

Active preoperative nutrition is safely implemented by the parents in pediatric ambulatory tonsillectomy

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Abstract

Preoperative fasting is considered to be necessary to prevent intraoperative regurgitation and aspiration of gastric contents. However, long-lasting preoperative fasting has been shown to have a connection with postoperative problems, such as nausea.

Objective: To evaluate whether preoperative nutritional counseling of parents on child's limited preoperative fasting and active preoperative nutrition risks the child's safety in pediatric ambulatory tonsillectomy.

Methods: Families, with children 4 – 10 years old, were randomly allocated to the study groups (n= 116; 58/58). The intervention group received verbal and written preoperative counseling on child's active preoperative nutrition, and the control group the current written guidelines. All children were asked to be four hours without solids and two hours without fluids. The children in the intervention group were encouraged to have clear fluids on two occasions. The later portion

was two hours preoperatively. Preoperative fasting, surgery, the child's hemodynamic, nausea and vomiting and incidents of aspiration during anesthesia induction and first postoperative oral intake were recorded.

Results: The parents in the intervention group followed the guidelines and there were no mistakes such as exceeding fasting time limits. No complications, such as aspiration, occurred though the total preoperative fasting time in the intervention group was significantly shorter ($p < .0001$) than in the control group.

Conclusion: According to the present fasting guidelines in the pediatric ambulatory tonsillectomy, children are advised to fast in fluids for two hours before surgery. However, the children fast significantly longer. Although active counseling on child's preoperative nutrition increased preoperative oral fluid intake, no complications occurred, and fasting of the child was safely implemented by the parents.

Keywords: ambulatory surgery, parents, pediatric tonsillectomy, preoperative fasting, safety.

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The purpose of a long period of preoperative fasting in surgical care has been to prevent aspiration of stomach contents by reducing the risk of vomiting. This has been based on the assumption that long periods of fasting will reduce the volume and acidity of stomach contents and the risk of pneumonia caused by aspiration [1]. Children undergoing ambulatory surgery have been without fluids preoperatively for even more than 14 hours [2]. Research in the field of pediatric surgery has highlighted the need for shorter preoperative fasting periods [3], and randomized controlled trials have shown that a two-hour fast is safe and might even have a beneficial impact on the acidity of stomach contents [4] and promote emptying of the stomach [5]. Neither aspiration nor other complications related to fasting have increased, and patients have been more satisfied [6]. According to the parents, the children are less irritable and tolerate the preoperative experience better, nor do they consider the changed guidelines

difficult to follow [4].

According to the present fasting guidelines, children are allowed to drink clear fluids two hours and eat solid food 4-6 hours before surgery [7, 8]. In practice, changes have been delayed because of fears related to aspiration [9], and according to recent studies, children are still often fasting preoperatively for longer periods in spite of the guidelines for shorter fasting times [10, 11], although the benefits of shorter fasting times have clearly outweighed the drawbacks [12].

Pediatric tonsillectomy patients seem to fast preoperatively for as long as others in pediatric surgical care [13, 3, 14, 15], even though their postoperative fast may be several hours longer. Thus, preoperative clear fluids might help to resolve the problem of perioperative irritation and dehydration in children [16], also in pediatric tonsillectomy patients. However, one of the most common

postoperative problems in tonsillectomy patients is nausea and vomiting which may cause fears of aspiration [17], and may have been delaying the implementation of the shorter fasting guidelines in pediatric tonsillectomy patients, especially in ambulatory settings when the parents are taking care of the child's preoperative fasting.

The purpose of this study was to examine whether preoperative nutritional counseling of the parents on the child's fasting, and the child's active preoperative nutrition by the parents causes increasing risk situations in the child's safety in pediatric ambulatory tonsillectomy.

Materials and Methods

Patients

A prospective, randomized intervention study was designed with the approval of research institutions. The data were collected between February 2006 and January 2008. Children 4 – 10 years old (n = 134), admitted for ambulatory tonsillectomy, were invited to participate in the study. Children with diabetes, gastro-esophageal problems, or other severe disease, and weight over 50kg were excluded. The study information was delivered to the parents by mail with the invitation to the child's surgery. Informed consent was ensured verbally and in written form from the parents and verbally and/or in written form from the children according to the child's wishes. Ten families did not agree to participate, 124 families were randomly allocated into an intervention group and a control group (62 / 62). All families except six (4.8%) completed the study, one child was operated before admission because of a peritonsillar abscess, and in one case the study protocol was violated. The data consist of 116 (58 / 58) children.

Surgery and perioperative setting

Surgery was performed using sharp dissection or electrocautery technique. The experience of the surgeon (resident / specialist) and the surgical technique frequencies did not differ significantly between the study groups. No sedative premedication was administered, but the site of venapuncture was anesthetized with EMLA cream® (Astra Zeneca, Sweden). Propofol 3 mg/kg and fentanyl 3 µg/kg were used for anesthesia induction, and the patients were paralyzed for endotracheal intubation using 0.5 – 1.0 mg of rocuronium bromide. Anesthesia was maintained with 1 – 2 MAC sevoflurane in air, depending on the required level of anesthesia.

At the end of surgery, neuromuscular blockade was reversed with glycopyrrolate (10 µg/kg) and neostigmine (50 µg/kg), and the child was extubated when spontaneous respiration was regular and adequate. After extubation, the child was transferred to the postanesthesia care unit (PACU) for continuous monitoring of vital signs. All patients received oxycodone 0.1mg/kg iv in the PACU during the first postoperative hour. The same dose was repeated as a rescue analgesic in six patients in each group; one child in the control group received it twice. All patients had postoperative iv infusion (Natriumklorid Braun 4,5mg/ml cum glucose 25mg/ml; B. Braun Medical Oy), the intervention group 21 ml/kg (SD 5.94) and the control group 22ml/kg (SD 7.28). The patients were transferred to the second phase recovery room when they were fully awake and their cardiovascular and respiratory status was stable. **Study design**

The parents and the children, according to their age, in the intervention group (n = 58) received verbal and written preoperative nutritional face-to-face counseling on the child's fasting and active preoperative nutrition. The children were asked to be four hours without solids and two hours without fluids before surgery. On the morning of surgery, the children were actively encouraged to drink clear fluids on two occasions, at 4:30 and at 7:00. The later portion

was two hours before surgery. Clear juices without pulp or visible chunks were allowed. Portions were calculated according to the child's weight, 10ml / kg [7, 9]. All operations were scheduled to begin at 9:00 am.

The control group (n = 58) received current information on the child's preoperative fasting without any verbal preoperative counseling. The information was given in written form and delivered to the parents by mail. The parents were asked to keep the child without solid food for four hours and without fluids for two hours prior to surgery. Before discharge both study groups received the same verbal and written instructions about the child's postoperative home care.

Data collection

On the morning of surgery the parents were asked verbally and in writing about the timing, quality and quantity of the child's preoperative oral intake. Exceeding of the portions and timing of structured preoperative nutrition were recorded. Also the type and duration of surgery, the child's blood pressure, heart rate, bleeding, nausea and vomiting in the operating room, as well as heart rate, bleeding, nausea, vomiting and the time spent in the PACU and first oral intake were recorded. In addition, all intra- and postoperative complications were recorded.

Statistics

The differences in categorical variables between the groups were tested using chi-squared test. Shapiro-Wilk test was used to test the normality of the continuous variables. The differences in the normally distributed variables between groups or dichotomic demographic variables were compared with two-sample t-test. In the case of non-normally distributed variables Mann-Whitney U-test was used. P-values less than 0.05 were considered statistically significant. Statistical analyses were performed using SAS System for Windows, version 9.1 (SAS Institute Inc., Cary, NC).

Results

The data from 116 families were recorded. The characteristics of the participants are shown in Table 1, overleaf.

Child's preoperative fasting

Children's preoperative fasting in the case of solids did not differ between the study groups; this lasted over four hours in all cases. In the case of fluids the difference between the study groups was significant (Table 2). In the intervention group children received clear fluids at 4:30 (mean 7.7ml/kg, SD 2.5) and at 7:00 (mean 8.1ml/kg, SD 2.4). None of the parents exceeded the portions or timing of structured preoperative nutrition. No association with the children's characteristics and the preoperative fasting times was shown.

Table 2 The children's preoperative fasting (n = 116).

Preoperative fasting time	Intervention group (n= 58)	Control group (n=58)	p-value
/ in case of fluids (h)			
[mean (SD)]	2.69 (2.08)	12.13 (2.45)	
min / max]	1.91 / 14.35	2.95 / 14.05	<.0001
/ in case of solids (h)			
[mean (SD)]	12.20 (1.80)	12.69 (1.53)	
min / max]	5.567 / 15.98	10.17 / 14.05	0.343

Table 1 Characteristics of the participants (n = 116).

	Intervention group (n= 58)	Control group (n=58)	p-value
Mother or Father / Both [n (%)]	41 (70.7) / 17 (29.3)	48 (82.8) / 10 (17.2)	0.215
Age (yrs) [mean (SD)]	35.6 (5.3)	35.6 (6.2)	0.210
Education			
– compulsory schooling / high school [n (%)]	29 (50) / 27 (46.5)	33 (56.9) / 23 (39.7)	0.782
– higher education [n (%)]	12 (20.7)	4 (6.9)	0.040
– education in health care [n (%)]	13 (22.4)	16 (27.6)	0.668
Child in surgery			
– sex (m/f) [n (%)]	34 (58.6) / 24 (41.4)	25 (43.1) / 33 (56.9)	0.137
– age (yrs) [mean (SD)]	7 (2)	6 (1.5)	0.001
– height (cm) [mean (SD)]	126 (13)	120 (11)	0.159
– weight (kg) [mean (SD)]	28 (9)	25 (7)	0.036
Earlier experiences of fasting in surgical care [n (%)]:			
Experiences of the parents:			
– earlier surgical care (yes / no)	36 (62.1) / 22 (37.9)	46 (79.3) / 12 (20.7)	0.065
– time of surgery	5(8.6) / 14 (24.1)/	8(13.8)/16(27.6)/10(17.2)/4(6.9)	0.694
(within 1 / 5 / 10 years / over 10 years ago)	9(15.5)/7(12.1)		
– type of surgery (ENT*/ other)	11 (19) / 25 (43.1)	16 (27.6) / 27 (46.6)	0.834
In the family:			
– earlier surgical care (yes / no)	32 (55.2) / 26 (44.8)	32 (55.2) / 24 (41.4)	0.852
– previous time of surgery (within 1/ 5 / 10 years / over 10 years ago)	10 (17.2) / 13 (22.4) / 6 (10.3) / 1 (1.7)	7 (12) / 14 (24.1) / 5 (8.6) / 0	
– type of surgery (ENT*/ other)	23 (39.7) / 8 (13.8)	17 (29.3) / 14 (24.1)	0.253
Fasting information:			
– earlier information (yes / no)	19 (32.8) / 38 (65.5)	16 (27.6) / 40 (69)	0.685
– time of information (within 1 / 5 / 10 years / over 10 years ago)	1 (1.7) / 4 (6.9) / 3 (5.2) / 8 (13.8)	0 / 4 (6.9) / 3 (5.2) / 7 (12)	1.000

* ENT = ear, nose and throat surgery

Child's intraoperative safety

The operations of the children in the intervention group went well although there were variation, e.g. in the duration of surgery and intraoperative blood loss. However, there were no significant differences between the study groups regarding intraoperative registration. Moreover, none of the children in either study group vomited in the operating room, and none did have any sign of aspiration during anesthesia induction. (Table 3, opposite)

Child's postoperative safety

The children in the intervention group did not suffer from nausea in the PACU; only one child had nausea and no one vomited. Some of the children experienced seeping from the wound in the throat and spat blood, while one child in the intervention group was reoperated because of postoperative bleeding (Table 3). There were no significant differences between the two groups in these respects. However, most children in both study groups received, at least, their first portions of fluids before discharge when the perioperative fasting time in the control group had lasted significantly longer ($p < .0001$) than in the intervention group (Table 4).

Table 4 The children's perioperative fasting (n = 107).

	Intervention group (n= 58)	Control group (n=58)	p-value
Total perioperative fasting time (h)	6.00 (2.47)	15.55 (1.95)	
[mean (SD)	4.00 / 16.75	9.50 / 21.25	<.0001
min / max]			

Discussion

Doubts have been expressed about the safety of shorter preoperative fasting times because of a fear of nausea, vomiting and aspiration [1, 17]. Especially children undergoing tonsillectomy may have caused concern because they are more likely to suffer from nausea and vomiting. The concern may be stronger in ambulatory settings where the implementation of the child's preoperative fast is parental. Therefore, the purpose of this study was to examine whether preoperative nutritional counseling of the parents on the child's fasting and active preoperative nutrition by the parents risks the child's safety in pediatric ambulatory tonsillectomy.

Table 3 Registration in the operating room and in the PACU (n = 116).

	Intervention group (n= 58)	Control group (n=58)	p-value
Operating room:			
– (TE / TEA* [n (%)]	21 (36) / 37 (64)	13 (22) / 45 (78)	0.102
– additional surgery** [n (%)]	15 (26)	19 (33)	0.414
– sharp dissection / electrocautery [n (%)]	49 (86) / 9 (15.5)	54 (93) / 4 (7)	0.238
– resident / specialist [n (%)]	47 (81) / 11 (19)	48 (83) / 10 (17)	1.000
– duration of surgery** [min] [mean (SD) min / max]	30.5 (14.9) 7 / 83	34 (12.6) 9 / 73	0.163
– aspiration during anaesthesia induction	0	0	
– RR [mean (SD) min / max]	116 / 65 (14 / 12) 80 / 38 / 170 / 101	114 / 63 (16 / 13) 88 / 32 / 162 / 112	0.188 / 0.114
– blood loss (ml/kg) [mean (SD) min / max]	2 (2.13) 0 / 8.33	2.6 (2.30) 0 / 10.4	0.073
– nausea / vomiting [n%]	0 / 0	0	
– urination	0	0	
PACU:			
– time in the PACU [n (%)] [mean (SD) min / max]	50.4 (17.3) 28 / 145	47.8 (15.1) 20 / 123	0.332 0.040
– heart rate (ml/kg) [mean (SD)	82 (15.3) 48 / 135	87 (17.6) 50 / 150	0.263 1.000
– bleeding [n%]	1 (1.7)	0	
– spitting blood [n%]	6 (10.3)	13 (22.4)	0.130
– nausea / vomiting [n%]	1 (1.7) / 0	2 (3.4) / 0	1.000
– urination [n%]	2 (3.4)	1 (1.7)	1.000

*TE = tonsillectomy / TEA = adenotonsillectomy ** tympanostomy, paracentesis or maxillary puncture

The parents in the intervention group followed the guidelines. In the case of solids, the children fasted from the previous evening. In the case of fluids, the children received fluid portions according to the guidelines and no mistakes occurred. In this study, the amounts of fluids were determined according to the child's weight, whereas former studies have confirmed that unlimited amounts of clear fluids are safe up to two hours before surgery in children [13, 14]. Thus, the parents in this study were able to follow more restricted instructions than are recommended by the guidelines.

No complications, such as aspiration during anesthesia induction, occurred during the children's surgery, although in the intervention group, the parents strictly followed the instructions increasing preoperative fluid intake of their child. According to the results of this study, in limited preoperative fasting time in children even after active nutritional counseling of the parents, there is no fear of aspiration. However, although limited preoperative fasting times have been considered valid, the compliance with the guidelines have been inadequate [11]. Focus of the interest have been more in the idea that the children are not allowed to take fluids at least for two hours before surgery but not in the fact that the children are allowed, and even recommended [3], to take clear fluids freely up to two hours before surgery. It seems that shorter preoperative fasting time may have been prevailing guideline but its implementation has been passive. Health care professionals may have an illusion about their modern fasting guidelines in children. However, it seems that the child's active preoperative nutrition to avoid his/her extensive perioperative fasting times is dependent on the activity of health care professionals, at least in ambulatory settings.

Health care professionals have had their doubts about the safety of limited preoperative fasting times. Therefore, parents of the children in ambulatory surgery may be embarrassed and do not follow

those guidelines without closer counseling [18]. However, it seems that there is not former studies concerning distinct implemented preoperative fasting times in children undergoing ambulatory tonsillectomy. According to the results of this study, preoperative nutritional counseling of the parents on the child's fasting, and the child's active preoperative nutrition by the parents increases child's preoperative fluid intake but does not increase the number of mistakes in fasting times or perioperative complications. The present fasting guidelines, which should limit the preand perioperative fasting times, especially in children, are not reality until after active preoperative counseling of the parents but does not risk the children's safety. Although the data of this study were relatively small, and more research is needed, we can recommend active preoperative counseling of the parents on present fasting guidelines without fears of complications in pediatric surgical care.

Conclusion

In conclusion, active preoperative nutrition of fluids up to two hours before surgery decreases significantly child's pre- and perioperative fasting time and may release child perioperative stress. According to the present fasting guidelines in the pediatric ambulatory tonsillectomy, patients are advised to fast in fluids for two hours before surgery but the children fast significantly more without preoperative active counseling. Although active counseling on child's preoperative nutrition increased preoperative oral fluid intake, no mistakes or complications occurred, and fasting was safely implemented by the parents.

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