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ORIGINAL ARTICLE / ÖZGÜN ARAŞTIRMA

Determining a Safe Time for Oral Intake Following Pediatric Sedation

Pediatrik Sedasyon Sonrası Oral Alım için Güvenli Zamanın Belirlenmesi

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ABSTRACT

Objective: While there are suggestions for oral hydration times after general anesthesia, there is no published study with regard to sedation. The aim of this prospective study was to determine a safe time for oral intake after pediatric sedation and its association with nausea and vomiting after discharge.

Methods: A total of 180 children (aged 1 month to 13 years) sedated for magnetic resonance imaging were randomly assigned into three groups. All patients fasted for 6 hours and were allowed to take clear fluids until 2 hours before sedation with thiopental (3 mg/kg). After the patients were transported to the recovery room, we allowed the patients to drink as much clear fluids as they wanted prior to discharge in group I, 1 hour after the patients met the discharge criteria for group II, and 2 hours after the patients met the discharge criteria for group III. All patients were assessed for vomiting in the recovery room until 1 hour after their first oral hydration. The parents were then telephoned the next day and questioned regarding nausea/vomiting and any unanticipated hospital admission.

Results: There were no statistically significant intergroup differences with respect to age, sex, weight, or the ASA status. There was no nausea and vomiting in either the recovery or post discharge period in any group. In the telephone questionnaire, no hospital admissions were reported.

Conclusion: Oral hydration just before discharge is safe, and fasting children after discharge for a period of time is unnecessary for patients sedated with thiopental.

Key words: Sedation, oral intake, postoperative nausea and vomiting

ÖZET

Amaç: Genel anestezi sonrası oral sıvı alımı zamanı ile ilgili öneriler bulunmakla birlikte, sedasyon ile ilgili yayınlanan herhangi bir çalışma yoktur. Bu prospektif çalışmanın amacı pediatrik sedasyon sonrası oral ilk alım için güvenli zamanını belirlemek, bunun taburculuk sonrası bulantı kusma ile ilişkisini saptamaktır.

Yöntemler: Manyetik rezonans görüntüleme için sedasyon uygulanan 180 çocuk (1 ay -13 yaş) rastgele üç gruba ayrıldı. Tüm hastalar tiyopental (3 mg/ kg) ile sedasyon öncesi 6 saat aç bırakıldı; 2 saat öncesine kadar berrak sıvı almalarına izin verildi. Derlenme odasına transfer sonrası grup I' deki hastaların taburcu edilmeden hemen önce, grup II' deki hastaların taburcu edilme kriterlerini karşıladıktan 2 saat sonra, grup III' deki hastaların ise taburcu edilme kriterini karşılaştırdıktan 3 saat sonra diledikleri kadar oral berrak sıvı almalarına izin verildi. Tüm hastalar oral sıvı aldıkları zamandan 1 saat sonrasına kadar derlenme odasında kusma açısından takip edildi. Hastaların aileleri ertesi gün telefonla aranarak bulantı/ kusma, umulmadık hastane başvurusu açısından sorgulandı.

Bulgular: Gruplar arasında yaş, cinsiyet, vücut ağırlığı ya da ASA fiziksel durum sınıflaması açısından istatistiksel olarak anlamlı bir fark saptanmadı. Grupların hiçbirinde derlenme odası ve taburculuk sonrası bulantı ve kusma, telefon sorgulamasında umulmadık hastane başvurusu yoktu.

Sonuç: Tiyopental ile sedatize edilen hastaların taburculuktan hemen önce oral sıvı alımı güvenli olup taburcu edildikten sonra aç kalmalarına gerek yoktur.

Anahtar kelimeler: Sedasyon, oral alım, postoperatif bulantı ve kusma

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INTRODUCTION

Parallel with the increase in the number of diagnostic and interventional procedures, the need for non-operating room anesthesia (NORA) has also been increased in many settings including gastroenterology, cardiology, radiology, pediatrics, and emergency medicine. Although adverse outcomes of post-anesthesia care after general and ambulatory anesthesia have been well documented, there is a lack of evidence in the field of NORA. Severe adverse outcomes (hypoxia, apnea, cardiac arrest, and death) related with NORA have been reported from closed malpractice claims. However, there is little information about minor and post discharge complications including inadequate postoperative pain control, admission for complications, and nausea/vomiting [1-3]. The association of the frequency of vomiting with drinking clear fluids before discharge is unclear, and there is a disagreement between the consultants and the American Society of Anesthesiologists (ASA) members about reductions in adverse outcomes or increases in patient satisfaction scores with the drinking of clear fluids before discharge. Therefore, new literature is required for further evaluation [4]. In order to avoid nausea/vomiting because of inadequate emergence from general anesthesia, the permission time for oral hydration after non-gastrointestinal surgery is about 4-6 hours in clinical practice [5]. In a study investigating the duration of emetic effects of general anesthesia after non-abdominal surgery in children, Chen et al. showed the return time to baseline of the electrogastrographic changes as 1 hour, and reported this as a safe time for feeding [6]. While there is a suggestion for oral hydration times after general anesthesia, no information has been published for sedation. Clinical practices also differ from one center to another. Some let the children drink just before discharge, some let them drink after a few hours. Sedated children are often sent home after a brief recovery [7], thus, the incidence of nausea/vomiting after discharge is not always known. Therefore, we aimed to investigate the safe time for restarting oral hydration after sedation, and its correlation with nausea/vomiting after discharge.

METHODS

This prospective study was approved by the local Clinical Research Ethical Committee. We obtained written informed consent from the patients' parents. Following consent, and assuming a statistical power of 90% and an alpha of 5% [8], 180 children undergoing elective magnetic resonance imaging (MRI) (ASA status I/II, aged 1 month to 13 years) were randomly assigned to one of three groups. Patients were excluded if they were in an ASA III/IV status, had any barbiturate allergies, porphyria, a condition which could delay gastric emptying time, gastrointestinal disorders, or underwent an MRI with general anesthesia.

All patients fasted for 6 hours but were allowed to take clear fluids until 2 hours before sedation. After maintaining a peripheral catheter, all patients received thiopental (3 mg/kg) intravenously followed by an additional dose of thiopental (1 mg/kg) to achieve the targeted level of a Ramsay sedation score of 5. The patients breathed spontaneously through an oxygen facemask without an artificial airway. After they were transported to the recovery room near the MRI suite, they were assessed for discharge criteria with the modified Aldrete scoring system until they reached a score of 9 [9]. We allowed the patients to drink as much clear fluid as they wanted prior to discharge in group I, 1 hour after the patients met the discharge criteria for group II, and 2 hours after the patients met the discharge criteria for group III. All patients were also assessed for vomiting in the recovery room until 1 hour after the first oral hydration. Because the assessment of nausea is difficult in some of the studied age groups, we assessed the vomiting with the modified scoring system used by Mercan et al. (0: no vomiting; 1: retching [attempt to vomit without expulsion of stomach contents]; 2: single episode of vomiting during a 30-minute period; 3: continuous retching or two or more episodes of vomiting during a 30 minute period) [8]. Children scored as a 3 were considered to have severe postoperative nausea and vomiting (PONV) and received a 100 μg/kg dose of ondansetron and were observed in the recovery room until they were free of PONV for one hour. For all patients, assessments were continued with a telephone survey of their parents. The parents were telephoned the next day and questioned regarding nausea/vomiting and any unanticipated hospital admission.

Statistical analysis

Statistical analyses were performed with the Statistical Package for the Social Sciences version 18.0 (SPSS Inc., Chicago, IL, USA) for Windows. Descriptive data were expressed as median (min-max) and frequency (%). The normal distribution assumption of the quantitative outcomes was analyzed with Shapiro-Wilk tests. Results were evaluated using the nonparametric Kruskal-Wallis test for comparisons between groups. To compare two groups, we used the Bonferroni-corrected Mann-Whitney U test for non-normal data. The frequencies were compared with the Pearson's chi-square method. A p value less than 0.05 was considered as statistically significant.

RESULTS

There were no statistically significant intergroup differences with respect to age, sex, weight, or the ASA status (Table 1). The median ages were 4.25 (1-14), 4.50 (0-17), and 5.0 (0-12) years (p = 0.649), and the median weights were 16.5 (8-50), 16 (3-45), and 19 (2-55) kg (p = 0.266) for groups I, II, and III, respectively. Sedation was effective in all patients. All MRI scans were completed without any complications. There was a considerable difference in the length of the procedure between groups. The median length of the procedure was 20 minutes for groups I and II (10-45 and 10-90 minutes, respectively), and 15 minutes for group III (10-95 minutes) (p = 0.009). Distribution of procedure types among groups differed significantly, with a greater percentage of patients had cranial MRI in group 3 (p = 0.001) (Table 1, figure 1). There was no nausea and vomiting in any of the groups at any time.

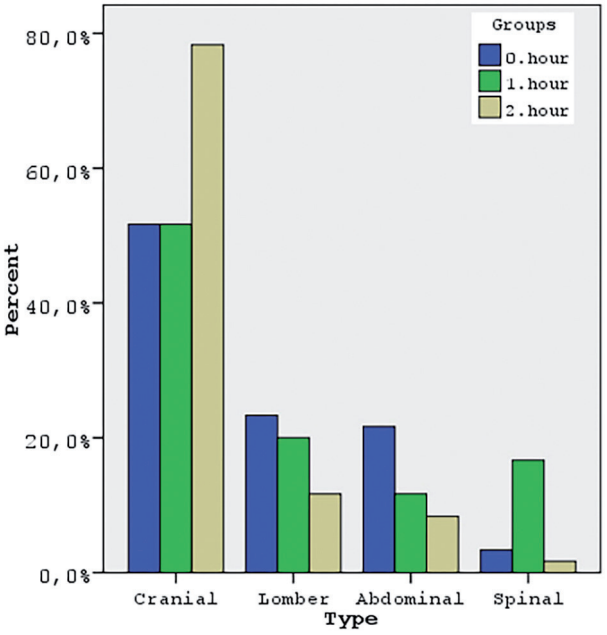

Figure 1. The distribution of procedure types in the groups.

Table 1. Demographic and characteristic data of groups.

	Group I (n = 60)	Group II (n = 60)	Group III (n = 60)	p
Demographics				
Sex (Male / Female)	37 / 23	38 / 22	32 /28	0.489
ASA*				
I	36 (60)	31 (51.7)	28 (46.7)	0.335
II	24 (40)	29 (48.3)	32 (53.3)	
Age (y)**	4.25 (1-14)	4.5 (0-17)	5 (0-12)	0.649
Weight (kg)**	16.5 (8-50)	16 (3-45)	19 (2-55)	0.266
Characteristics				
Type of procedure*				
Cranial	31 (28.4)	31 (28.4)	47 (43.1)	0.001
Lomber	14 (42.4)	12 (36.4)	7 (21.2)	
Abdominal	13 (52)	7 (28)	5 (20)	
Spinal	2 (15.4)	10 (76.9)	1 (7.7)	
Procedure length (min)**	20 (10-45)	20 (10-90)	15 (10-95)	0.009#

ASA (American Society of Anesthesiologists); * Data in parentheses are frequency (percentage); ** Data are median (min-max). ; # Group 1- Group 2: p = 0.546, Group 1- Group 3: p = 0.009, Group 2- Group 3: p = 0.007

DISCUSSION

In this study, we investigated the safe time for the first oral fluid intake after emergence from a deep sedation, and its association with nausea and vomiting. Results of the present study demonstrated that oral hydration prior to discharge is safe and occurred without subsequent vomiting in children sedated with thiopental for MRI.

NORA can be associated with various complications including awareness, hypothermia, pain, difficult airway management, and PONV [10]. As an important factor that decreases patient satisfaction and increases total time for hospital stays, PONV has been experienced not only in the recovery room but also after being discharged from outpatient surgery [11]. Mandatory food intake after surgery has been shown to increase nausea and vomiting. In a study investigating the effect of postoperative fasting on vomiting in children undergoing outpatient surgery, the vomiting incidence in patients allowed to take food according to their needs was not statistically different compared with patients fasted for 6 hours after surgery. The authors recommended not to fast the children, and instead, allow them to eat and drink according to their own needs [12]. In another study with children undergoing inguinal hernia or orchiopexy undescended testis surgeries under general anesthesia, some patients received clear fluids after 2 hours, and some received them 1 hour after emergence. These authors found that oral intake 1 hour after emergence did not increase the incidence of vomiting [8]. In our study, we also investigated the safety of oral intake 1-2 hours after emergence, as well as just after emergence based on their own needs. In a study with adult patients undergoing non-gastrointestinal surgery with general anesthesia, the authors compared early (just after emergence) versus delayed (4 hours after emergence) oral hydration. The early oral intake group had a similar incidence (22%) of vomiting compared with the delayed oral intake group (20%), but had higher satisfaction [13]. While the findings in the literature concerning vomiting after outpatient surgery are similar to these studies, the literature regarding sedation is very limited.

In a study including 376 children undergoing diagnostic imaging studies with sedation, the side effects after discharge were motor imbalance (31%), gastrointestinal effects (nausea, vomiting, diarrhea [23%]), agitation (19%), and restlessness (14%). The sedatives used were midazolam, chloral hydrate, or both. While the gastrointestinal effects were significantly higher in the chloral hydrate group, they were lowest in the midazolam group [7]. However, there is no information regarding the timing of oral intake in this study. Costa et al. compared the incidence of post-discharge side effects in children who received high doses of chloral hydrate with children who received midazolam during outpatient dental treatment. They reported vomiting after discharge in 2 patients out of 53 patients that received midazolam, and no vomiting in the chloral hydrate group [3]. The oral intake time is also lacking in this study. Karamnow et al. retrospectively analyzed an 8-year period of reported adverse events in moderately sedated adult patients outside the operating room. However, their report concerns the major adverse effects like apnea, over sedation, hypoxemia, reversal agent use, and prolonged bag-mask ventilation. The report on minor side effects is lacking [14]. In a study investigating the complications of intravenous sedation in intellectually disabled patients undergoing dental treatments, the author reported no nausea and vomiting with propofol sedation in the recovery period, similar to another study investigating propofol efficiency in sedation during intracarotid sodium amobarbital procedures (Wada test) [15, 16]. However, there is no information about the first oral intake time of the patients or the period after their discharge in either study. Chang et al. examined the National Anesthesia Clinical Outcomes Registry database from 2010 to 2013. In their report, the most common minor complication with NORA was PONV with an incidence of 1.06%. However, in the analyzed population, the type of anesthesia was not only sedation, there were also general anesthesia as well as neuroaxial and regional techniques that may have affected the incidence rate [2]. In our study, none of the patients in any group experienced nausea and vomiting, which may be related to the elimination half-life of the sedative we used. Thiopental is considered an ultrashort acting agent with a rapid onset (within 1 minute) and brief duration of action (about 15 minutes) [17]. Sedatives can impair gastrointestinal motility in humans [18]. While there are some studies con-

cerning the effects of sedation on gastric emptying [18-21], we could not find any data regarding the effect of thiopental. Although the patients were allowed to drink based on their own needs just before discharge in group I, all of the patients in this group has chosen to drink at the time of discharge. This could be due to the fact that the MRI was in the morning for all of the patients, and they had all been fasted by their parents from the previous night, thus, at the end of the imaging, they were all very thirsty. We found the length of procedures in group II as the shortest when compared with the other two groups. After randomization, cranial MRI procedures were performed more than any other imaging procedures in group II. As the shortest procedure, cranial MRIs may have caused the shorter procedure length in this group.

Investigating the effect of early oral intakes after sedation with only one type of sedative is a limitation of this study. While there are many different sedatives being used, and their elimination half-lives vary, the incidence of nausea and vomiting can also change from one agent to another. The other limitation is the duration of the procedures. For longer procedures, an infusion of sedatives rather than an intravenous intermittent bolus admission will need to be used, and this can also change the incidence of nausea and vomiting.

In conclusion, our study demonstrated that fasting children for a period of time after being discharged is unnecessary. We can let them drink just before discharge, especially if they are sedated with thiopental. More studies are needed to investigate the use of other sedatives and safe times for the first oral intakes after sedation.

Declaration of Conflicting Interests: The authors declare that they have no conflict of interest.

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