, as sufentanil does not cause an elevated plasma histamine level.

Conclusion

The combination of sufentanil, thiamylal, atracurium and N2O/O2 is a safe, reliable anesthetic for short surgical procedures, providing a smooth intraoperative course and rapid awakening. One disadvantage of this technique, however, is the high incidence of nausea and emesis. Nonetheless, patient acceptance was excellent.

Further study is planned to utilize this low dose sufentanil technique with droperidol and with isoflurane (Forane®) and O2 to reduce this incidence.

REFERENCES


AUTHORS

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