The Effect of Nasogastric Tube Application During Cardiac Surgery on Postoperative Nausea and Vomiting—A Randomized Trial

Ronit Lavi, MD, Rita Katznelson, MD, Davy Cheng, MD, FRCPC, Leonid Minkovich, MD, Andy Klein, MD, FRCA, Jo Carroll, RN, Jacek Karski, MD, FRCPC, and George Djaiani, MD, DA, DEAA, FRCPC

Objective: **Postoperative nausea and vomiting (PONV) are significant morbidities following cardiac surgery. The purpose of this study was to determine if application of a nasogastric (NG) tube during cardiac surgery can reduce the prevalence of postoperative PONV.**

Design: **This study was a prospective randomized controlled trial.**

Setting: **University tertiary referral center.**

Participants: **Two hundred two patients undergoing elective cardiac procedures.**

Interventions: **Patients were prospectively enrolled and randomized to either receive or not receive an NG tube after induction of anesthesia. Standard anesthetic technique and postoperative care were employed in all patients. Preoperative demographic data, pain score, nausea score and incidence of vomiting were recorded early (0-8 hours) and late (8-16 hours) following extubation. Antiemetic and analgesic medications were compared between the 2 groups.**

Measurements and Main Results: **One hundred three patients were randomized to no an NG tube (controls) and 99 received an NG tube as part of their perioperative management. Demographic data and surgical characteristics were similar between the 2 groups. However, the control group had more smokers. Incidence and severity of nausea, pain scores, and analgesic requirements were similar between the 2 groups. Prevalence of vomiting was more frequent in the control group (24%) than in the NG tube group (10%, $p = 0.007$), and was more frequent in patients who underwent valve and redo procedures.**

Conclusions: **Use of an NG tube during cardiac surgery may reduce the incidence of postoperative vomiting.**

KEY WORDS: nasogastric tube, postoperative nausea and vomiting, cardiac surgery

THE INCIDENCE OF POSTOPERATIVE NAUSEA AND VOMITING (PONV) following cardiac surgery can exceed 50%, with most of the patients requiring antiemetic therapy to control symptoms.[1-3] Vomiting can be associated with significant morbidity due to electrolyte disturbances, dehydration, wound dehiscence, postoperative bleeding, and aspiration contributing to increased health care costs and patient dissatisfaction.[1,2,4,5]

Several pharmacologic and nonpharmacologic treatments have been evaluated for prevention and treatment of PONV after cardiac surgery. However, the incidence of PONV remains high.[1,2,4-6] Cardiac surgical patients are particularly vulnerable to the potential risks of oversedation, hypotension, and cardiac arrhythmias associated with the traditional antiemetics.[7-9] Consequently, the effectiveness of nonpharmacologic therapies also have been previously evaluated.[6,10,11] Gastric distention increases intragastric pressure and predisposes to vomiting, especially if the intragastric gas mixture contains elements of volatile anesthetics inadvertently introduced into the stomach during manual ventilation. A nasogastric (NG) tube insertion could lead to gastric decompression and evacuation of gastric contents during the surgical intervention, and decrease the incidence of PONV.[10]

The purpose of this study was to evaluate if the presence of an NG tube during cardiac surgery reduced the incidence of PONV in the early postoperative period.

METHODS

After approval by the University Health Network Research Ethics Board, informed consent was obtained from 245 patients undergoing elective cardiac surgery. Patients were randomized to either NG tube (NGT group) or no NG tube (control group) by computer-generated random number tables. Exclusion criteria were a past history of hiatus hernia, previous gastric surgery, morbid obesity, preoperative use of antiemetic medications, H2-receptor antagonists, or proton pump inhibitors. Furthermore, it was decided a priori that patients who would require postoperative ventilator support beyond 24 hours also would be excluded from the analysis.

Premedication was standardized to lorazepam, 2 to 4 mg sublingually 1 hour before surgery. Anesthesia was induced with midazolam, 0.05 mg/kg, fentanyl, 10 to 15 μg/kg, and propofol 0.5 to 1 mg/kg. Pancuronium, 0.1 mg/kg, was administered to facilitate tracheal intubation. After induction of anesthesia and intubation, an NG tube was inserted in the patients assigned to the NGT group and maintained on gravity until removal with extubation. When transesophageal echocardiography (TEE) was used in patients assigned to NGT group, the NG tube was inserted after induction. After the stomach emptied, it was pulled back to the nasopharynx and redirected after the TEE probe was withdrawn. It stayed in and on gravity until extubation in the same manner as in patients who did not have a TEE study done in this group.

Anesthesia was maintained with propofol infusion at 1 to 4 mg/kg/h in all patients. Isoflurane was used in an oxygen/air mixture at the discretion of staff anesthesiologist in charge of the case. At the end of the procedure, all patients were transferred to the postcardiac intensive care unit (ICU). Propofol infusion was continued until the extubation criteria were fulfilled according to the standard institutional protocol.[11] All patients received neostigmine, 2.5 mg, and glycopyrrolate, 0.8 mg, before extubation. Postoperative pain was managed with intravenous morphine 2- to 4-mg boluses, and oral acetaminophen, 20 mg/kg, at 4 to 6 hours as required. In addition, in the absence of contraindications, patients were given indomethacin, 50 to 100 mg, up to a maximum of 3 doses.

All patients were assessed for nausea and vomiting by the nursing staff in the ICU. Patients were asked to grade nausea as mild, moderate,

From the Department of Anesthesia, Toronto General Hospital, University Health Network, University of Toronto, Toronto, Ontario, Canada.

R.L. is currently affiliated with the Department of Anesthesia and Perioperative Medicine, London Health Science Centre, University of Western Ontario, London, Ontario, Canada.

Address reprint requests to George Djaiani, MD, DA, DEAA, FRCPC, Department of Anesthesia and Pain Management, Toronto General Hospital, 200 Elizabeth Street, 3EN-410, Toronto, ON M5G 2C4, Canada. E-mail: george.djaiani@uhn.on.ca

1053-0770/2501-0018$36.00/0

doi:10.1053/j.jvca.2010.02.011

Table 1. Demographic Variables and Surgical Characteristics

	NGT Group (n = 99)	Controls (n= 103)	*p* Value
Age, y	57 ± 13.9	56.2 ± 11.3	0.6
Male sex	73 (74)	77 (75)	0.8
BMI, kg/m^2	30 ± 0.64	29.2 ± 0.63	0.2
Diabetes mellitus	20 (20)	22 (21)	0.9
Smoking	7 (7)	18 (17.5)	0.03
Motion sickness	2 (2)	1 (0.9)	0.5
Type of surgical procedure			
CABG	52 (53)	59 (57)	0.5
Valve replacement	55 (56)	56 (54)	0.8
Redo surgery	5 (5)	7 (7)	0.6
Septal myectomy	4 (4)	5 (5)	0.7
Duration of CPB	93 ± 37	87 ±34	0.2
X-clamp duration	74 ± 32	70 ±38	0.3
Intraoperative TEE	59 (60)	60 (58)	0.8

NOTE. Data expressed as mean ± SD or number of patients, n (%).
Abbreviations: BMI, body mass index; CPB, cardiopulmonary bypass; TEE, transesophageal echocardiography.

or severe. A score of 1 was allocated to mild nausea; 2 to moderate nausea; and 3 to severe nausea. Retching and vomiting were considered as equal and were recorded as a dichotomous variable. Assessments were performed immediately after extubation, then hourly for 2 hours, every 2 hours until 8 hours, and then every 4 hours until the end of the study period (16 hours after extubation). The total scores for nausea, vomiting, and pain were summed up independently, and evaluated for 2 separate time periods: first, 0-8 hours after extubation, and, second, 8-16 hours after extubation. The first-line antiemetic therapy was intravenous dimenhydrinate, 25 mg, followed by either a second dose of dimenhydrinate, 25 mg, or granisetron, 1 mg. Postoperative pain was assessed with a visual analog scale ranging from 0 (no pain) to 10 (the worst pain possible) and was recorded at the same predetermined time intervals.

Continuous variables are presented as either mean ± SD or median (range), and dichotomous variables as numbers (percentages). The baseline characteristics of the groups were compared using analysis of variance for continuous variables and chi-square statistic for categoric variables. Single-predictor and multivariable-linear-regression models were used to estimate the effect of NG tube insertion on nausea and vomiting. Variables found to show association in the single-predictor analysis ($p < 0.20$) were used in the multivariable model. Data were analyzed with JMP software (ver 6.0.2 statistical Discovery from SAS Inc); $p < 0.05$ was considered statistically significant.

Considering that 25% of patients develop postoperative vomiting following cardiac surgery, a sample size of 99 patients per group would be sufficient to provide 80% power to detect a 50% reduction in the proportion of affected patients (2-tailed Fisher exact test $\alpha = 0.05$).

RESULTS

Out of 245 patients undergoing elective cardiac surgery initially recruited to this study, 43 (17.5%) patients were excluded from the study either due to cancellation of the procedure prior to randomization or due to prolonged unexpected ventilation (>24hours) after surgery. A total of 202 patients met the inclusion criteria; 99 patients in the NGT group and 103 controls. Both groups were similar with respect to demographic data and surgical characteristics, with the exception of a higher prevalence of smoking in the control group (Table 1).

In the entire study population, 52(26%) patients had nausea in the first 8 hours and 35(17%) in the following 8 hours after extubation. However, there was no difference in the incidence of nausea, or nausea scores between the 2 groups (Fig 1). In contrast, the prevalence of vomiting was more frequent in the control group (25 patients, 24%) than the NG tube group (10 patients, 10%, $p = 0.007$) during the first 8 hours after extubation (Fig 2). However, this difference was lost during the second study period (8-16 hours after extubation) (Fig 2).

A total of 73 patients (36.3%) required treatment with antiemetics at any time during the study period. There was no difference with respect to antiemetic requirements between the 2 groups (Fig 3). A total dose of propofol was similar between the 2 groups.

The 2 groups were similar with respect to pain scores and postoperative morphine requirements during the study period (Fig 4). Both groups received similar amounts of acetaminophen and indomethacin.

Median postoperative intubation times were 365(130-1435) and 345(140-1200) minutes in the NGT and control groups, respectively, $p = 0.20$. Endotracheal intubation was difficult in 4 (4%) patients in the NGT group and 3 (2.9%) patients in the control group, ($p = 0.9$) NG tube insertion was considered

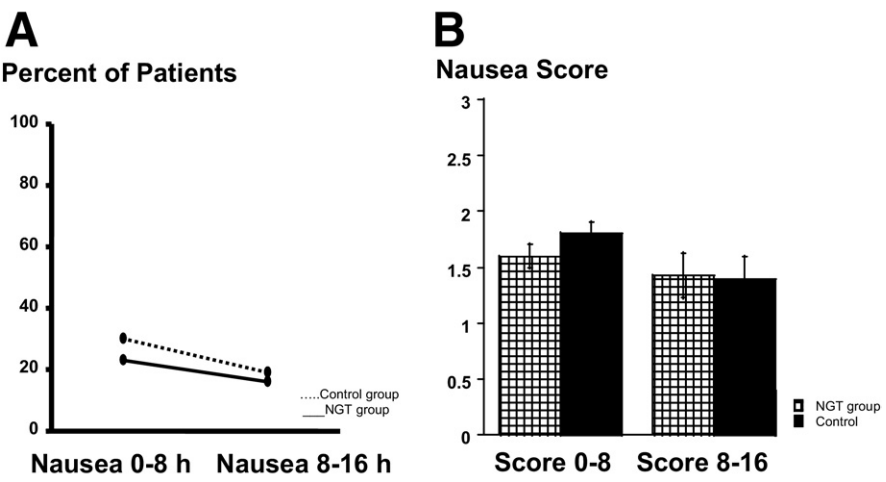

Fig 1. Nausea incidence and score in the 2 groups 0-8 hours following extubation and 8-16 hours afterwards. Nausea incidence (A) and scores (B) were not significantly different between the groups.