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Omission of Nasogastric Tube Application in Postoperative Care of Esophagectomy

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Abstract
Introduction Surgeons routinely use nasogastric (NG) tubes in most esophageal resection surgeries. Considering the numerous complications caused by using the tube and the uncertainty about its usefulness and the scarcity of studies conducted on the subject, particularly in patients with esophageal cancer, the necessity of using the tube in these types of cases is investigated in the present study.
Methods In this clinical trial, patients with esophageal cancer were randomized into groups with NG tube and without NG tube after surgery; the latter were prescribed Metoclopramide, as well. The variables recorded for each patient included the first day of gas passage, defecation and bowel sounds (BSs) auscultation, as well as the duration of postoperative hospitalization, nausea and vomiting, abdominal distension, pulmonary complications, wound complications, anastomosis leak, and the need for placing/replacing the NG tube.
Results The incidence of anastomosis leak was significantly higher in the NG-tube group (6 vs. 0; $P = 0.016$). Other complications were not different in the two groups. The mean time of gas passage, defecation, BS auscultation, and the duration of postoperative hospitalization did not have meaningful differences in the two groups. The need for placing/replacing the NG tube was the same for both groups.
Conclusions The routine application of NG tubes after surgery is not recommended for all patients. We suggest that NG tubes should be used according to the specific problems of each patient.

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Introduction

Cancer of the esophagus is among the well-known neoplasms of human beings. Various surgical methods are developed to treat this disease: removal of the cancerous organ (through the abdomen or thorax) and replacing it with an alternative, most commonly a portion of the stomach or colon [1–3].

Nasogastric (NG) tubes are commonly placed during the surgery and are kept after the operation without any supporting evidence in reference books. Surgeons claim that the use of NG tubes decreases the occurrence of acute distention of the stomach due to ileus, has a preventive effect against nausea and vomiting, and diminishes the risk of anastomosis leak, but this claim has not been proven.

The use of NG tubes for decompression of gastrointestinal tract was first described by Levin in 1921 [3]. Pain and Wangesteen later suggested this to become a routine procedure [4]. However, further studies have questioned its effect since the 1960s. The application of NG tubes is accompanied by few adverse effects, including throat pain, nasal mucosal damage, sinusitis, gastritis, and epistaxis [5]. Several studies also have reported that the use of NG tubes is accompanied by an increased risk of pulmonary complications, more delayed regression of ileus, and a longer duration of hospitalization. The majority of these studies

have reported no relationship between the use of NG tubes and the risk of anastomosis leak [4, 6–31].

It is important to notice that the best part of those studies were the sections that focused on the use of NG tubes in patients undergoing surgical treatments for diseases of stomach, small intestine, colon, or urogenital tract. Also, the role of prokinetic agents as an alternative to the use of NG tubes has not been sufficiently evaluated. This study was undertaken in regard to the complications of the application of NG tubes in patients undergoing esophagus resection and to assess its positive and negative effects.

Materials and methods

This randomized, controlled trial was performed at the Cancer Institute of Imam Khomeini Hospital, Tehran, from 2005–2006. Forty patients with the following inclusion criteria were included in this study: all patients had to be known cases of esophagus cancer, who were candidates for surgical removal of the esophagus with the Orringer or McKeown methods [2]. Patients with intestinal obstruction were excluded from this study.

The patients were randomized into two study groups, after agreeing with the written consent form. The randomization was done just before starting the operation and was informed to the surgeon. A preoperative antibiotic was prescribed for all of the patients. In the McKeown technique, thoracotomy (posterolateral) was done first. After releasing the esophagus and the tumor, cutting and ligation of both ends was done. The thorax was closed and the abdomen was opened by midline incision. The stomach and the abdominal esophagus as well as the phrenoesophageal ligaments were released. The distal stump of the esophagus was drawn from the hiatus into the operative field and was separated from the stomach. Gastroplasty was done for large stomachs and pyloromyotomy was performed for all patients. The third incision was performed in the neck at which the cervical esophagus was released; the proximal stump of the cut esophagus was drawn up in to the field and was separated from the cervical esophagus. In the Orringer method, the thoracic incision was omitted and the thoracic esophagus was released transhiatally. All of the anastomoses were made by using the handsewn method (single-layer separated vicryl sutures). The stomach was used as the conduit to be anastomosed to the esophagus. Cervical Penrose drains were applied for the cases before cervical closure.

During the postoperative period, NG tubes were applied and fixed for the first group of patients. For the second group, NG tubes were not used after the operation; however, 10 mg of metoclopramide was administered intravenously every 8 h, starting immediately after the operation and continued until the regression of intestinal movements. All patients were operated on by the same team of surgeons with similar techniques. They all received 5,000 IU of heparin subcutaneously twice per day as well as 50 mg of ranitidine intravenously, every 12 h.

Once the signs of the regression of bowel movements were detected, the NG tube was removed from each patient of the first group. In case of abdominal distention, intrathoracic distention of the stomach, or repeated vomiting, an NG tube was (re)inserted for the patient very cautiously. All of the patients were precisely examined by the same physician every day until their discharge; they also received weekly examinations afterwards for a period of 1 month from the date of the operation. At least one chest X-ray image was obtained for every patient after the operation. Chest physiotherapy started from second day of the surgery, and the patients got out of the bed with abdominal support as soon as possible. Gastrographin swallow was performed for all of the patients before starting to eat at the 7th day of operation. The diagnosis of the leak was made by both clinical and radiological criteria.

The patients' information on the following variables were recorded: age and sex, first day of gas passage, defecation and BS auscultation as well as the duration of postoperative hospitalization, occurrence of nausea and/or vomiting, abdominal distention, operation complications (including pneumonia, atelectasis, anastomosis leak, wound dehiscence, and wound infection), type of operation, and whether the placement/replacement of NG tubes was necessary after the operation. Anastomosis leak was defined as gross excretion of salivary secretions from the site of anastomosis, plus positive evidence for leak in gastrographin study day 7. Pneumonia and atelectasis were assessed in the presence of suggestive signs or symptoms, using chest X-ray studies. Wound infection was clinically diagnosed based on a combination of signs and symptoms, including discharge, fever, pain, swelling, and redness.

Based on our sample size calculations, to be able to detect a difference of 0.2 days in the time to return of bowel movements, with a type one error of 0.05 and a power of 0.8, we needed approximately 20 patients in each group. All of the data were analyzed by means of SPSS 11.5, using t test, Mann-Whitney U test, Fisher's exact, and logistic regression models. $P < 0.05$ was defined as statistically significant.

Results

Twenty-two patients were randomized to the NG-tube group, and 18 to the second group (without

Table 1 Frequency of postoperative complications in the two groups (with and without NGT)

	Patients with NGT (n = 22)	Patients without NGT (n = 18)
Nausea	3	3
Vomiting	2	2
Distention	1	1
Pneumonia	0	2
Atelectasis	0	1
Anastomosis leak*	6	0
Wound infection	0	1
Placed/replaced NG	0	1
Perioperative death	0	1

* $P < 0.05$ in comparing the two groups

NGT nasogastric tube

NGT + metoclopramide), using random numbers table. The mean age of the patients was not different in the two study arms (58.4 ± 10.3 years vs. 60.1 ± 8.1 years, respectively, $P = 0.6$). Esophagectomy was performed using the Orringer method for 20 patients and the McKeown method for the remaining patients [2].

The comparison of the incidence rate of nausea, vomiting, abdominal distention, atelectasis, pneumonia, wound infection, and the need for placement/replacement of an NG tube after the operation showed no difference between the two groups of patients ($P > 0.05$; Table 1).

Wound dehiscence did not occur in any of the cases. Anastomosis leak occurrence was significantly higher in patients with NG tube compared with the other group (6 cases vs. 0 case, $P = 0.02$).

Perioperative death occurred in one patient in the NG-tube group, and none of the patients in the other group ($P = 0.45$). The comparison of the mean days of the first gas passage, defecation, and BS auscultation, as well as the mean postoperative days spent in the hospital showed no difference between the two study arms ($P > 0.05$; Table 2).

Table 2 Times of returning of bowel movement and postoperative hospital stay for the two groups (with and without NGT)

	With NGT	Without NGT
First day of gas passage	4.2 ± 1.3	4.5 ± 2.3
First day of defecation	5.4 ± 2.4	6 ± 2.5
First day of BS auscultation	4.1 ± 1.9	4.2 ± 2.9
Length of hospital admission (days)	10.9 ± 3.5	13.9 ± 8.2

Data are mean ± standard deviation

There was no significant difference between the two groups

NGT nasogastric tube, *BS* bowel sound

To assess the interactions of the age, the surgical method, and the use of NG tube on the occurrence of anastomosis leak, data were reanalyzed by using a logistic regression model. It indicated that only the use of NG tubes had a significant correlation with the occurrence of anastomosis leak ($P = 0.001$).

Discussion

Previous studies have reported different results on the gastrointestinal complications of NG tubes during the postoperative period. Whereas some studies have reported a higher incidence of nausea and vomiting in patients without an NG tube [4, 7, 12, 16, 26], other studies have reported a lower incidence of these symptoms in patients with NG tubes [8, 9]. A third group of studies have reported no correlations between these two factors [15, 20, 24, 29, 30].

Whereas the majority of the previous studies have reported a higher incidence of abdominal distention in patients for whom an NG tube was not used, there was no difference between our two study arms in regards to the incidence of abdominal distention, nausea, or vomiting [7, 11–13, 15, 16, 26, 31]. Theoretically, NG tubes may diminish the incidence of nausea and vomiting by decompressing the gastrointestinal tract and expelling the aggregated secretion; they also may have an opposite effect with regard to the stimulation of pharynx and larynx and subsequently the gag reflex. Nevertheless, the majority of the studies agree that the presence or absence of the three above-mentioned signs is of low clinical importance, and that an NG tube may be (re)inserted in case of repeated vomiting or late occurrence of abdominal distention. We believe that the importance of these factors is too low to be explained as a reason for the routine application of NG tubes.

Most previous studies have not detected any significant difference in time to return of the bowel movements [6, 10, 13, 15, 16, 19, 20, 24]. The results of our study are in agreement with this conclusion. In contrast, whereas most of the previous studies have reported a higher incidence of pulmonary complications in patients with an NG tube, we observed no statistically significant difference in the occurrence of pneumonia or atelectasis between the two study arms [13, 15, 16, 22]. This may be due to the small sample size of our trial. The NG tubes may increase the risk of aspiration and may interfere with the effective depletion of pulmonary secretions and thus increase the rate of pulmonary complications.

Although some studies have reported a fewer number of postoperative days spent in the hospital by patients for whom an NG tube was not used, other studies have

indicated no difference in the number of these days in patients with or without NG tubes [8, 25, 29]. The results of our study are in agreement with this second group of studies. The difference in this number within our study groups (10.9 vs. 13.9 days, in patients with and without NG tubes, respectively) is mainly due to a longer hospitalization period of two of the patients in the NG-tube group, the cause of which was not related to the use of NG tubes.

Our two study groups experienced a similar rate of wound-related complications, which is in agreement with the results of the previous studies [7, 9, 11–13, 15, 16, 19, 20, 23, 29].

Ironically, although there has been no report of an increased risk of anastomosis leak in patients for whom an NG tube was used, this risk was estimated to be significantly larger in our NG-tube group. It is important to regard the basic differences between the patients recruited in the other studies and those participating in our study. None of the previous studies exclusively used patients with esophagus cancer, and the number of these patients among all study patients was too low. Our patients were operated on using the Orringer or McKeown techniques; in both of these methods, an angled anastomosis is created between the stump of esophagus and the anterior wall of the stomach. The NG tubes may press this angled anastomosis and may cause necrosis and leak. However, this theory must be proven by more robust evidence.

Although not measured precisely, our estimate is that the usual rate of anastomosis leak in our center is approximately 10–20% for the above-said surgical techniques. We observed a 27% rate of anastomosis leak in our NG-tube group in our research. Given the sample size of the group (22 patients), the lower 95% confidence interval for the true rate is less than 9%. This means that the rate of leak that we observed in our NG-tube group is not far from the normal level that we experience in our routine practice, and a true estimate of approximately 10–20% looks more feasible.

Our overall conclusion is that the application of the NG tubes does not help with having better control of gastrointestinal and wound complications and probably has a negative effect on the pulmonary function. Indeed, if complementary research confirms the proposed effect of NG tubes on anastomosis leak, it may be better to avoid its use as much as possible. These results show that the placement of NG tubes after the resection of esophagus should be performed selectively and not as a routine for all patients.

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