Dispensability of nasogastric tube after perforated peptic ulcer surgery: a randomized controlled trial

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Introduction
Every year, approximately 4 million individuals are affected by peptic ulcer disease (PUD). Among patients with PUD, the lifetime occurrence of perforation stands at ~5%. Associated with this complication is a mortality rate spanning from 1.3 to 30%. Whether the surgery was done open or laparoscopic, the postoperative plan of management remained dogmatic for many years, especially regarding the presence of a nasogastric (NG) tube.

Patients and methods
This prospective, single-center, randomized controlled study of patients with perforated peptic ulcer (PPU) presented to Kasr Alainy Emergency Hospital was conducted to assess the dispensability of NG tube postoperatively in perforated peptic ulcer patients. Patients were randomly allocated into two groups, group A (NG tube control group): 40 patients and group B [Enhanced Recovery after Surgery (ERAS) group]: 34 patients.

Results
The study revealed a significant decrease in hospital stay by approximately 2 days for patients in the ERAS group, compared with those receiving standard care. This reduction in hospital stay was observed without any increase in postoperative complications among the ERAS group. However, this may be clinically nonsignificant due to a limited number of patients in our study.

Conclusion
The routine use of NG decompression and delayed oral feeding appears to be unnecessary. These practices contribute to prolonged hospital stays without yielding any beneficial effects on morbidity and mortality rates.

Keywords:
enhanced recovery after surgery, nasogastric tube, perforated peptic ulcer

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Introduction

Despite marked progress in the medical field, perforated peptic ulcer disease (PPUD) remains one of the most common presentations in emergency hospitals. Incidence of Perforation is about 2 to 10% of patients with peptic ulcer disease (PUD) [1]. Whether the surgery was done open or laparoscopic, postoperative insertion of the nasogastric (NG) tube remained dogmatic for many years. Enhanced recovery was really applied after elective gastrointestinal surgeries like gastrectomy and gastrojejunostomy, but still so far from being practiced after emergency surgeries. The postoperative management of PPUD often relies on conventional practices rather than being guided by evidence-based medicine [2].

NG tube is placed after PPUD surgery to decompress the stomach aiming at diminishing incidence of leakage. The standard practice of using NG after abdominal surgeries aims to expedite the recovery of bowel function, diminish pulmonary complications, and reduce the duration of hospitalization [3]. Nelson and Edwards conclusion was that routine NG decompression fails to achieve its intended objectives, and therefore, it should be replaced by a selective approach to the use of NG tubes [2].

Methods

This is a prospective, single-center, randomized controlled study of patients with PPU presented to Kasr Alainy emergency hospital from March 2020 to September 2020, to assess dispensability of NG tube postoperatively in PPU patients. The study protocol underwent review and approval by the institutional research and ethics committee.

History, general and local examination was done for all patients. This included vital signs and detailed personal, present and past history. Hemodynamic unstable patients were defined as patients with the following signs and symptoms: systolic blood pressure less than 90, delayed capillary refill time greater than 2 s, disturbed consciousness level, shortness of breath (respiratory rate > 22 breath/ min) and Pulse greater than 120/ min (ACS, ATLS, 2012).

The diagnosis of PPUD was verified through an erect abdominal radiography, which revealed the presence of air beneath the diaphragm. Additionally, a pelvi-abdominal ultrasound was conducted to identify any accumulation of free fluid within the pelvic and abdominal regions. In some difficult cases, abdominal computed tomography (CT) with contrast was done to exclude other diseases with the same presentation. Preoperative preparations were done to all patients in the form of fluid resuscitation before transferring to operating room. Proton pump inhibitors (PPI) and antibiotics were given in the form of third generation cephalosporin and metronidazole.

The exclusion criteria were as shown:

(1) Perforated gastric malignancy (diagnosed either preoperative by biopsy or postoperative by pathology).
(2) Perforation size more than 1 cm.
(3) Delayed presentation more than 48 h from onset of abdominal pain.
(4) ASA III and ASA IV surgical patients according to the classification of the American Society of Anesthesiologists
(5) Postoperative need for vasopressors [nor adrenaline].
(6) Mentally disabled patients.
(7) Previous history of perforated peptic ulcer.
(8) Pregnancy.
(9) Presence of more than one perforated peptic ulcer.
(10) Spontaneously sealed-off perforated ulcers that were diagnosed either preoperatively or during surgery and that did not require surgical repair.

Patients were randomly allocated into two groups

Group A (NG tube control group) 40 patients

Patients admitted during days [Saterday –Monday – Wednesday – Friday]. This group received standard postoperative care, routine postoperative NG tube Insertion was done. It was connected to a collecting bag, until its output was nil, then it was removed and the patient started oral feeding (liquids) after regaining active bowel movements.

Group B (ERAS group) 34 patients (we lost follow-up of 6 patients so, we excluded them from our study)

Patients admitted during days [Sunday – Tuesday – Thursday] were submitted to NG tube insertion only during the procedure and taken out at the end of the operation. In the hospital ward, patients were allowed to initiate oral feeding when they exhibit active bowel movements (such as passing flatus or stool) or when audible bowel sounds are present.

Common practice in both groups

After proper preoperative preparation (including lab work and fluid resuscitation), patients were explored under general anesthesia through a midline incision. Abdominal lavage was done, and then perforation site was detected. Graham's Patch (pedicled omental flap) was performed. Drains were inserted followed by closure in layers.

For patients who showed symptoms and signs of postoperative ileus, their oral intake was promptly halted. Postoperative ileus was diagnosed if a quiet abdomen along with at least one of the following criteria: (1) NG drainage exceeding 300 ml/day or requiring NG tube reinsertion due to repeated vomiting. (2) abdominal distension (3) inability to pass gas or stool by the third postoperative day, in absence of general or local manifestations of leakage (fever, leukocytosis, elevated CRP, and radiological evidence of intra-abdominal collection).

For patients who experienced postoperative ileus, the resumption of oral feeding occurred once both nausea and vomiting had completely resolved and active bowel sounds were audible. PPI twice daily, antibiotics (third generation cephalosporin and metronidazole), and analgesics in form of 1 gm. Paracetamol IV infusion every 6 h were delivered to all patients.

Aiming to encourage patient to be ambulant in the early postoperative days, urinary catheter was removed day one postoperatively, in order to decrease incidence of deep venous thrombosis (DVT). Abdominal drains were taken out before surgical discharge after making sure absence of any doubtful drainage. The discharge criteria for both groups were;

(1) Vital stability.
(2) Complete tolerance to oral feeding.

Patients were followed-up for 4 weeks after hospital discharge during visits to the surgical outpatient clinic.

PPI and antibiotics were prescribed to all patients postoperatively. Then, they were asked to continue on oral acid –reducing therapy PPI for 3–6 months. Oral paracetamol 500 mg was given on demand.

Data collection

It was done for all preoperative, operative, and postoperative data of the included patients in the study. Data were collected through direct observations, resuscitation room record, admission sheets, operative notes, clinical in patient records, outpatients follow-up clinic records, and the weekly morbidity and mortality conference of the emergency department.

These data are:

(1) General condition at time of presentation (stable, shocked)
(2) Age.
(3) Sex.
(4) Medical history [diabetes mellitus (DM) or hypertension (HTN) or previous history of treated gastritis or gastric malignancy].
(5) Special habits of the patient (smoking, addiction, tramadol), long use of nonsteroidal anti-inflammatory drugs (NSAIDS) more than 30 pills in last 30 days [4].
(6) Duration of symptoms [onset of acute sharp abdominal pain].
(7) Site of the lesion (prepyloric –duodenal).
(8) Size of perforation/cm
(9) Postoperative NG tube output day 0, 1, 2.
(10) When patient started oral feeding?
(11) Postoperative complications (leakage –surgical site infection –ileus).
(12) Duration of hospital stay.
(13) Mortality.
(14) Readmission within 1 month from date of discharge.

Data analysis

Data were coded and entered using the statistical package for the Social Sciences (SPSS) version 26 (IBM Corp., Armonk, NY, USA). Data was summarized using mean, standard deviation, median, minimum and maximum in quantitative data and using frequency (count) and relative frequency (percentage) for categorical data. Comparisons between quantitative variables were done using the nonparametric Mann-Whitney test (Chan, 2003a). For comparing categorical data, χ^2Chi square (c2) test was performed. Exact test was used instead when the expected frequency is less than 5 (Chan, 2003b). *P* values less than 0.05 were considered as statistically significant.

Chan YH (2003a): Biostatistics102: Quantitative Data – Parametric and nonparametric Tests. Singapore Med J.;44(8): 391-396.

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Results

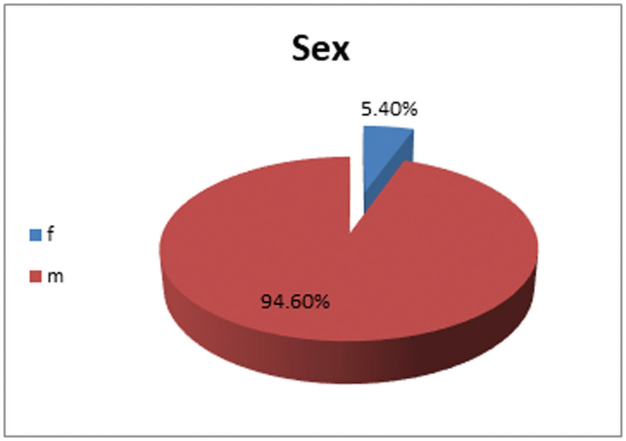
This is a prospective, randomized controlled study included 74 patients [group A: 40 patients, group B: 34 patients].

Base-line data and Co-morbidities

Table 1 shows Demographic data of the 74 patients revealed a mean age of 38.19±9.99 years (range 18 to 59 years), with male sex 94.6% of the studied group Fig. 1. 20 patients had co-morbidities (6 had DM and 14 had hypertension). 54 patients were heavy smokers, 24 patients were tramadol addict, and 34 patients were taking NSAIDs more than four days per week Fig. 2. Regarding perforation site; 66 patients were pre pyloric, and only 8 patients were in first part of duodenum [Table 2], with mean size 5.8 mm Fig. 3.

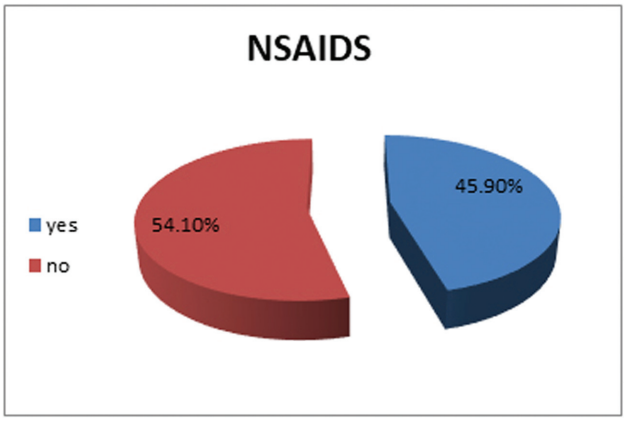
Two patient in the NG tube control group developed omentopexy-site leak. The leakage was evident as abdominal drainage containing bile-tinged fluid [hepato-renal drain]. Contrast enhanced abdominal CT imaging revealed contrast extravasation and intraperitoneal collection. One of them was managed conservatively by percutaneous drainages, improved and discharged. The other patient was re explored

Fig. 1



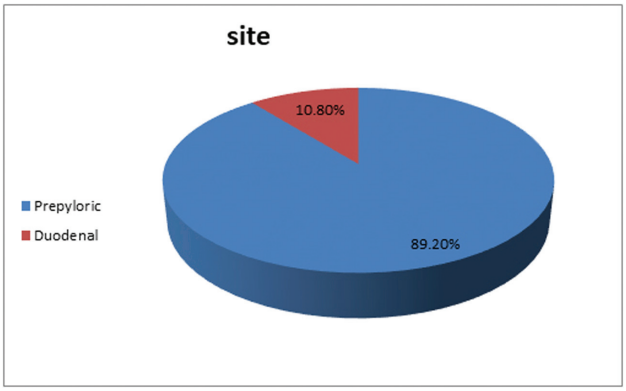
Pie chart demonstrate sex distribution.

Fig. 2



Pie chart demonstrate nonsteroidal anti-inflammatory drugs taking among study groups.

Fig. 3



Pie chart demonstrate site of perforated peptic ulcer.

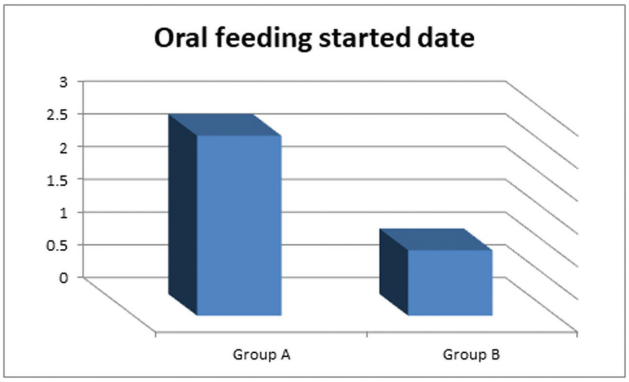
and there was leakage from previous repair site due to gangrenous patch which was removed and new patch was done. Day 3 postoperative, patient deteriorated again, with bile tinged fluid coming out through abdominal wound and drains, then transferred to operating room (OR), re explored, leak from omentopexy site. The operative decision for this patient was distal gastrectomy and gastro-jejunostomy. Patient then, transferred to ICU, was on cardiac supports and passed away two days later. But this may be clinically non-significant due to limited number of patients in our study.

During the hospital stay, eight patients in the NG control group and two patient in the ERAS group experienced an episode of postoperative ileus. Among the control group, six patients developed superficial surgical site infections in the abdominal wound, while four patients in the ERAS group also experienced such infections. These infections were treated with local wound care on an outpatient basis.

Mean time for onset of oral feeding for the control group was 2.7±0.4 days while, for the ERAS group was one day Fig. 4. Mean length of hospital stay for the control group was 6.1±1.5 while, for the ERAS group was 4.18±0.39 days as showed in Fig. 5.

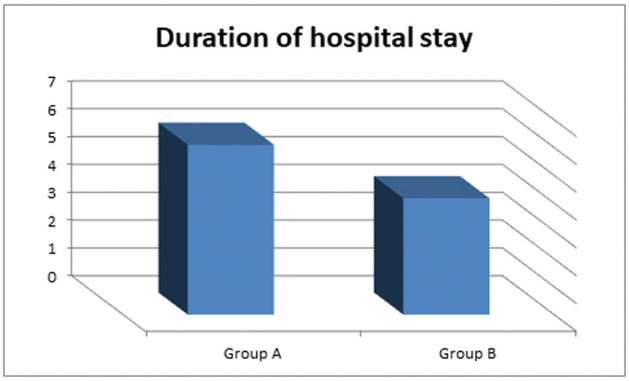
Within 1 month following discharge, four patients from the control group and two patients from the ERAS group were readmitted to the hospital. Two patient from ERAS group developed postoperative ileus after discharge. Both patients were readmitted and subsequently underwent a comprehensive clinical assessment, along with contrast-enhanced CT imaging, to exclude any potential infected collection. These patients positively responded to conservative management, which involved NG decompression, bowel rest, and fluid replacement. The four patients of the control group [one patient represented by burst abdomen day 9 postoperatively and the other one

Fig. 4



Bar chart representing difference in the onset of oral feeding time.

Fig. 5



Bar chart difference in length of hospital stay for study groups.

presented with wound deheisence]. The other two patients represented by manifestation of intestinal obstruction (adhesive type) and were managed conservatively [Table 3].

Discussion

PUD occurs due to an imbalance between stomach acid-pepsin and mucosal defense barrier [5]. PUD is known to cause significant short-term morbidity in around 50% of patients and has the potential to lead to mortality rate spanning from 1.3 to 30%, posing a substantial threat to human health and life. Consequently, there has been a longstanding and continuous effort to investigate effective treatment approaches for peptic ulcer disease in the context of modern surgery [6]. Evidence based research has provided evidence that numerous traditional practices in surgical care, including the utilization of surgical drains, NG tubes, and graduated diets, are dispensable or even harmful [7].

In our study, male predominance in PPUD was evident (n=70, i.e., 94.6%). This is similar with a study done in Ethiopia by Ersemo T where the male to female ratio was reported to be 5.6 : 1.0 [8]. This contrast in incidence does not seem to apply in developed countries, as evidenced by a study conducted by Thorsen and colleagues on the epidemiology of PPUD in Norway. Their research revealed that females are more commonly affected than males, with 89 out of 172 of their patients being females [9].

A regular use of smoking and Tramadol, in addition to chronic use of NSAID was found in 73, 32.4, and 45.9% of our patients, respectively. A study from eastern India by Nishith M Paul Ekka and Shital Malua also reported 65.73% were known smokers while 42.86% patients were admittedly alcoholics in addition to NSAID abuse in 46.15% of patients [10].

Our study showed that there was marked reduction in hospital stay by around 2 days with no aggravation in postoperative complication in the ERAS group of patients compared with the NG control group. In the literature, Gonenc and colleagues demonstrated a decrease in the length of hospital stay (LOH) by three days for patients who underwent laparoscopic Graham patch repair while being managed under ERAS protocols [11].

In our current study, we observed a lower incidence of postoperative ileus in the ERAS group, although this difference did not reach statistical significance. Since both groups shared similar inclusion criteria and underwent the same surgical technique, the noticeable reduction in postoperative ileus rate was attributed to the exclusion of routine NG decompression and the implementation of early oral feeding in the ERAS group.

Unlike the control group, the ERAS group employed active bowel sounds as a distinctive endpoint for assessing bowel function, instead of commonly used indicators such as the passage of flatus and bowel movements. This decision was grounded in the rationale of minimizing the potential risk and duration of postoperative ileus. The intention was to trigger a gastrocolic reflex, thereby prompting synchronized propulsive actions and inducing the release of gastrointestinal hormones that positively influence bowel motility. Secondly, the practice of routine NG decompression has been demonstrated to extend the duration of postoperative ileus and delay the resumption of oral feeding after major abdominal surgery. This, in turn, contributes to a prolonged hospital stay [12].

Cheatham *et al.* [13] reported that a delayed return to oral feeding not only prolongs the occurrence of ileus but is also associated with heightened pulmonary complications when combined with the utilization of NG decompression.

While there are some instances of the effective implementation of modified ERAS protocols in emergency cases, these studies are constrained by their incorporation of a limited number of care elements and a smaller pool of patients. Feasibility of ERAS protocols was addressed first by Gonenc and colleagues on 47 patients who were operated on for PPU [11]. The focal points of their study primarily revolved around the elimination of NG decompression and the reintroduction of liquid feeds within 24 h following the surgery.

We noted that prepyloric perforation was the commonest site for PPUD in our Egyptian patients, unlike what is reported in many literatures that duodenal bulb perforation is more prevalent than prepyloric one [14]. We have no explanation for this finding for the time being, but this needs to be more investigated.

In the current study, patients with perforations larger than 10 mm were excluded. This exclusion was motivated by the fact that these patients typically necessitate additional procedures such as feeding

jejunostomy, truncal vagotomy, and gastrojejunostomy. The aim was to maintain the homogeneity of the study groups. Furthermore, it's acknowledged that larger perforations are linked with heightened complication rates during the postoperative phase. Similar exclusion criteria were also applied in a previous randomized controlled trial (RCT) focusing on the application of ERAS protocols in cases of perforated peptic ulcers, as demonstrated by Gonenc *et al.* [11].

These results, which are consistent with our study results, ensure that routine traditional NG decompression after PPUD operations should be reevaluated, as has no significant impact on leakage rates. In addition, it may increase hospital stay that is not encouraged especially nowadays.

The findings of this study need to be understood considering the study's limitations. Firstly, the exclusion of patients with a high surgical risk, particularly those in an advanced stage of the disease with septic shock, may have contributed to more favorable surgical outcomes for PPUD in our patient group than would typically be expected. A subsequent clinical study that includes patients with poorer surgical risk, who might benefit from enhanced recovery pathways, is essential as such patients make up the majority of PPUD cases under normal circumstances.

Secondly, this study marks the first attempt to explore the viability of excluding routine NG decompression and implementing certain aspects of enhanced recovery pathways in emergency gastric surgery. It lays the groundwork for future research that can delve into the practicality of ERAS in emergency surgery scenarios.

The current study has its own set of limitations. The exclusion of high-risk patients, including those categorized as ASA class 3 and 4, as well as those with irreversible shock, may have influenced the positive outcomes observed. The potential correlation between early functional recovery and cost savings could not be evaluated, as the study was conducted in a non-paying facility. Additionally, due to the relatively limited number of cases included in our study, further research is required to provide additional support and validation to our findings in the future.

In conclusion, the routine use of NG decompression and delayed initiation of oral feeding may not be necessary, as these practices tend to extend the hospital stay without yielding positive effects on morbidity and mortality rates.

Table 1 Descriptive statistics of demographic, past history and intra operative data collected on the studied patients

	Count	%
Sex		
f	4	**5.4%**
m	70	**94.6%**
Smoking		
yes	54	**73.0%**
no	20	**27.0%**
Tramadol		
yes	24	**32.4%**
no	50	**67.6%**
NSAIDS		
yes	34	**45.9%**
no	40	**54.1%**
Previous history of treated gastritis		
yes	20	**27.0%**
no	54	**73.0%**
DM		
yes	6	**8.1%**
no	68	**91.9%**
HTN		
yes	14	**18.9%**
no	60	**81.1%**
site		
Prepyloric	66	**89.2%**
Duodenal	8	**10.8%**

Table 2 Size of the perforation and age of the patients included in our study

	Mean	Standard Deviation	Median	Minimum	Maximum
Age	38.19	9.99	36.00	18.00	59.00
Size (mm)	5.84	1.14	5.00	5.00	9.00

Table 3 The results of primary outcome

	Group				
	Group A (control group) *N*=40		Group B(ERAS group) *N*=34		
	Count (%)		Count (%)		*P* value
Leakage					
yes	2	5.0%	0	0.0%	1
no	38	95.0%	34	100.0%	
PO ileus					
yes	8	20.0%	4	11.8%	0.667
no	32	80.0%	30	88.2%	
Surgical site infection					
yes	6	15.0%	4	11.8%	1
no	34	85.0%	30	88.2%	
Mortality					
yes	2	5.0%	0	0.0%	1
no	38	95.0%	34	100.0%	

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Nil.

Conflicts of interest
The authors declare that they have no conflict of interest.

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