Parental Satisfaction With AnesthesiaWithout Intravenous Access for Myringotomy

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Objective: To evaluate the effect of intravenous (IV) access in children undergoing bilateral myringotomy with pressure-equalizing tube placement.

Design: One hundred healthy children were enrolled in this randomized controlled study. One group received IV access; the other group did not. Anesthesia in both groups was induced through a mask and maintained with oxygen, nitrous oxide, and sevoflurane. Spontaneous ventilation was maintained. All children received fentanyl, 1 µg/kg intramuscularly. Children with IV access received 20 mL/kg of lactated Ringer’s solution. Parents were telephoned the day after surgery to report on pain and vomiting, as well as their satisfaction with anesthesia.

Setting: Tertiary care children’s hospital with all procedures performed by attending pediatric otolaryngologists and otolaryngology residents. Anesthesia was administered by a pediatric anesthesiologist and a trainee.

Results: The groups were similar in age, weight, and incidence of vomiting. Children with IV access spent more time than those without (mean ± SD minutes) in the operating room (21 ± 8 vs 17 ± 7; \( P = .02 \)), in phase 2 recovery (75 ± 67 vs 51 ± 24; \( P = .02 \)), and in the hospital (119 ± 67 vs 88 ± 30; \( P = .005 \)). These children also required more pain medication (31% vs 2%; \( P < .001 \)) and had a lower parental satisfaction rate (28% vs 95%; \( P < .001 \)).

Conclusions: Intravenous access in otherwise healthy children undergoing myringotomy provided no added benefit. Children without IV access had reduced pain requirement and spent less time in the operating room, in phase 2 recovery, and in the hospital. Parental satisfaction, a clinically relevant outcome, was significantly greater for parents of children without IV access.

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Many factors affect the satisfaction of parents and their children undergoing minor surgery such as bilateral myringotomy with pressure-equalizing tube placement (BMT). These include postoperative vomiting (POV), intravenous (IV) placement, postoperative pain, and time spent in the hospital. The presence or absence of an IV catheter can affect all of these variables. Intravenous access allows perioperative fluid and drug administration but can result in discomfort, subcutaneous infiltration, and possible parental dissatisfaction if numerous venipunctures were required. The absence of IV access often results in earlier discharge because oral fluids and medication can be given at home.

Postoperative vomiting is a common problem after surgery. The overall incidence is 35%\( ^1 \) and usually occurs on the first postoperative day but can occur up to 7 days later. Several factors are known to affect the incidence of POV, including age, type of surgery, postoperative care, medications, coexisting diseases, history of POV, and anesthetic management. The age at which children are most likely to develop POV is 2 to 12 years.\(^2\) Postoperative vomiting is common after adenotonsillectomy, orchiopexy, and after strabismus, gastrointestinal, and otologic surgical procedures.\(^3\) Obesity, gastroparesis, female sex, motion sickness, preoperative anxiety, opioid analgesics, and the duration of anesthetic all increase the incidence of POV.\(^4\) Postoperative vomiting interferes with oral medication and intake, delays ambulation, increases length of hospital stay, and is one of the most common causes of unplanned postoperative hospital admissions.

There are several ways to decrease POV. These include gastric suctioning to...
relieve distension, avoidance of selected anesthetic agents such as nitrous oxide and opioids, and withholding oral fluids postoperatively. Aggressive IV hydration and adequate pain control may also decrease POV.

Institutions vary greatly as to the presence or absence of IV access for a straightforward, short case such as BMT. Many institutions routinely place IV access for all surgical procedures. In our institution, we had 2 groups of pediatric anesthesiologists: those who routinely placed IV catheters and those who rarely placed IV catheters for BMT.

The purpose of this study was to assess whether the presence of IV access, or lack thereof, affects the incidence of POV, postoperative pain, and length of hospital stay. Parental satisfaction was also assessed as a measure of perioperative outcome.

Methods

Patient Selection

After receiving institutional review board approval and informed consent, 100 children aged 2 to 12 years undergoing BMT at Children’s Hospital of Michigan, Detroit, were enrolled in this randomized controlled study. Only healthy children (American Society of Anesthesiologists’ classification [ASA] 1) or those with mild systemic disease (ASA 2) were enrolled. Children younger than 2 years were excluded because of the decreased incidence of nausea and vomiting in this age group, as well as the difficulty in distinguishing emergence delirium and pain in this age group. High-risk patients with a severe systemic disease that limits activity (ASA 3) or a constant threat to life (ASA 4) were excluded from the study. Children including those with airway problems, multisystem disease, or cardiac disease were also excluded, since they may benefit from placement of an IV catheter in case of an emergency. Any child with an allergy to fentanyl, a history of severe POV, or who needed IV medication was excluded.

Study Design

All children received general anesthesia with sevoflurane, nitrous oxide, and oxygen by mask as is routinely done for BMT. The surgical procedures were performed by attending pediatric otolaryngologists or otolaryngology residents with various levels of training with supervision. All children received fentanyl, 1 µg/kg intramuscularly, for pain. To maintain consistency between the study groups, intramuscular fentanyl was used even in those patients who had IV access. Random number tables were used to randomize patients into 2 groups. Group 0 had no IV access, and group 1 had IV access and received a bolus of lactated Ringer’s solution, 20 mL/kg IV, which was started in the operating room and completed in the postoperative care area.

Observations and Measurements

Results were recorded by a research nurse. An objective pain scale (Table 1) was used to assess postoperative pain and the need for additional pain medications. A total pain score of 5 or greater was considered significant, requiring analgesic administration. Postoperative pain was treated with codeine, 0.5 mg/kg by mouth (group 0) or 0.25 mg/kg IV (group 1), and acetaminophen, 15 mg/kg by mouth. Blood pressure, heart rate, respiratory rate, oxygen saturation, and pain scores were recorded every 5 minutes in the recovery room. Additional pain medication, time in the operating room, time in the recovery room, time in the wake-up room, time to first oral intake, time until ready for discharge, and actual discharge time were recorded. Parents were contacted by telephone 24 hours after the procedure by the same research nurse, to assess the child’s and parents’ satisfaction with the presence or absence of IV access as well as to document any additional vomiting or oral pain medication. The nurse and parents were aware of the IV status of the child. The parents were only asked whether they were happy with the presence or absence of IV access. Their answer was limited to yes, no, or unsure.

Statistical Analysis

Age, weight, blood pressure, heart rate, and respiratory rate were analyzed using the t test. Time, including operating room time, recovery room time, wake-up room time, time to first oral intake, and time to discharge, was analyzed using the t test. Objective pain scores, parental satisfaction, the presence of vomiting (yes/no), and ear pain (yes/no) were analyzed using the Fisher exact and χ² tests. Data are reported as mean ± SD value or proportion of patients. Statistically significant differences between either means or proportions were considered achieved at P ≤ .05, 2-tailed.

Results

One hundred eligible patients were included in this study. Between group 1 and group 0 there were no significant differences in age (4.9 ± 3.0 years vs 4.9 ± 3.2 years), sex, weight (18.8 ± 9.0 kg vs 21.3 ± 12.0 kg), and incidence of POV (23% vs 21%). Table 2 shows that children with IV access (group 1) spent more time than those without in the operating room (21 ± 8 vs 17 ± 7 minutes; P = .02) and in phase 2 recovery (75 ± 67 vs 51 ± 24 minutes; P = .02). We did not wait for IV access, though, to begin the procedure. Children in group 1 spent a significantly longer time in the

### Table 1. Objective Pain Scale

<table>
<thead>
<tr>
<th>Pain Scale Item</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood pressure*</td>
<td>0</td>
</tr>
<tr>
<td>10% Higher</td>
<td>1</td>
</tr>
<tr>
<td>10%-20% Higher</td>
<td>2</td>
</tr>
<tr>
<td>Crying</td>
<td>0</td>
</tr>
<tr>
<td>Not crying</td>
<td>2</td>
</tr>
<tr>
<td>Crying, not respond to comforting</td>
<td>2</td>
</tr>
<tr>
<td>Crying, no response to comforting</td>
<td>2</td>
</tr>
<tr>
<td>Moving</td>
<td>2</td>
</tr>
<tr>
<td>None</td>
<td>0</td>
</tr>
<tr>
<td>Restless</td>
<td>1</td>
</tr>
<tr>
<td>Thrashing</td>
<td>2</td>
</tr>
<tr>
<td>Agitation</td>
<td>0</td>
</tr>
<tr>
<td>Asleep or calm</td>
<td>0</td>
</tr>
<tr>
<td>Mild</td>
<td>0</td>
</tr>
<tr>
<td>Hysterical</td>
<td>0</td>
</tr>
<tr>
<td>Verbal</td>
<td>0</td>
</tr>
<tr>
<td>Asleep or state no pain</td>
<td>0</td>
</tr>
<tr>
<td>Mild pain (can localize)</td>
<td>1</td>
</tr>
<tr>
<td>Moderate pain (can localize)</td>
<td>2</td>
</tr>
</tbody>
</table>

*Compared with preoperative blood pressure.

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The most common surgical procedure performed in the United States on children is BMT. Although anesthetic complications can affect the outcome of BMT, a recent study confirmed a very low rate of perioperative complications. One of the most common perioperative complications that patients experience is POV. The POV rate of approximately 20% for our study may appear high; however, it represents a 24-hour POV rate in an age group (2-12 years) that is high risk. Very few physicians follow-up to actually calculate the incidence of POV for 24 hours after the child leaves the hospital. About half of the children in this study and other studies vomit at home vs in the hospital. Although, perioperative hydration has been shown to decrease POV, the incidence was essentially the same in both groups of our study. This would appear to negate one potential benefit of IV access. Intravenous access increased objective pain scores in group 1 and seemingly contributed to the increased incidence of postoperative pain. The mere presence of IV access can cause a child to become agitated and even inconsolable. This may also have contributed to the decreased satisfaction in parents whose children had IV access. The marked increase in operating room time, time in phase 2 recovery, and total time in the hospital may also have contributed to the decreased parental satisfaction in group 1. Furthermore, this increased time decreases the efficiency of delivery of care at the institution as well as the cost-effectiveness of providing this service to patients.

Pain following BMT is real and not just associated with the mere presence of IV access. In fact, Watcha et al. reported that when an inhaled anesthetic technique is not supplemented by an analgesic, up to 76% of children undergoing BMT required pain relief in the early postoperative period. Pain after BMT is often associated with external auditory canal lacerations. A small but equal number of patients experienced lacerations of the external auditory canal in both study groups. Lacerations are more common in a training institution where residents early in their training perform many of these surgical procedures with supervision. As a training institution with many residents, we have made the decision to provide adequate pain relief for all patients in a prospective fashion.

It is difficult to distinguish some aspects of emergence delirium from actual pain. Cravero et al. showed that (1) emergence agitation occurred commonly in patients who received sevoflurane, even without a painful procedure and (2) the incidence of delirium is markedly decreased by the administration of fentanyl. This study was designed to evaluate the efficacy of IV access. To maintain consistency between the study groups, intramuscular fentanyl was used even in those patients who had IV access so that the same route of administration of opioid could be used in both arms of the study. Our goal was to notice any difference based on the placement of an IV catheter, not the route of opioid administration.

Many different agents have been evaluated for the treatment of pain after BMT. Rectal acetaminophen may be sufficient for some patients; however, it has a delayed onset of action and needs to be given well before the procedure to treat pain immediately after BMT. Malat et al. showed that intramuscular fentanyl decreased postoperative pain following BMT in children. Tobias et al. showed that acetaminophen with codeine provided better pain relief than acetaminophen alone after BMT.

As physicians, we continually strive to improve the quality of care we deliver as well as improve the quality of our patients’ lives. Recent studies have shown that the quality of life in children with otitis media has been improved following BMT. Parental satisfaction can be either directly or individually linked to this improved quality of life considering that most caregivers, if given the choice, would again have their children undergo BMT. A small but significant part of care, such as IV access or lack thereof, can greatly affect the child’s hospital stay and the parent’s satisfaction.

The establishment of IV access in ASA 1 or ASA 2 children undergoing BMT provided no added benefit. On the contrary, children without IV access had lower postoperative pain scores, reduced opioid requirements, and spent less time in the operating room, in phase 2 recovery, and in the hospital. Intravenous access did not decrease POV. Parental satisfaction, a clinically relevant outcome, was significantly greater for parents of children who did not receive IV access.

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REFERENCES


Correction

Error in Figure Label. In the original article titled “An Animal Model for Cochlear Implants,” published in the May issue of the ARCHIVES (2004;130:499-508), the time units in Figure 7 were mislabeled. The correct time units are microseconds. Additionally, the last sentence of the legend for Figure 7 should have read as follows: “Note that the clipped stimulus artifact remains constant, while the peaks corresponding to neural activity in the cochlea between 200 and 800 microseconds after stimulus onset grow with the size of the stimulus.”