Use of dexamethasone to reduce postoperative vomiting and pain after pediatric tonsillectomy procedures

Abdulhamid H. Samarkandi, FKSU, FFARCSI, Mussarat A. Shaikh, MCPS, FCPS, Rana A. Ahmad, DA, FCPS, Ahmed Y. Alammar, MD, FKSU.

ABSTRACT

Objectives: The purpose of this study is to determine whether a single dose of dexamethasone 0.5mg/kg administered before surgery could decrease post operative vomiting and pain and improves oral intake in the first 24-hours after pediatric tonsillectomy procedures.

Methods: It is a randomized, double blind, placebo controlled study. Sixty children age 2-12-years ASA 1 and11 were scheduled for tonsillectomy, dexamethasone (n=29) and control group (n=31) were enrolled in the study. Dexamethasone group received 0.5mg/kg intravenous dexamethasone and control group received saline at the time of induction. The anesthetic regimen and surgical procedures were standardized for all patients. All patients were observed in post anesthesia care unit (PACU) and ward for post operative vomiting, pain, need for rescue antiemetic or analgesia and time for first oral intake for 24-hours.

Results: Data from 60 patients were analyzed. The overall incidence of early as well as late vomiting was significantly less in dexamethasone as compared to control group (37% versus 74% *P*=0.016), overall incidence of retching was 29% in control and 3.4% in dexamethasone (*p*=0.008). Vomiting once or more than once was significantly high in control as compared to dexamethasone group. The need for rescue antiemetic, the time to first oral intake and analgesic requirements did not show any significant difference in both groups.

Conclusion: Dexamethasone is considered safe and there was no adverse effects associated with a single dose of dexamethasone. Although the need for rescue antiemetic, time to oral intake and analgesia requirements in both groups were not significant, however, we found that dexamethasone does have antiemetic properties as overall incidence of retching and vomiting was significantly less in dexamethasone group as compared to control group in children who underwent tonsillectomy.

Saudi Med J 2004; Vol. 25 (11): 1636-1639

The incidence of post operative emesis is more frequent in pediatric patients than in adults.[1] The incidence is increased after strabismus, tonsillectomy and orchidopexy.[2] Tonsillectomy with or without adenoidectomy is one of the most frequently performed surgical operations in children and is associated with an incidence of post operative vomiting ranging between 40% and 73%.[3-5] Among the antiemetics used currently, 5HT3 antagonists such as ondansetron and granisetron are effective, but their high cost limit their widespread use.[6,7] Other antiemetic drugs used currently (such as anticholinergics, dopamine receptor antagonists and antihistamines), although effective, possesses clinically significant side effects such as restlessness, dry mouth, tachycardia and extra

From the Department of Anesthesia (Samarkandi, Shaikh, Ahmad), Department of Otorhinolaryngology (Alammar), Head and Neck Surgery, College of Medicine, King Saud University, Riyadh, *Kingdom of Saudi Arabia*.

Received 21st March 2004. Accepted for publication in final form 1st June 2004.

Address correspondence and reprint request to: Dr. Mussarat A. Shaikh, Consultant Anesthetist, College of Medicine, King Saud University, PO Box 7805, Riyadh 11472, *Kingdom of Saudi Arabia*. Tel. +966 (1) 4671599/97. Fax. +966 (1) 4679364. E-mail: dr_mussarat_a@hotmail.com

pyramidal symptoms.[8-10] Dexamethasone was first reported to be an effective antiemetic agent in patients receiving cancer chemotherapy in 1981.[11] Since then several studies have shown that dexamethasone is equal to or better than other antiemetic agents in preventing nausea and vomiting associated with chemotherapy. Recently dexamethasone has also been reported to have prophylactic effect on post operative nausea and vomiting (PONV) in patients undergoing tonsillectomy,[12,13] thyroidectomy[14,15] or major gynecological surgery.[16] Dexamethasone has also proved to be very effective in laparoscopic procedures.[17,18] The purpose of the present study was to determine whether the single dose of intra-venous dexamethasone administered before surgery would decrease PONV and improved oral intake in the first 24-hours using a standardized anesthetic technique. To specifically delineate the contribution of dexamethasone all anesthetic and non anesthetic factors that could influence the incidence of PONV were standardized such as. history of motion sickness, use of antiemetic, antihistamine and steroids before surgery.

Methods. After obtaining institutional review board approval and written informed consent from parents, 60 children age 2-12-years, ASA 1 and 11 patients undergoing general anesthesia for elective tonsillectomy were enrolled in the study. This study was carried out in King Abdulaziz University hospital, College of Medicine King Saud University Hospital from November 2003 through to March 2004. The study design was randomized, double blind and placebo controlled. Patients with a history of motion sickness or who had received antiemetic, antihistamine or steroids with in 24-hours of surgery were excluded. Children were allowed to eat solid food until midnight and to take clear liquids until 3-hours before the expected start of surgery. All patients received trimeprazine (vallergan) 2mg/kg as premedication orally one hour before induction. After establishing standard monitoring, an inhaled induction was performed using O_2, N_2O and sevoflurane followed by insertion of intravenous cannula. Fentanyl 1ug/kg given at induction and after achieving adequate level of anesthesia endotracheal intubation was carried out. Once spontaneous breathing established patient maintained on 2-3% sevoflurane. Intravenous fluid were given according to the calculation of body weight/ kg/hr of 0.225% dextrose-saline. Each child received dexamethasone 0.5mg /kg (steroid group) or equal volume of saline (control group) intravenously in a randomized, double blind fashion after the induction of anesthesia. Randomization was guided by a computer-generated number table. All tonsillectomies were performed using an electro dissection technique. At the end of the procedure, suction of blood and oral secretions were carried out under vision by the surgeon. All children received acetaminophen suppository 20mg/kg for post operative pain relieve in the operating room. The trachea was extubated in head down left lateral position. All children were transferred to post anesthesia care unit (PACU) where standard monitoring was established. Patients observed for one hour. The incidence of vomiting episodes and pain during PACU stay were recorded by the PACU nurse. After transfer to the ward clear fluids were offered to all children and time of oral intake was noted. The nurse in the ward was instructed to observe vomiting and pain and any rescue antiemetic or pain killer required. They assessed the severity of post operative pain clinically looking at the behavior of the child on a scale of 0-2 (This is a simple where 0=no pain, 1=mild pain, and 2= severe pain). Rectal acetaminophen 20mg /kg was administered to all children every 6 hourly. Episodes of vomiting occurring less than 5 minutes apart were considered one episode. Vomiting was treated with metoclopramide 0.15mg/kg intravenously, when the patient vomited twice or there were persistent distressing emetic symptoms. Early vomiting was defined as vomiting in PACU and late vomiting was defined as vomiting in ward. Children were offered liquids in the ward and time of first oral intake was noted. Children were discharged according to discharge criteria of our institute: they were awake, alert. comfortable and able to swallow without difficulty, had stable vital signs, minimal or no nausea and vomiting. All patients were discharged home after giving acetaminophen suppository/acetaminophen tablets orally.

Sample size. By considering the predicted incidence of PONV in the placebo group as 70%, and a reduction of 50% of incidence in PONV in the study group (dexamethasone) such as 35%, with α=0.05, β=0.20 (power=80%), we need to have 28 in each group.

Statistical tests. We used student t-test for independent groups to compare between dexamethasone and control group with respect to age, weight, duration of surgery and duration of anesthesia. Categorical data were analyzed using chi-squared test and fisher's exact test. A *p* value less than 0.05 was considered significant. The 95% CI calculated for the difference in proportions.

Results. Data from 60 patients were analyzed, 29 received dexamethasone 0.5mg/kg and 31 patients received the placebo. The 2 groups were similar, as we found no significant difference between the 2 groups with respect to age, weight, gender, duration of anesthesia and surgery. (**Table**

Table 1 - Demographic characteristics and duration of anesthesia and surgery.

Variable	Dexamethasone group (n=29)	Control group (n=31)	*p* value (2-tailed)
Age (year)	7.169 ± 2.95	7.28 ± 0.885	0.885
Weight (kg)	23.207 ± 8.2	21.05 ± 7.67	0.297
Surgery duration (minute)	38.34 ± 5.89	39.29 ± 4.16	0.47
Anesthesia duration (min)	53.66 ± 5.46	53.26 ± 3.96	0.747

Table 2 - Comparison of outcome variables (vomiting and recovery characteristics) associated with tonsillectomy between dexamethasone and control group.

Outcome variables	Dexamethasone (%) (n=29)	Placebo (%) (n=31)	$\chi 2$	*p* value	95% CI for difference of proportion
Vomiting					
Yes	11 (37.9)	23 (74.2)	5.796	0.016	(-59.7, -12.8)
No	18 (62.1)	9 (25.8)			
Retching					
Yes	1 (3.4)	9 (29)	-	0.008*	(-42.9, -8.3)
No	28 (96.6)	22 (71)			
Rescue antiemetic					
Yes	7 (24.1)	15 (48.4)	2.82	0.093	(-47.7, -0.76)
No	22 (75.9)	16 (51.6)			
Time to first oral intake					
3 hours	4 (13.8)	1 (3.2)	-	0.1565*	(-3.4, 24.6)
>3 hours	25 (86.2)	30 (96.8)			
Analgesia required					
Immediate	10 (37)	17 (54.8)	1.19	0.275	(-42.6, 7.0)
Late	17 (63)	14 (45.1)			

CI - confidence interval, * Fisher's exact test

1). The duration of stay in PACU was one hour in both the groups. The overall incidence of early as well as late vomiting was significantly less in dexamethasone group as compared to control group (37.9% versus 74.2% *P*=0.016), overall incidence of retching was also 29% in control as compared to 3.4% in dexamethasone (*P*=0.008). Vomiting once or more than once was significantly high in control as compared to dexamethasone. On the other hand, the need for rescue antiemetic, the time for oral intake and analgesic requirement did not differ in both groups **(Table 2)**. All surgeries went uneventful and did not influence patient recovery. All patients met discharge criteria and were discharge home after 24-hours.

Discussion. Post operative nausea and vomiting continues to be a common complication of surgery especially tonsillectomy[12,13] thyroidectomy,[14,15] laparoscopic cholecystectomy[17,18] and gynecological procedures.[16] It is a limiting factor in the early discharge of ambulatory surgery patients and is a leading cause of unanticipated hospital admissions. Post operative nausea and vomiting can lead to increase recovery room time, expanded nursing care and potential hospital admission, all factors that may increase the total health care cost. Equally important are the high levels of patient discomfort and dissatisfaction associated with PONV. Post operative morbidity after tonsillectomy in children includes pain, vomiting, inadequate oral intake and dehydration. An electro dissection technique not only decrease the duration of surgery, but it also almost eliminates immediate post operative hemorrhage. However, electro dissection may cause more pain and discomfort due to edema and inflammation.[19] To minimize PONV and improve oral intake anesthesiologist have focused primarily on

anesthetic technique with minimal emetic potential. The efficacy of dexamethasone as an antiemetic has been well established in chemotherapy induced nausea and vomiting, but studies of its antiemetic potential in children undergoing tonsillectomy has produced variable results.[20-22] Post operative nausea and vomiting is a multifactorial problem and several anesthetic and non anesthetic factors must be standardized to examine the antiemetic potential of any specific drug. Several articles have been published suggesting the use of dexamethasone as prophylactic antiemetic for PONV and different doses have been used in different studies. Wang et al[15] used different doses to find out the minimum effective dose of dexamethasone in preventing post operative nausea and vomiting in women undergoing thyroidectomy and he found 5 mg is the minimum effective dose[14] Kang et al[16] on the other hand found 2.5 mg of dexamethasone as the minimum effective dose to prevent nausea and vomiting after major gynecological surgery with no influence on postoperative pain. A wide dose range of dexamethasone (8-32mg) has been used in the prophylaxis of emesis related to chemotherapy and after pediatric and gynecological surgery. Pappas et al[12] observed a decrease in overall incidence of postoperative vomiting and improved quality of oral intake especially during the 24-hours after discharge in children undergoing tonsillectomy who received dexamethasone 1mg/kg after the induction as compared Marie et al[13] found dexamethasone 0.5mg/kg significantly decreased the incidence of postoperative vomiting mainly after discharge from PACU and it also improved the quality of oral intake and satisfaction scores in children undergoing tonsillectomy.[23] In our study the anesthetic technique, amount of intravenous hydration, narcotic analgesic dose and antiemetic therapy were standardized. The dose selected in our patients was 0.5mg/kg dexamethasone intravenously at the time of induction of anesthesia and according to the data collected we found that overall incidence of early as well as late vomiting and retching was significantly less in dexamethasone group as compared to control where as no significant difference was found as far as time to first oral intake, rescue antiemetic and analgesic requirements are concerned.

In conclusion dexamethasone is considered safe and there were no adverse effects associated with single dose of dexamethasone but if this is to be adopted as a routine in preventing PONV in clinical practice further studies regarding the effect of intravenous dexamethasone are needed.

References

1. Rose JB, Watcha MF. Postoperative nausea and vomiting in pediatric patients. ***British Journal of Anaesthesiology*** 1999; 83: 104-117.
2. Lerman J. Surgical and patient factors involved in postoperative nausea and vomiting. ***British Journal of Anaesthesiology*** 1992; 69: 24S-32S
3. Litman RS, Wu CL, Catanzaro FA. Ondansetron decreases emesis after tonsillectomy in children. ***Anesth Analg*** 1994; 78: 478-481.
4. Furst SR, Rodarte A. Prophylactic antiemetic treatment with ondansetron in children undergoing tonsillectomy. ***Anesthesiology*** 1994; 81: 799-803.
5. Ferrari LR, Donlon JV. Metclopramide reduces the incidence of vomiting after tonsillectomy in children. ***Anesth Analg*** 1992; 75: 351-354.
6. Sniadach MS, Alberts MS. A comparison of the prophylactic antiemetic effect of ondansetron and droperidol on patients undergoing gynecologic laparoscopy. ***Anesth Analg*** 1997; 85: 797-800.
7. Raphael JH, Norton AC. Antiemetic effect of prophylactic ondansetron in laparoscopic surgery: randomized, double-blind comparison with metoclopramide. ***Br J Anaesth*** 1993; 71: 845-848.
8. Melnick B, Sawyer R, Karambelkar D, Phitayakorn P, Lim NT, Patel R. Delayed side effects of droperidol after ambulatory general anesthesia. ***Anesth Analg*** 1989; 69: 748-751.
9. Jimenez-Jimenez FJ, Garcia-Rulz PJ, Molina JA. Drug induced movement disorders. ***Drug Safety*** 1997; 16: 180-204.
10. Watcha MF, White PF. Postoperative nausea vomiting . Its etiology, treatment and prevention. ***Anesthesiology*** 1992; 77: 162-184.
11. Aapro MS, Alberts DS. Dexamethasone as an antiemetic in patients treated with cisplatin [Letter]. ***New Engl J Med*** 1981; 305: 520.
12. Pappas LS, Radha S, Andrew JH, Maianna MS, Joseph JJ, Joseph D. The effect of preoperative dexamethasone on the immediate and delayed postoperative morbidity in children undergoing adenotonsillectomy. ***Anesth Analg*** 1998; 87: 57-61.
13. Marie TA, Sahar SS, Laudia BR, Georges MZ, Anis SB. The effect of dexamethasone on postoperative vomiting after tonsillectomy. ***Anesth Analg*** 2001; 92: 636-639.
14. Jhi JW, Shung TH, Shih CL, Yao CL, Chiu MH. The use of dexamethasone for preventing postoperative nausea and vomiting in females undergoing thyroidectomy: a dose ranging study. ***Anesth Analg*** 2000; 91: 1404-1407.
15. Wang JJ, Ho ST, Lee SC, Liu YC, Liu YH, LiaoYC. The prophylactic effect of dexamethasone on postoperative nausea and vomiting in women undergoing thyroidectomy: a comparison of droperidol with saline. ***Anesth Analg*** 1999; 89: 200-203.
16. Kang L, Chi CH, Yuan YC. The effective dose of dexamethasone for antiemesis after major gynecological surgery. ***Anesth Analg*** 1999; 89: 1316-1318.
17. Wang JJ, Ho ST, Liu YH, Lee SC, Liu YC, Liao YC, Ho CM. Dexamethasone reduces nausea and vomiting after laparoscopic cholecystectomy. ***British Journal of Anaesthesiology*** 1999; 83: 772-775.
18. Wang JJ, Ho ST, Liu HS, Ho CM. Prophylactic antiemetic effect of dexamethasone in women undergoing ambulatory laparoscopic surgery. ***British Journal of Anaesthesiology*** 2000; 84: 459-462.
19. Leach J, Manning S, Schaefer S. Comparison of two methods of tonsillectomy. ***Laryngoscope*** 1993; 103: 619-622.
20. Catlin FI, Grimes WJ. The effect of steroid therapy on recovery from tonsillectomy in children. ***Arch Otolaryngol Head Neck Surg*** 1991; 117: 649-652.
21. Volk MS, Martin P, Brodsky L. The effect of preoperative steroids on tonsillectomy patients. ***Arch Otolaryngol Head Neck Surg*** 1993; 109: 726-730.
22. Splinter WM, Roberts DJ. Dexamethasone decreases vomiting in children after tonsillectomy. ***Anesth Analg*** 1996; 83: 913-916.
23. April MM, Callan, Nowak DM, Hausdorff MA, The effect of intravenous dexamethasone in pediatric adenotonsillectomy. ***Archives of Otolaryngology Head and Neck Surgery*** 1996; 122: 117-120.