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Original Article

Comparison of Gastric Cancer Surgery with Versus without Nasogastric Decompression

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There is a widespread belief that nasogastric decompression in gastric cancer surgery allows better surgical field and leads to the reduction of postoperative complications. The aim of this study was to evaluate whether gastric cancer surgery can be safely performed without nasogastric decompression. From March to June 2000, 119 patients with gastric adenocarcinoma were randomized into either a tubeless group (n=56) or an intubated group (n=63). Exclusion criteria included a history of upper gastrointestinal bleeding and pyloric obstruction. No remarkable difference was found in the incidence of complications in the tubeless and intubated groups (mean 10.9%, p=0.945). The incidence of nasogastric tube insertion in the tubeless group was similar to the incidence of nasogastric tube reinsertion in the intubated group (p=0.747). Time to pass flatus was not different in the two groups (p=0.054), nor was the length of hospital stay (p=0.148). These results suggest that gastric cancer surgery can be performed safely without nasogastric decompression.

Key Words: Gastric cancer, surgery, nasogastric decompression

INTRODUCTION

The value of nasogastric decompression in abdominal surgery has been questioned by several clinical trials.[1-4] Most surgeons traditionally continue to use nasogastric decompression, believing that its use facilitates better surgical field and reduces complications such as nausea, vomiting, aspiration, and anastomotic leakage caused by postoperative ileus.[5-7]

A number of factors have been reported to influence postoperative ileus,[8-14] such as anesthesia, the extent or type of surgery, operation time, analgesia, mobilization, early postoperative feeding and prokinetics. No single study to date has evaluated the possibility of performing gastric cancer surgery without nasogastric decompression under conditions that allows the influence of surgery related factors on postoperative outcomes to be determined in a controlled manner.

The purpose of this study was to evaluate whether gastric cancer surgery could be performed safely without nasogastric decompression by comparing operations performed by a single surgeon in a prospective randomized study.

MATERIALS AND METHODS

We performed this study according to the requirements of the Helsinki Declaration. The study was approved by the Ethics Subcommittee of Yonsei University College of Medicine for Research Involving Human Subjects (No. 2000-3). All patients gave written informed consent.

From March 2000 to June 2000, we enrolled 151 consecutive patients who underwent gastric resection for gastric adenocarcinoma. Patients who showed pyloric obstruction or hematemesis due to gastric cancer and patients who did not consent to the study were excluded prior to the randomization process. After obtaining consent, eligible patients were randomized before surgery

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into an intubated or a tubeless group using a random number table. Patients with unresectable gastric carcinoma or who had received intraperitoneal chemotherapy or patients with suspected suture-line insufficiency were excluded after randomization.

All patients received perioperative antibiotic prophylaxis, and received pain control by epidural patient controlled anesthesia (PCA), with morphine 7 mg and 0.5% bupivacaine 30 ml using a WalkMed PCA (McKinley Medical Co., Medex, CO, USA). No prokinetics for bowel movement or anti-emetics were used in any patient. All patients were preoperatively trained about effective postoperative pulmonary toileting and were encouraged to move around from the second postoperative day. In the tubeless group, intraoperative gastric decompression was carried out using the needle decompression technique.[15] The needle decompression technique is a method for the aspiration of gastric contents using a 19-gauge needle connected to a suction (which was introduced to the stomach through the anterior wall of the stomach avoiding the tumor located area after collecting gases in the duodenum and proximal jejunum by external manual squeezing aborally). An 18 Fr. silastic nasogastric tube (Sewoon Medical Co., Seoul, Korea) was inserted intraoperatively and connected to a Gomco (Allied Healthcare Product Inc., St. Louis, MI, USA), which intermittently removed the bowel contents postoperatively until a patient passed flatus in the intubated group. Nasogastric tube was removed whenever the patients passed flatus. Postoperative oral intake was restricted for all patients until the passage of flatus in the absence of abdominal distension or vomiting. Patients were allowed water after resolution of the ileus, and then progressed to a liquid diet and a semi-solid diet when water was tolerated for more than 24 hours. The length of hospital stay was defined as the duration of stay from the day of the operation to the day of discharge or transferal to the department of medical oncology for postoperative adjuvant chemotherapy. Patients were discharged or transferred when they were able to tolerate a semisolid diet of at least 72 hours without evidence of any complication.

Postoperative laboratory tests including hematologic and chemical tests were performed on the 1st and 7th postoperative day. Routine chest and abdominal imaging studies were not performed. Postoperative complications included gastrointestinal, respiratory, wound, and other complications. Pneumonia was defined as an abnormal chest x-ray and a positive sputum culture and atelectasis, confirmed by chest x-ray. Intra-abdominal abscess was defined as a collection determined radiographically and treated with systemic antibiotics and/or percutaneous drainage, and wound infection was proven by a positive culture. Major mechanical complications included prolonged ileus for more than 5 days, mechanical obstruction, wound dehiscence, and anastomotic leakage.

For patients in the tubeless group, a nasogastric tube was inserted after more than two episodes of persistent nausea and vomiting (over 100 ml within 24 hours), after twelve hours of severe abdominal distension, or after postoperative anastomotic leakage was confirmed clinically and/or radiologically. In the intubated group, a nasogastric tube was reinserted when the above symptoms or complications were noted after nasogastric tube removal.

All of the operative procedures were performed by one experienced gastric surgeon (SH Noh). The following standardized operative procedures were performed: 1) A total or distal subtotal gastrectomies were performed depending on the location and macroscopic type of gastric cancer; 2) For early gastric cancer, D2 lymphadenectomy was preferred, while for advanced gastric cancer, D3 lymphadenectomy was usually performed according to the rules of "The Japanese Research Society for Gastric Cancer".[16]

All statistical analyses were performed using the 'Statistical Package for Social Science' (SPSS) version 9.0 for Windows (SPSS Inc., Chicago, IL, USA). Inter-group comparisons were made using the Student's t test for continuous variables and the two-tailed (2 test for discrete variables. The accepted level of significance was $p < 0.05$.

RESULTS

Of the 151 enrolled patients, 15 patients were

excluded prior to randomization, because of pyloric obstruction, hematemesis, or lack of consent. Another 17 patients were excluded from the study due to unresectable cancer, intraperitoneal chemotherapy, and suture-line insufficiency. Randomization was successful for the remaining 119 patients. A total of 63 patients were randomised to the intubated group, and 56 to the tubeless group. (Fig. 1)

The sex and age of the patients, the duration of operation, extent of surgery, and stage of disease showed similar distributions for the two groups (Table 1).

The overall complication rate was 10.9% (13/119), i.e., 11.1% (7/63) in the intubated group, and 10.7% (6/56) in the tubeless group. There were no significant differences between the two groups in terms of the incidence and types of complications (Table 2). The complication rate of the two groups was similar in subtotal gastrectomy (5.4% versus 8.8%, p=0.574) and total gastrectomy (19.2% versus 13.6%, p=0.604). There was no operative mortality in either group.

Insertion of a nasogastric tube in the tubeless group during the postoperative period occurred in two patients (3.6%), one due to postoperative intestinal obstruction and the other due to bile leakage resulting from bile duct injury during lymph node dissection, which was treated conservatively. A nasogastric tube was reinserted in three patients (4.8%), one due to a large emesis and the others for severe abdominal distension after removal of the tube in the intubated group (Table 3). Incidences of nausea were more common in the intubated group (p=0.001) while incidences of vomiting were similar in both groups (p=0.818)(Table 3).

Time to the presence of bowel sound and the passage of flatus were no different for the two groups (p=0.203, 0.054 respectively). The tubeless group showed a shorter time to tolerate a clear liquid and a semi-solid diet than the intubated group ($p < 0.001$, 0.002 respectively), whereas the length of hospital stay was no different for the two groups (p=0.148) (Table 3).

DISCUSSION

In this study, we found that patients who underwent gastric cancer surgery with or without nasogastric decompression had similar bowel function restoration and complication rates.

Nasogastric intubation for gastrointestinal decompression is a common practice in abdominal surgery. Some surgeons would worry that

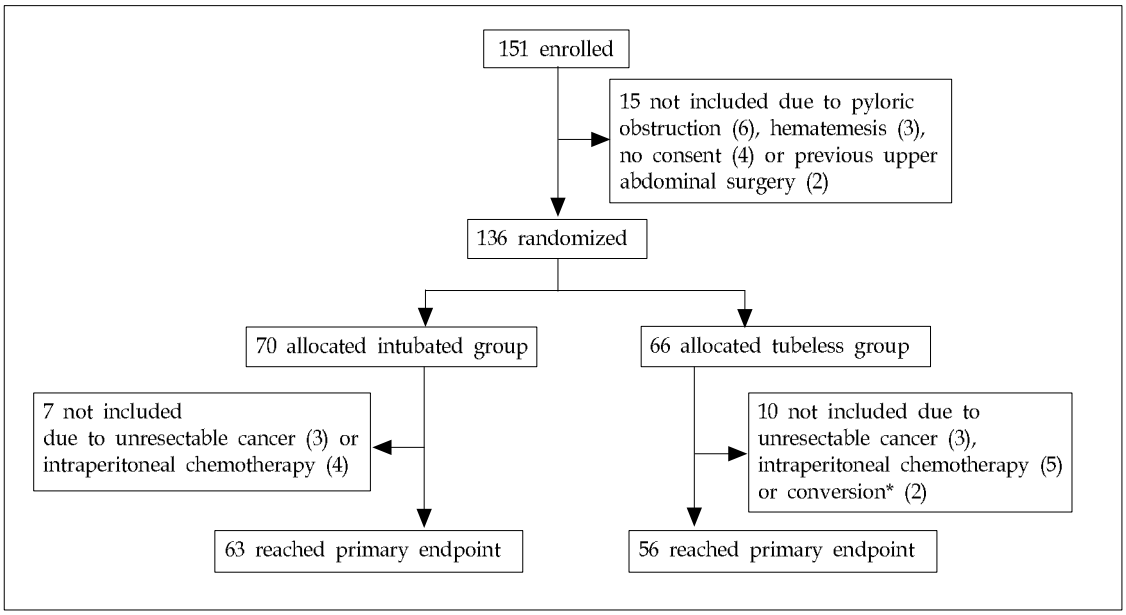

Fig. 1. Trial profile. *Conversion means that a nasogastric tube was inserted during operation due to suture-line insufficiency.

Table 1. Demographic and Surgical Characteristics of the Patients

	Intubated (n=63)	Tubeless (n=56)
Age* (years)	57.1 ± 11.5	58.8 ± 11.8
Sex		
Male	51 (81.0)	41 (73.2)
Female	12 (19.0)	15 (26.8)
Duration of op.*(min)	153.9 ± 33.9	151.9 ± 23.3
Extent of gastric resection		
Subtotal gastrectomy	37 (58.7)	34 (60.7)
Total gastrectomy	26 (41.3)	22 (39.3)
Type of reconstruction		
Gastroduodenostomy	11 (17.5)	10 (17.9)
Gastrojejunostomy	26 (41.3)	24 (42.8)
Oesophagojejunostomy	26 (41.3)	22 (39.3)
Lymphadenectomy		
D2	30 (47.6)	22 (39.3)
D3	33 (52.4)	34 (60.7)
Stage		
EGC	24 (38.1)	18 (32.1)
AGC	39 (61.9)	38 (67.9)

Values in parentheses are percentages.
Student's t test or two-tailed X^2 test showed no significant difference between the two groups.
*Age and duration of op. was expressed as means ±standard deviations. Duration of op. was expressed as means ± standard deviation. Op.; operation.

Table 2. Postoperative Complications

	Intubated* (N=63)	Tubeless (N=56)	*p*
None	56 (88.9)	50 (89.3)	0.945
Present	7 (11.1)	6 (10.7)	
Gastrointestinal complication			
Postoperative ileus	2 (3.2)	1 (1.8)	
Obstruction	1 (1.6)	1 (1.8)	
Respiratory complication			
Atelectasis	2 (3.2)	2 (3.6)	
Pneumonia	0 (0.0)	1 (1.8)	
Wound complication			
Infection	0 (0.0)	2 (3.6)	
Other complication			
Bile leakage	0 (0.0)	1 (1.8)	
Chyle leakage	2 (3.2)	2 (3.6)	
Intra-abdominal abscess	1 (1.6)	1 (1.8)	

Values in parentheses are percentages.
*Nasogastric tube insertion itself caused epistaxis in two patients of the intubated group.

Table 3. Surgical Outcomes of the Patients

	Intubated* (N=63)	Tubeless (N=56)	*p*
Reinsertion	3 (4.8)	2 (3.6)	0.747
Nausea			0.001
Absent	35 (55.6)	47 (83.9)	
Present	28 (44.4)	9 (17.1)	
Vomiting			0.818
Absent	59 (95.7)	53 (94.5)	
Present	4 (6.3)	3 (5.5)	
Return of bowel sound*	2.7 ± 0.6	2.6 ± 0.6	0.203
Passage of flatus*	3.8 ± 0.9	3.5 ± 0.9	0.054
Tolerance to clear liquid diet*	5.2 ± 1.0	4.6 ± 0.9	<0.001
Tolerance to semi-solid diet*	6.3 ± 1.1	5.7 ± 0.9	0.002
Length of hospital stay*	11.1 ± 3.7	10.3 ± 1.7	0.148

Values in parentheses are percentages.
*Values are presented as postoperative days.

without nasogastric decompression, aspiration pneumonia, anastomotic leakage, or delayed detection of bleeding might be exacerbated. However, aspiration can be prevented by the cautious evaluation of gastric contents and a gentle induction procedure. Moreover, a careful accurate surgical procedure can guarantee secure anastomosis. The possibility of regurgitation or pressure disruption of anastomosis is insignificant because small intestinal motility returns within a day of operation. Surgeons find it difficult to get an uncluttered surgical field due to air and fluid in the stomach and duodenum at the start of the operation without nasogastric intubation.[3,5] However, nasogastric tube insertion may cause severe discomfort and may even be harmful, since the procedure can cause injury to the aerodigestive tract.[17,18]

In this study, we could not compare the effect of both postoperative nasogastric decompression and nasogastric tube insertion itself because patients in the tubeless group never used a nasogastric tube. The intraoperative needle decompression technique makes it possible to perform tubeless gastric cancer surgery.[15] However, in the present study nasogastric tube insertion itself caused epistaxis in two intubated patients. Nasogastric tube insertion was required in two patients (3.6%) of the tubeless group, and the nasogastric tube reinsertion was required in three patients of the intubated group (4.8%). This is comparable to previous studies that showed a 5 to 7% insertion rate of nasogastric tube in a postoperative tubeless group.[1-4]

Some studies have demonstrated that the nasogastric tube may be associated with an increased incidence of pulmonary complications, such as atelectasis and pneumonia.[1-4] However, we did not find a lower rate of pulmonary complications in the tubeless group, and found that postoperative complications were similar in both groups. The relatively young age of our patients, the short operation time, and earlier mobilization by better pain control, as a result of using epidural analgesia may be associated with lower pulmonary complications.

Passage of flatus was slightly faster in the tubeless group, whereas time to the return of bowel sound was similar in the two groups. It was found difficult to progress to a semisolid diet after starting water in the intubated group, because some time had to be allowed for these patients to recover from sore throats. However, there was no difference in the length of hospital stay between the two groups as others have reported.[2,18]

Postoperative outcomes may be affected by a number of surgery related factors such as surgical techniques, surgical extent, and differences among surgeons.[19,20] In the present study, a standardized surgical technique and surgical extent by a single surgeon made it possible to compare clearly the effect of nasogastric decompression.

We conclude that gastric cancer surgery can be performed safely without nasogastric decompression, and that this may prevent the discomfort and injury caused by the insertion of the nasogastric tube. To determine whether general surgeons can adequately conduct tubeless gastric cancer surgery, we plan to conduct a multi-institutional study.

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