Intravenous home hydration in pediatric patients following adenotonsillectomy

Albert H. Park *, Helen Kim

Department of Otolaryngology—Head and Neck Surgery, Loyola University Medical Center, 2160 S. 1st Avenue, Maywood, IL 60153, USA

Received 22 October 2001; received in revised form 17 April 2002; accepted 21 April 2002

Abstract

Objective: To determine the feasibility, safety and efficacy of intravenous home hydration for pediatric postoperative adenotonsillectomy patients. Method: Nonrandomized control trial of two groups of pediatric patients following adenotonsillectomy—one with (H) and one without postoperative home intravenous hydration (WH). Setting: A tertiary care, university-based children's hospital. Intervention: Administration of 25 cm$^3$ kg$^{-1}$ of Lactated Ringer's solution once a day for 3 days via an intravenous catheter. Results: Three of 22 patients in the (WH) group and none of the 25 patients in the (H) group required an emergency room admission for dehydration. Difficulty swallowing and activity level were found to be statistically different based on $\chi^2$-analysis ($P<0.05$). The hydration group (H) had a greater swallowing difficulty score (1.4) compared with the nonhydration (WH) group (0.06). The (H) group had a lower activity score (0.2) compared with the (WH) group. Other parameters such as duration of pain, the severity of pain, days until oral feeds could be taken without difficulty, degree of dysphagia, degree of neck, throat, tongue and ear pain were not statistically different between the two groups based on $\chi^2$-analysis ($P<0.05$). There were no complications associated with intravenous hydration. Conclusion: Increased efficacy from intravenous hydration was not shown based on a number of parameters. Selected patients with a high likelihood to develop dehydration or medically intractable emesis may benefit from intravenous hydration and may avoid emergency room or hospital admission. Bolus infusions of 25 cm$^3$ kg$^{-1}$ of Lactated Ringer’s solution by home care nursing can be implemented safely in pediatric patients. © 2002 Elsevier Science Ireland Ltd. All rights reserved.

Keywords: Home hydration; Pediatric patients; Adenotonsillectomy

1. Introduction

The morbidity following adenotonsillectomy is significant [2–4]. Almost all children who undergo this procedure require oral analgesics to control postoperative pain and often struggle to maintain adequate hydration. A minority of these patients cannot take sufficient fluids and require admission to an emergency room. The financial cost, hours waiting, psychological trauma and burden of traveling are a few of the negative factors families note after the ordeal.

An alternative method came about from our experience sending hospitalized patients home...
with intravenous medication. This method involves sending the child home with a heplock, having a nurse visit the child’s home, and administering intravenous fluids once a day for 3 days. The potential advantage to the child and family would include reduced need for oral fluids, avoiding additional odynophagia with oral intake, improved hydration and fewer emergency room admissions.

2. Materials and methods

This pilot study investigated the efficacy of intravenous home hydration for pediatric postoperative adenotonsillectomy. A nonrandomized control trial of two groups of pediatric patients following adenotonsillectomy was studied: one with and one without postoperative intravenous home hydration.

The patients who made up the hydration group included only those whose families wished to utilize postoperative home hydration because of concerns regarding postoperative nausea or fluid intake. The typical child had a history of poor oral intake or excessive nausea or emesis. The surgical technique utilized for both groups was identical. Adenoids were removed using a curette. Tonsils were removed utilizing monopolar electrocautery. Postoperatively, the patients were admitted to the pediatric floor then discharged the following morning.

Patients who made up the hydration group had the intravenous catheter heplocked prior to discharge to home. The family was informed of proper catheter care: covering the catheter at all times and learning how to deal with a dislodged catheter. The control group patients had their intravenous catheter removed prior to discharge to home.

The home care nurse visited the hydration group once a day for 3 days. She inspected the IV site, reinforced IV care issues then infused Lactated Ringer’s solution (25 cm$^3$ kg$^{-1}$ h$^{-1}$) for 2 h. She also recorded pain, nausea, oral intake, activity and vital signs. An ENT research nurse called the nonhydration group to inquire about pain, nausea, emesis, activity and oral intake. Efficacy was evaluated using clinical measures of oral intake, pain, nausea, emesis and activity during the postoperative period. Instances when patients required an emergency room or hospital admission, and complications were also recorded.

3. Results

Forty-seven consecutive patients younger than 18 years of age who underwent adenotonsillectomy were studied. $\chi^2$-Analysis yielded no statistical difference between the two groups based on age, indication for surgery, adenoid or tonsil size. Age distribution was 1.5–9.5 years in the hydration and 1.5–15.5 years in the control group. All 22 patients in the nonhydration and 23/25 patients in the hydration group underwent tonsillectomy and adenoidectomy; two patients in the hydration group underwent tonsillectomy alone. Twenty-one/22 of the nonhydration and all 25 patients in the hydration group were administered 0.5% naropin (Astra-Zeneca) injection into the tonsillar fossa following tonsillectomy. Seventeen/22 of the nonhydration and 23/25 of the hydration group were given 1 mg kg$^{-1}$ of decadron during surgery.

On the third postoperative day, several parameters were measured. $\chi^2$-Analysis ($P < 0.05$) found no statistically different values between the hydrated and nonhydrated groups with respect to ability to take oral feedings, ability to take soft or solid foods, quantity of oral intake, frequency of urination, degree of dysphagia, degree of neck, throat, tongue and ear pain and activity level. Nausea was reported in one patient (5%) in the nonhydration group and nine patients (36%) in the hydration group. No patient in the nonhydration group had emesis; four patients in the hydration group had emesis.

By the seventh postoperative day, various parameters such as ability to take oral feedings, ability to take soft or solid foods, quantity of oral intake, frequency of urination, degree of neck, throat, tongue and ear pain were not statistically different between the two groups based on a $\chi^2$-analysis ($P < 0.05$). Difficulty swallowing and activity level were found to be statistically different based on $\chi^2$-analysis ($P < 0.05$) as shown in Fig. 1. Difficulty
swallowing was assessed based on a four point scale (0/3). The hydration group had a greater swallowing difficulty score (1.4) compared with the nonhydration group (0.6). The activity score was measured on a two point scale (0, limited activity; 1, normal activity). The hydration group had a lower activity score (0.2) compared with the nonhydration group (0.6).

The duration of pain, the severity of pain (based on scale 0–10), the days until the patient was able to take oral feeds without difficulty, the days until dysphagia resolved and the days until full activity is resumed were not statistically different between the two groups based on $\chi^2$-analysis ($P < 0.05$). Values for each group are shown in Table 1. Three of 22 patients (14%) in the nonhydration group and none of the 25 patients with hydration required an emergency room admission for dehydration. There were no complications associated with the intravenous hydration.

Below is a typical case history of a patient who became dehydrated following adenotonsillectomy. A 3-year and 6-month-old child underwent a tonsillectomy and adenoidectomy for obstructive sleep apnea. Intraoperative findings were notable for 3+ sized tonsils and 3+ sized adenoids. The adenoids were removed using a curette; the tonsils were removed via monopolar cautery. On the first postoperative day, he was able to ingest 14 oz of fluids and soft foods. Tylenol with codeine was provided for analgesia. Unfortunately, by the fourth postoperative day, his oral intake dropped dramatically, and he was refusing to take the Tylenol with codeine. His urination output dropped, and he was admitted to the emergency room. He received 400 cm$^3$ of Lactated Ringer’s solution per hour for 2 h. The heplock was subsequently removed, and he was discharged to home. By the sixth postoperative day, his dysphagia subsided, and he was able tolerate fluids without difficulty.

Below is a typical case history of a patient who was administered intravenous hydration following tonsillectomy. A 15-year-old female underwent a tonsillectomy for recurrent tonsillitis and two episodes of peritonsillar abscesses. Both peritonsillar abscesses required intraoral incision and drainage. Intraoperative findings were notable for tonsils that were very adherent to the underlying muscular fossa presumably from recurrent infection. Monopolar cautery was used to dissect the tonsils away from the pillars. She was observed overnight and infused Lactated Ringer’s solution at 100 cm$^3$ h$^{-1}$. She was subsequently discharged to home with a heplock on the first postoperative day.

A home care nurse administered 1000 cm$^3$ of Lactated Ringer’s solution once a day. Oral intake was less than 10 oz for the first 3 days. Because of her poor intake, the original heplock was replaced by another one on the third postoperative day. She continued to require daily infusions until the seventh postoperative day. By then, her oral intake dramatically improved, and her dysphagia lessened. The heplock was removed, and she required no further nursing visits.
4. Discussion

The motivation for intravenous hydration came about from a desire to decrease postoperative morbidity following adenotonsillectomy. The rationale for this approach is to 'rest' the throat by not requiring oral intake while intravenous fluids are being administered. Since an intravenous catheter can be utilized for 4 days, the protocol for this approach involved leaving the intraoperatively placed catheter in place when the child was discharged.

This pilot study did not illustrate an increased efficacy from intravenous hydration based on a number of parameters. The ability to take oral feeds, the ability to take soft or solid foods, the quantity of oral intake, the frequency of urination, the degree of neck, throat, tongue and ear pain were not found to be statistically different between the hydration and nonhydration groups based on a χ²-analysis. Difficulty swallowing and activity level by the seventh postoperative day were statistically different and favored the nonhydration group.

Blakeslee et al. studied 120 healthy children who were referred for tonsillectomy [1]. Sixty patients returned home without IV hydration (group 1); 60 patients returned home with IV hydration (group 2). It is unclear whether these children were randomized. They did note that group 2 patients had less trismus, less weight loss, less halitosis, less nausea and vomiting, better oral intake, better pain control, fewer days of convalescence and less otalgia. Statistical analysis showed a significant difference favoring group 2 for nausea and vomiting (P = 0.01).

A reason for the discrepancy in our results compared with those by Blakeslee et al. may be that our patients were not randomized. The hydration group was made up of patients believed to be at high risk to develop postoperative dehydration during preoperative counseling. Some of these patients also had associated abnormalities (e.g. Downs syndrome, craniofacial anomalies) and make up a different patient group compared with Blakeslee et al. Another difference is that Blakeslee et al.’s hydration group underwent continuous infusion of 5% dextrose in Ringer’s Lactate between 60 and 120 cm³ h⁻¹. We felt that a bolus infusion through a heplocked catheter would be easier for patients and families to tolerate.

The hydration group did not require an emergency room admission for dehydration. Three of the 22 patients in the nonhydration group required admission. Blakeslee et al. noted fewer patients in hydration group required a hospitalization. They did not clarify the reason for the admission (e.g. dehydration, hemorrhage, emesis). The financial advantage is obvious when one considers the significant cost for an emergency room evaluation, intravenous catheter placement and hydration. The cost for a home nurse evaluation, heplock care and infusion of Lactated Ringer’s solution is $100 per day. This cost was less for two families whose mothers were nurses.

When patients were evaluated 2–3 weeks following surgery, almost 50% noted without solicitation the beneficial effects of intravenous hydration. Intangible advantages of hydration included additional family education by the home care nurses regarding recommended analge-

### Table 1

The two groups were compared with respect to the duration of pain, severity of pain (based on a scale 0–10), days until able to take oral feeds without difficulty, days until dysphagia resolved and days until full activity is resumed.

<table>
<thead>
<tr>
<th>Group</th>
<th>Duration pain (days)</th>
<th>Severity pain (0–10)</th>
<th>Days until po intake ok</th>
<th>Days until no dysphagia</th>
<th>Days full activity resumed</th>
</tr>
</thead>
<tbody>
<tr>
<td>No hydration</td>
<td>7.8</td>
<td>8.2</td>
<td>5.5</td>
<td>8.9</td>
<td>8.4</td>
</tr>
<tr>
<td>Hydration</td>
<td>9.0</td>
<td>8.9</td>
<td>4.8</td>
<td>10.1</td>
<td>10.1</td>
</tr>
<tr>
<td></td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
</tbody>
</table>

All the parameters were found to be NS or not statistically significantly different based on χ²-analysis (P < 0.05).
sia dosing, strategies for optimal oral intake, treatment for fever, neck, throat of tongue pain. Home care nurses were also invaluable in communicating potential concerns to the physician with respect to hydration, nausea, emesis, respiratory status and compliance to analgesia utilization.

A potential adverse effect of home hydration includes catheter infection, hemorrhage from an open catheter or premature kinking or dislodging. There were no complications from the intravenous hydration group. Families were extensively counseled regarding potential catheter problems by the nursing staff in the recovery room and by the home care nurses. The site was carefully secured with tape and tagaderm. The home care nurses inspected the catheter site for erythema, induration and stability at every visit.

As a result of this pilot study, we have begun to expand the use of home intravenous hydration to include patients who were not sent home initially with a catheter. Patients who undergo adenotonsillectomy and cannot drink at home secondary to dysphagia and/or nausea and emesis are told to return to the ambulatory surgery center. Previously these patients were seen in the emergency room for hydration with a significant burden to the family with respect to cost and wait ($1000–1500). Recently, a pediatric anesthesiologist places an intravenous heplock and administers Lactated Ringer’s solution. The family is informed of proper catheter care, and the child is sent home with the catheter. A home care nurse then visits the family and infuses the Lactated Ringer’s solution once a day for the next 3 days.

Third party reimbursement was not a problem. Notification to the patient’s insurance company and home care service was usually initiated on the day of surgery. For patients following adenotonsillectomy who required a return visit to the ambulatory surgery center for hydration, notification to the insurance company and home care service was initiated prior to the visit. Insurance companies were willing to accept the intravenous hydration protocol since it obviated additional inpatient hospitalization.

In conclusion, the universal use of intravenous hydration cannot be recommended for pediatric patients undergoing adenotonsillectomy. Selected patients with a high likelihood to develop dehydration or repeated medically intractable emesis may benefit from intravenous hydration and avoid emergency or hospital admission. Bolus infusions of 25 cm$^3$ h$^{-1}$ of Lactated Ringer’s solution by home care nursing are safe and can be implemented in pediatric patients.

Acknowledgements

I would like to acknowledge the home care nurses, Sue Lance, Keith Veselik, Simon Ros, and Radha Sukhani, for their assistance and advice. I would also like to acknowledge Youlian Liao, for his expertise and assistance in biostatistics.

References