ORIGINAL ARTICLE

Is routine nasogastric decompression necessary following emergency surgery for perforated peptic ulcer?

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ABSTRACT

BACKGROUND: Nasogastric (NG) tube decompression has traditionally been used after abdominal surgery to prevent postoperative ileus and gastric distension. The aim of this study was to evaluate the necessity of NG tube decompression following emergency repair of perforated peptic ulcer (PUP).

METHODS: This retrospective study included 189 patients who underwent emergency surgery for PUP between 1999 and 2017. Patients were divided into two groups: those managed with an NG tube (Group 1, n=154) and those managed without an NG tube (Group 2, n=35). Demographic data, clinical characteristics (American Society of Anesthesiologists [ASA] scores and comorbidities), intraoperative findings, and postoperative outcomes, including length of hospital stay, time to oral intake, and complications, were analyzed.

RESULTS: The study cohort included 189 patients, of whom 84.1% were male, with a mean age of 54.1±19.9 years. Baseline demographic and clinical characteristics, including age, comorbidities, ASA scores, and operative details, were comparable between the two groups. There were no statistically significant differences in postoperative complications or 30-day mortality. However, patients in Group 2 demonstrated a significantly earlier transition to oral feeding (3.7±0.9 vs. 4.3±1.4 days; p=0.03) and a shorter duration of hospital stay (6.6±3.1 vs. 8.1±3.8 days; p=0.04) compared to Group 1.

CONCLUSION: Routine NG decompression is not necessary following surgery for PUP. Avoiding routine NG tube use does not increase morbidity or mortality and is associated with earlier oral intake and a shorter hospital stay. We recommend the use of NG decompression in selected patients when clinically indicated.

Keywords: Duodenal ulcer; gastric decompression; nasogastric tube; peptic ulcer; perforation.

INTRODUCTION

Peptic ulcer (PU) is caused by a wide range of factors that lead to erosion of the gastric and duodenal mucosa due to disruption of the mucosal barrier against gastric acid and pepsin.[1] Many factors contribute to its development, including Helicobacter pylori infection, chronic use of non-steroidal anti-inflammatory drugs, and smoking.[2,3] Peptic ulcer perforation (PUP) is a severe complication of peptic ulcer disease.[2] It involves contamination of the peritoneal cavity with gas-

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tric and duodenal contents.[3,4] Although bleeding is the most frequent complication of peptic ulcer disease, PUP remains the leading cause of mortality.[5] Operative management is recommended in patients presenting with massive pneumoperitoneum, active extraluminal contrast extravasation from the gastric lumen, and clinical signs of acute abdomen.[3] Traditionally, omentopexy is used in the treatment of perforated peptic ulcer (PPU) via open or laparoscopic surgery, and patients are managed with a nasogastric tube (NGT) during the early postoperative period.[6]

Current Enhanced Recovery After Surgery (ERAS) protocols recommend early removal of all catheters, including urinary and nasogastric (NG) tubes, following both elective and emergency surgeries. This protocol has also been safely implemented after surgery for PUP, even in elderly patients.[2] Routine nasogastric tube use after abdominal surgery largely reflects traditional practice. However, routine use of NG tubes following abdominal surgery has been associated with increased pulmonary and wound complications.[7] Furthermore, although abdominal distention may occur after abdominal surgery, only about 7% of cases require decompression with an NG tube.[7] There are no clear data in the literature regarding the necessity of NG tube use after PPU repair.[8]

The NG tube has traditionally been used in the early postoperative period after most abdominal surgical procedures, including PPU repair. The aim of this study was to examine the necessity of NG tube decompression following an important emergency procedure such as PUP repair.

MATERIALS AND METHODS

Study Population and Study Groups

Between 1999 and 2017, a total of 298 patients underwent emergency surgery for perforated peptic ulcer at our institution. For the purpose of this analysis, only patients who received primary repair via open omentopexy were considered eligible for inclusion. Consequently, patients who underwent alternative surgical procedures were excluded from the study. Specifically, nine patients who underwent gastrectomy or definitive ulcer surgery, one patient who underwent laparoscopic repair, and 46 patients whose repairs utilized the falciform ligament instead of the omentum were excluded from further analysis. One patient with a perforation diameter of 7 cm who underwent repair using an omental Graham patch was included in the study. After this initial screening, 242 patients remained eligible. An additional 53 patients were excluded due to incomplete data, resulting in a final study cohort of 189 patients. Figure 1 presents a flowchart summarizing the process of patient inclusion and exclusion based on the study criteria. The patients were divided into two groups:

- Group 1: Patients with NG tube insertion (n=154)
- Group 2: Patients without NG tube insertion (n=35).

Ethical Considerations

This study was approved by the Inonu University Scientific Research and Publication Ethics Board (Date: 27.02.2018, Decision no: 2018/5-3).As the analysis was conducted retrospectively, neither verbal nor written informed consent was required from the patients or their relatives. The study was conducted in accordance with the Declaration of Helsinki

Study Parameters

We retrospectively reviewed the institutional electronic database to collect demographic data (age and gender) and clinical characteristics, including American Society of Anesthesiologists (ASA) scores and comorbidities such as diabetes mellitus, hypertension, cardiovascular disease, chronic obstructive pulmonary disease (COPD), history of malignancy, and chronic renal disease (CRD). Preoperative laboratory values, including white blood cell count (WBC), hemoglobin, blood urea nitrogen (BUN), and creatinine levels, were recorded. Intraoperative data, such as the location and diameter of the perforation and the duration of the operation, were also documented. Postoperative outcomes assessed included length of hospital stay, time to oral intake, and specific com-

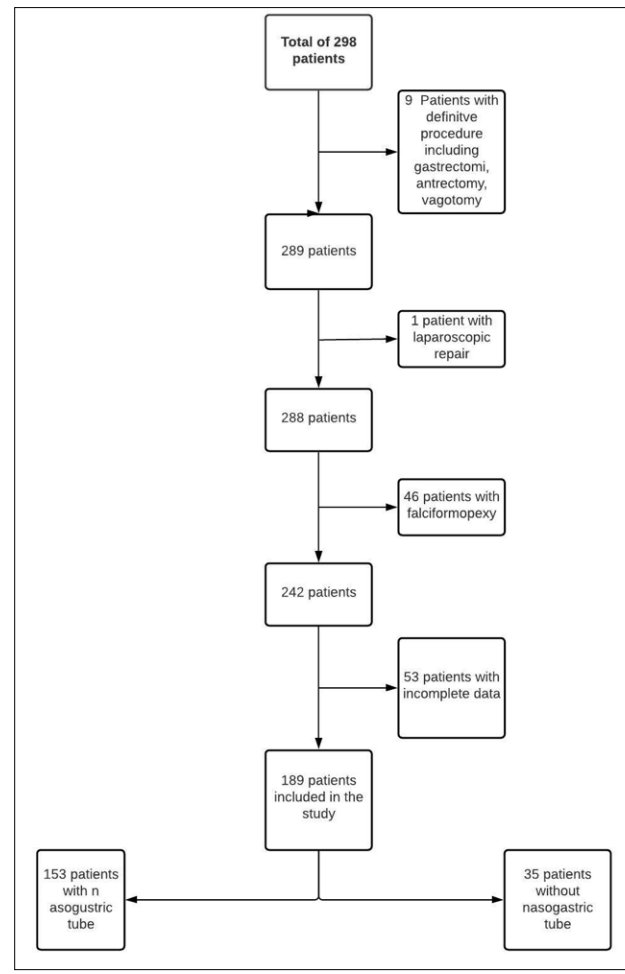

Figure 1. Flowchart illustrating patient selection at the beginning and end of the study, including the inclusion and exclusion criteria.

plications, including repair-site leakage, ileus, evisceration, atelectasis, pneumonia, surgical site infection, and the 30-day mortality rate.

Operative Technique

All patients underwent repair using the modified Graham patch technique.[9] The abdomen was entered through an upper midline incision, and the cavity was irrigated with large volumes of warm saline. After identification of the perforation, biopsies were routinely obtained from gastric ulcers; however, they were not routinely performed for duodenal perforations. The perforation was closed using 2/0 polydioxanone sutures. Following primary closure, an omental patch was prepared using energy devices and secured over the perforation site. Sump drains were placed in the subhepatic space and, when clinically indicated, in the pelvic cavity.

Statistical Analyses

The distribution of continuous variables was assessed using the Kolmogorov-Smirnov test. Normally distributed continuous variables are reported as mean±standard deviation (SD), while non-normally distributed variables are expressed as median (minimum–maximum). Categorical variables are presented as frequencies and percentages [n (%)]. For group comparisons, the Student's t-test was used for normally distributed data, and the Mann-Whitney U test was used for non-normally distributed data. Categorical variables were analyzed using the Pearson chi-square test. Statistical significance was defined as a $p<0.05$. All analyses were conducted using IBM SPSS Statistics for Windows, version 26.0 (IBM Corp., Armonk, NY, USA).

Table 1. Demographic, clinical, and preoperative characteristics of the patients

	All patients (n=189)	Group 1 (n=154)	Group 2 (n=35)	p value
Age	54.1±19.9	54.2±20.4	53.5±18.7	0.84
Gender				
Male	159 (84.1)	128 (83.1)	31 (88.6)	0.30
Female	30 (15.9)	26 (16.9)	4 (11.4)	
Interval between symptoms and admission (hours)	24 (1-192)	24 (1-192)	24 (4-168)	0.67
Comorbidities				
Diabetes mellitus	9 (4.7)	9 (5.8)	0 (0)	0.10
Hypertension	24 (12.7)	21 (13.6)	3 (8.6)	0.54
Cardiovascular disease	7 (3.7)	6 (3.9)	1 (2.8)	0.37
COPD	12 (6.3)	11 (7.1)	1 (2.8)	0.13
History of malignancy	9 (4.8)	8 (5.2)	1 (2.8)	0.28
CRD	7 (3.7)	4 (2.6)	3 (8.6)	0.42
ASA score				
I	61 (32.3)	48 (31.2)	13 (37.1)	0.32
II	46 (24.3)	32 (20.8)	14 (40)	
III	19 (10.1)	17 (11.0)	2 (5.7)	
IV	4 (2.1)	4 (2.6)	0 (0)	
V	1 (0.5)	1 (0.6)	0 (0)	
Laboratory values				
WBC	13.6±6.8	14.0±6.9	11.8±6.3	0.09
Hemoglobin	14.6±2.4	14.5±2.4	15.0±2.3	0.33
Creatinine	1.2±1.1	1.2±0.8	1.4±1.8	0.44
BUN	29.4±22.8	29.7±23.0	28.8±22.6	0.84
Albumin	2.7±0.6	2.7±0.6	2.6±0.4	0.46

Chronic obstructive pulmonary disease; CRD: Chronic renal disease; ASA: American Society of Anesthesiologists; WBC: White blood cell count; BUN: Blood urea nitrogen. Age: years; WBC: 10^9/L; Hemoglobin: g/dL; Creatinine: mg/dL; BUN: mg/dL; Albumin: g/dL. *Continuous variables are expressed as mean±standard deviation (mean±SD). Categorical variables are presented as number and percentage [n (%)].

RESULTS

Demographic and Clinical Characteristics

A total of 189 patients were included in the analysis (Fig. 1). The study cohort had a mean age of 54.1±19.9 years, with a male predominance (84.1%). The median time from symptom onset to hospital admission was 24 (1-192) hours. Hypertension (12.7%) and COPD (6.3%) were the two most common comorbidities observed. The majority of patients had ASA I (32.3%) and ASA II (24.3%) scores. The median perforation diameter was 0.5 (0.2-7) cm. The most frequent site of perforation was the duodenum, accounting for 79.4% of cases. The mean duration of hospitalization was 7.8±3.7 days. The most frequent postoperative complications included evisceration in eight (4.2%) patients, atelectasis in 13 (6.9%) patients, pneumonia in 17 (9%) patients, and wound site infection in 17 (9%) patients. Mortality occurred in 13 (6.9%) patients.

Baseline Characteristics of the Study Groups

Table 1 summarizes the preoperative demographic and clinical characteristics of patients in Group 1 and Group 2. There were no statistically significant differences between the two groups regarding age, time to hospital admission, ASA risk scores, or preoperative laboratory parameters. Furthermore, the distribution of comorbidities—including diabetes mellitus, hypertension, and COPD—was comparable between the two groups.

Intraoperative Findings

Table 2 summarizes the perioperative characteristics of patients in Group 1 and Group 2. Operative data revealed no significant differences between the two groups. Specifically, the diameter of the perforation, anatomical location of the perforation, and total duration of surgery were similar in both groups.

Table 2. Perioperative characteristics of the study groups

	All patients (n=189)	Group 1 (n=154)	Group 2 (n=35)	p value
Perforation diameter (cm)	0.5 (0.2-7)	0.5 (0.2-7)	0.5 (0.3-2)	0.58
Site of perforation [n (%)]				
Duodenum	150 (79.4)	125 (81.2)	25 (71.4)	0.17
Prepyloric	8 (4.2)	8 (5.2)	0 (0)	
Pyloric	6 (3.2)	3 (1.9)	3 (8.6)	
Cardia/corpus	19 (10.1)	13 (8.4)	6 (17.1)	
Gastroenterostomy anastomosis	3 (1.6)	2 (1.3)	1 (2.6)	
Operative time (minutes)	70 (30-210)	70 (30-210)	65 (60-120)	0.75

Continuous variables are expressed as median (minimum–maximum). Categorical variables are expressed as number and percentage [n (%)].

Table 3. Postoperative outcomes and distribution of complications

	All patients (n=189)	Group 1 (n=154)	Group 2 (n=35)	p value
Length of hospital stay (days)	7.8±3.7	8.1±3.8	6.6±3.1	0.04
Time to oral intake (days)	4.2±1.3	4.3±1.4	3.7±0.9	0.03
Complications				
30-day mortality	13 (6.9)	12 (7.8)	1 (2.9)	0.33
Leakage	4 (2.1)	3 (1.9)	1 (2.9)	0.55
Ileus	4 (2.1)	4 (2.6)	0 (0)	0.45
Evisceration	8 (4.2)	7 (4.5)	1 (2.9)	0.56
Atelectasis	13 (6.9)	10 (6.5)	3 (8.9)	0.42
Pneumonia	17 (9)	14 (9.1)	3 (8.9)	0.64
Wound site infection	17 (9)	15 (9.7)	2 (5.7)	0.38

Continuous variables are expressed as mean±standard deviation (mean±SD). Categorical variables are presented as number and percentage [n (%)].

Postoperative Outcomes and Complications

Regarding postoperative morbidity and mortality, the use of an NGT did not provide a statistically significant advantage. There were no significant differences between the groups in terms of repair-site leakage, postoperative ileus, wound site infection, or pulmonary complications (atelectasis and pneumonia). Twelve patients (7.8%) in Group 1 and one patient (2.9%) in Group 2 died within 30 days after surgery. The 30-day mortality rate was comparable between the two groups. All variables related to postoperative outcomes are summarized in Table 3.

Comparison of Recovery Characteristics

Significant differences were observed in postoperative recovery times. Patients in Group 2 demonstrated a significantly earlier transition to oral feeding compared to patients in Group 1 (3.7±0.9 days vs. 4.3±1.4 days, respectively; p=0.03). Consequently, the length of hospital stay was significantly shorter in Group 2 compared to Group 1 (6.6±3.1days vs. 8.1±3.8 days, respectively; p=0.04). All variables related to postoperative recovery are summarized in Table 3.

DISCUSSION

The routine use of NG tubes was popularized following McIver's thesis, which postulated that swallowed air after abdominal surgery exacerbates abdominal distension. Consequently, many surgeons adopted NG tube decompression in the belief that draining stomach contents would accelerate the resolution of postoperative paralytic ileus. However, clinical observations frequently reveal minimal drainage from the NG tube, prompting a re-evaluation of its efficacy and benefits. Therefore, the use of NG decompression has largely remained a traditional practice.[9,10] This high-volume, single-center study analyzed the effects of NG tube decompression on gastrointestinal function and perioperative patient outcomes. We found that patients managed without NG tube decompression experienced a significantly shorter time to oral feeding and a reduced duration of hospitalization. Our results suggest that NG tube decompression should not be used routinely but rather reserved for selected cases where it is clinically indicated.

In the present study, we demonstrated that in peptic ulcer perforation repair, routine nasogastric tube decompression should be avoided, as it delays the recovery of gastrointestinal function. Patients managed without NG decompression exhibited accelerated recovery, evidenced by earlier initiation of oral feeding and significantly shorter hospital stays. In elective colorectal surgery, several studies have shown that NG tube use does not hasten the recovery of gastrointestinal function; conversely, it has been associated with a significantly increased risk of respiratory tract infections.[11] Furthermore, routine NG tube use has not demonstrated advantages regarding surgical site infection, nausea, vomiting, or ileus rates.[12] Some studies have reported that, contrary to traditional expectations, intestinal peristalsis returns earlier in patients managed without an NG tube.[12] Similarly, other studies have shown that patients without an NG tube achieve earlier oral intake and a faster transition to solid food following colorectal procedures.[13] It has been suggested that nasogastric tube decompression of the upper gastrointestinal tract may disrupt reflexes triggered by orogastric secretions, potentially contributing to postoperative ileus.[13] Several factors are known to contribute to postoperative ileus, including autonomic nervous system dysfunction, systemic inflammatory responses, anesthetic medications, and the use of opioid analgesics.[14] A Cochrane meta-analysis further supported these findings, concluding that omitting NG tubes after abdominal surgery accelerates the return of bowel function and reduces pulmonary complications without increasing repair-site leak rates.[15]

We demonstrated that NG tube decompression does not reduce leakage from the repair site. This finding is consistent with observations from other upper gastrointestinal surgeries. Following esophagectomy, no differences were observed in repair-site leakage, pulmonary complications, or mortality between early and late NG tube removal groups.[16] In an experimental rabbit model of esophageal repair, Yurtcu et al.[17] reported higher repair success rates in the group without NG tubes. Similarly, after gastrectomy for gastric cancer, omission of the NG tube did not negatively affect rates of repair-site leakage, wound infection, morbidity, or mortality. Instead, the non-NG tube group benefited from earlier oral intake and shorter hospital stays.[18] Akbaba et al.[19] also reported that avoiding NG tubes after total gastrectomy and esophagojejunostomy resulted in fewer postoperative fevers, sore throats, and pulmonary complications, without an increase in leakage rates.

Nasogastric tube insertion is not without risk; complications primarily arise from traumatic insertion or malposition. Because insertion is typically performed blindly, it may cause superficial mucosal injury or severe complications such as perforation or fistula formation. Reported complications include arytenoid trauma,[20] posterior pharyngeal wall hematoma,[21] gastric perforation,[22] esophageal perforation, and pneumothorax.[23] Predisposing factors for these injuries include malpositioning and the absence or misplacement of an endotracheal tube.[24] In severe cases, such as in patients with skull base trauma, intracranial placement of the NG tube has been documented.[25] Fortunately, no NG tube-related complications were observed in our study. Nevertheless, NG tube decompression of the gastrointestinal tract is required under certain clinical circumstances.

According to the latest guidelines of the World Society of Emergency Surgery (WSES), nasogastric tube decompression of the stomach is recommended in the non-operative management of self-contained perforations.[3] NG decompression has been used for the past three centuries for the treatment and diagnosis of various gastrointestinal diseases,

such as intestinal obstruction and gastrointestinal bleeding. The primary objective is the evacuation of gastrointestinal fluids and air from the upper gastrointestinal system.[15] The use of an NG tube is a routine surgical practice to decrease intestinal distention caused by postoperative ileus after major abdominal surgeries. Its main purpose is to decrease complications such as repair-site leakage, prevent vomiting secondary to ileus, and reduce the risk of pulmonary complications.[26] Although elective surgery for PU disease has decreased, emergency surgery for PUP or hemorrhage due to PU is still performed. As with any abdominal surgery, gastric dilatation due to swallowed air, postoperative ileus, and postoperative nausea and vomiting are common postoperative problems.[27] Traditionally, all these conditions have been managed with NG tube insertion.[28] Postoperative ileus is often observed in critically ill patients, particularly those with severe sepsis or those requiring mechanical ventilation. Therefore, routine NG tube insertion is not justified. However, NG tube decompression may be necessary in selected cases, such as elderly patients with severe abdominal sepsis or critically ill patients requiring mechanical ventilation, to prevent complications related to gastrointestinal distention.[28,29]

We attempted to reduce selection bias by including only patients who underwent open repair. A major strength of this study lies in the comparability of the cohorts; preoperative demographic characteristics, clinical and laboratory parameters, as well as perioperative variables, were similar between the two groups, thereby reducing the impact of confounding factors. However, the study has certain limitations. The retrospective design and the lack of a standardized randomization protocol introduce the potential for selection bias.

CONCLUSION

In the present study of patients undergoing repair for peptic ulcer, those managed without an NG tube experienced significantly shorter hospital stays and an earlier return to oral intake, without an increase in morbidity or mortality. Based on these findings, we do not recommend the routine use of NG tubes after PPU repair. Avoiding routine NG tube use improves patient comfort, eliminates potential tube-related complications, accelerates the resumption of oral feeding, and reduces the length of hospital stay.

Ethics Committee Approval: This study was approved by the Inonu University Scientific Research and Publication Ethics Board (Date: 27.02.2018, Decision No: 2018/5-3).

Peer-review: Externally peer-reviewed.

Authorship Contributions: Concept: E.Ç., C.A., C.K.; Design: E.Ç., C.A., C.K.; Supervision: C.K., T.T.Ş., C.A.; Data collection and/or processing: E.Ç., M.Ş., E.Ö.; Analysis and/or interpretation: T.T.Ş., E.Ö., E.Ç.; Literature review: E.Ç., M.Ş., E.Ö.; Writing: T.T.Ş., E.Ö., E.Ç.; Critical review: T.T.Ş., E.Ç., C.K.

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ORİJİNAL ÇALIŞMA - *ÖZ*

Perfore peptik ülser nedeniyle yapılan acil cerrahi sonrasında rutin nazogastrik dekompresyon gerekli midir?

AMAÇ: Nazogastrik (NG) tüp dekompresyonu, abdominal cerrahi sonrası postoperatif ileus ve gastrik distansiyonu önlemek amacıyla kullanılagelmiştir. Bu çalışmanın amacı, perfore peptik ülserin (PPÜ) acil onarımı sonrasında NG tüp dekompresyonunun gerekliliğini değerlendirmektir.
GEREÇ VE YÖNTEM: Bu çalışma, 1999 ve 2017 yılları arasında PPÜ nedeniyle acil ameliyat edilen 189 hastayı içeren retrospektif bir çalışmadır. Hastalar iki gruba ayrıldı: NG tüp ile takip edilenler (Grup 1, n=154) ve NG tüp uygulanmadan takip edilenler (Grup 2, n=35). Demografik veriler, klinik özellikler (ASA skorları, komorbiditeler), intraoperatif bulgular ve hastanede kalış süresi, oral alıma başlama zamanı ve komplikasyonları içeren postoperatif sonuçlar incelendi.
BULGULAR: Çalışma grubu, yaş ortalaması 54.1±19.9 yıl olan 189 hastadan (%84.1'i erkek) oluşmaktaydı. Yaş, komorbiditeler, ASA skorları ve ameliyat detaylarını içeren temel demografik ve klinik özellikler iki grup arasında benzerdi. Postoperatif komplikasyonlar veya 30 günlük mortalite açısından istatistiksel olarak anlamlı bir fark saptanmadı. Ancak, Grup 2'deki hastalar, Grup 1'e kıyasla istatistiksel olarak anlamlı düzeyde daha erken oral beslenmeye geçiş (3.7±0.9'a karşı 4.3±1.4 gün; p=0,03) ve daha kısa hastanede kalış süresi (6.6±3.1'e karşı 8.1±3.8 gün; p=0.04) gösterdi.
SONUÇ: PPÜ cerrahisi sonrası rutin NG dekompresyonu gerekli değildir. Bu yaklaşım morbidite veya mortaliteyi artırmamakla birlikte, anlamlı derecede daha kısa oral alıma başlama süresi ve kısalmış hastanede kalış süresi ile ilişkilidir. NG dekompresyonunun bu hasta grubunda yalnızca gerekli koşullarda ve seçilmiş vakalarda kullanılmasını önermekteyiz.

Anahtar sözcükler: Duodenal ülser; gastrik dekompresyon; nazogastrik tüp; peptik ülser; perforasyon.

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