

Postoperative Complications of Graham Omentopexy for Duodenal Ulcer Perforation

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Abstract: Duodenal ulcer perforation is a life-threatening surgical emergency requiring prompt intervention. Graham's omentopexy remains a widely practiced and effective surgical technique for closure of perforated duodenal ulcers. However, postoperative complications continue to contribute to morbidity, particularly in resource-limited settings. **Objective:** To determine the postoperative complications of Graham's omentopexy in patients with duodenal ulcer perforation at Lady Reading Hospital, Peshawar. **Methods:** This descriptive study was conducted at Lady Reading Hospital-MTI, Peshawar, from May 24, 2024, to November 24, 2024. A total of 100 patients aged 18–65 years, of either gender, presenting with duodenal ulcer perforation were enrolled. Diagnosis was established clinically and confirmed by computed tomography (CT) scan. Patients who were pregnant or lactating, or had a prior history of abdominal surgery or radiation therapy, were excluded. All patients underwent Graham's omentopexy. Postoperative complications, including wound infection, bile leak, paralytic ileus, intra-abdominal abscess, pneumonia, and septic shock, were assessed. Data were analyzed using SPSS version 27. Complications were reported as frequencies and percentages, and 95% confidence intervals (CI) were calculated. **Results:** The mean age of the study population was 44.69 ± 13.47 years, with 63 (63.0%) male patients. Risk factors included *Helicobacter pylori* infection in 55 (55.0%) patients and non-steroidal anti-inflammatory drug (NSAID) use in 42 (42.0%). The majority of perforations were ≤ 1 cm in size (75%). Postoperative complications included wound infection in 20 (20.0%) patients, paralytic ileus in 8 (8.0%), pneumonia in 7 (7.0%), intra-abdominal abscess in 6 (6.0%), bile leak in 5 (5.0%), and septic shock in 4 (4.0%). **Conclusion:** Graham's omentopexy is a safe and effective surgical procedure for the management of duodenal ulcer perforation. Wound infection was the most common postoperative complication, followed by paralytic ileus and pneumonia. Early diagnosis and timely surgical intervention may further improve clinical outcomes.

Keywords: Duodenal Ulcer Perforation, Graham's Omentopexy, Postoperative Complications, Wound Infection, Paralytic Ileus

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Introduction

Perforated duodenal ulcer is one of the most serious and urgent surgical conditions encountered by general practitioners across the world, which requires quick confirmation and effective intervention for the prevention of life-threatening complications. Peptic ulcer disease is a common global health concern caused by *H. pylori* infection and NSAID use. Management of perforated duodenal ulcer remains a serious area of surgical practice, especially in settings where healthcare resources are significantly increased, resulting in an increase in morbidity and mortality rates after perforation incidents (1-4). Graham omentopexy has evolved as a cornerstone surgical intervention for the closure of duodenal perforations. In contrast to general ulcer surgery, Graham patch offers superior outcomes and broad applicability, rendering it predominantly appropriate for emergency settings and systemic compromise (5-7).

Another study conducted in Pakistan compared laparoscopic vs open Graham omentopexy and found considerably lower surgical site infection rates in the laparoscopic group, which strengthens the potential advantages of minimally invasive techniques (8). These findings have stimulated interest in refining the technique and intensifying surgical training in minimally invasive repair of duodenal perforations to optimize early recovery while maintaining patient safety (8).

Complication profiles following Graham omentopexy are a critical area of research. Whereas the practice provides a reliable means of closing perforations, wound infection (19.44%), leakage (16.66%), and paralytic ileus (6.94%) are typically caused by comorbidities (9, 10). Another observational study reported a higher wound infection rate (12%) after omentopexy, underscoring the need for targeted infection-prevention protocols in emergency surgical care (11). Despite concerted efforts to optimize surgical techniques, the fundamental principles of prompt resuscitation, accurate diagnosis, and timely operative intervention

remain paramount in achieving favorable outcomes. Combining standardized surgical care with rigorous postoperative supervision can help mitigate risks for patients with this critical surgical emergency (10, 11).

Regardless of developments in perioperative care and surgical approach. Postoperative complications after the Graham omentopexy for duodenal ulcer perforation continue to pose a critical challenge, specifically within the emergency surgical settings. Variability in available data highlights gaps and limits the ability to predict outcomes or perioperative management strategies accurately. An evaluation of postoperative complications following Graham omentopexy is therefore crucial to recognize their frequency and risk factors, which guide early intervention, optimize postoperative care, and eventually enhance surgical outcomes in cases of perforated duodenal ulcer.

Methodology

This descriptive study was conducted in the General Surgery Department, Lady Reading Hospital-MTI, Peshawar. The study commenced after obtaining ethical approval from the hospital's IRB (Ref. No. 127/LRH/MTI). The sample size was calculated using the OpenEPI web-based sample size calculator, with a confidence level of 95%, a margin of error of 5%, and an anticipated frequency of the postoperative complication paralytic ileus of 6.94% (9), yielding a sample of 100 patients. Consecutive non-probability sampling was used to select patients.

Patients eligible for the study included both male and female patients aged between 18 to 65 years, diagnosed with a perforated duodenal ulcer, defined as breach in the mucosal lining of the duodenum, resulting in the escape of gastric or duodenal contents into the peritoneal cavity diagnosed on CT scan showing Free Intraperitoneal Air (Pneumoperitoneum), and



Peritoneal Fluid among patients presenting with acute onset of severe abdominal pain (VAS > 5), and abdominal distension, and ASA status I to IV. Patients who were pregnant/lactating and those with previous abdominal surgery or radiation therapy were excluded.

After explaining the study's purpose and benefits to the patients, written informed consent was obtained. Preoperatively, demographic and clinical data were taken from the patients. Comorbidities were noted, such as diabetes mellitus (fasting blood glucose level ≥ 126 mg/dL), Hypertension (systolic blood pressure ≥ 140 mmHg or a diastolic blood pressure ≥ 90 mmHg on at least two separate occasions), and smoking was defined as a patient who had smoked at least one cigarette daily for the past year. History of non-steroidal anti-inflammatory drug (NSAID) use was defined as regular consumption of any NSAID for more than one week in the three months before enrollment in the study. *Helicobacter pylori* status was confirmed from the patients' medical records, which included stool antigen test results. Delayed presentation was defined as more than 24 hours between symptom onset and hospital presentation.

Patients diagnosed with perforated duodenal ulcer underwent Graham patch omentopexy under general anesthesia. First, the site of the perforated duodenal ulcer was identified via a midline incision. The surrounding structures were carefully dissected and exposed to facilitate access to the ulcer. The greater omentum, a large apron-like fold of peritoneum attached to the greater curvature of the stomach, was meticulously dissected and mobilized by releasing adhesions, dividing vascular attachments, and ensuring adequate length for transportation to the duodenal defect. Once sufficiently mobilized, the greater omentum was transposed over the perforated duodenal ulcer to provide a protective barrier and promote tissue healing. The omental flap was draped over the defect and secured in place with absorbable sutures. The abdominal incision was then closed in layers. Post-operative complications were observed, including wound infection, defined as white pleural discharge from the wound site within 15 post-operative days, diagnosed by physical examination, among patients presenting with all of the following complaints: fever > 39 °C, redness, tenderness, and pain (VAS > 4). Leakage was defined as gastrointestinal contents/fluids escaping from the site of surgical repair into the peritoneal cavity within the 7 post-operative days, diagnosed on CT scan showing extraluminal air and leakage of luminal contrast among patients presenting with all of the following complaints: abdominal pain (VAS > 4), distension, tachycardia, and peritonitis. Paralytic ileus was defined as a gastrointestinal motility disorder characterised by the temporary cessation of the normal, coordinated peristaltic activity of the intestines within 7 postoperative days, diagnosed on clinical evaluation showing obstipation, intolerance to oral intake, bloating, nausea, and vomiting. Pneumonia was diagnosed in the first 10 postoperative days based on new or progressive radiographic infiltrates on chest X-ray, along with clinical signs such as fever, productive cough, and leukocytosis. Septic shock was defined as persistent hypotension (systolic blood pressure <90 mmHg) requiring vasopressor support to maintain mean arterial pressure ≥ 65 mmHg, regardless of adequate fluid resuscitation, in the presence of suspected infection and a serum lactate level >2 mmol/L. The complete examination was conducted under the supervision of a surgeon with at least 5 years of experience following completion of their fellowship. A proforma was used to document patients' details.

SPSS 27 was used to record and analyse the data. The mean and standard deviation were used for age and BMI. Frequencies and percentages were presented for postoperative complications, perforation size (≤ 1 cm, > 1 cm), smoking, diabetes, ASA status, hypertension, NSAID use, delayed presentation (> 24 hours), and gender. Confidence levels at 95% were also determined for postoperative complications.

Results

The study included 100 patients; their mean age was 44.69 \pm 13.47 years. Their mean body mass index was 23.42 \pm 2.13 kg/m². The majority of the presented patients were male (63, 63.0%), as shown in Figure 1.

A history of using NSAIDs was recorded in 42 (42.0%) cases, while *H. pylori* infection was detected in 55 (55.0%) (Table 1). Regarding the ASA classification, 68 (68.0%) patients were classified as ASA I-II (Figure 2). Figure 3 shows the perforation size in the duodenal ulcer.

Postoperative complications were wound infection, which occurred in 20 (20.0%) patients. Bile leak was documented in 5 (5.0%) cases. Paralytic ileus developed in 8 (8.0%) cases, and abdominal abscess formation was noted in 6 (6.0%) cases. Pulmonary complications included pneumonia, which occurred in 7 (7.0%) cases. Septic shock was observed in 4 (4.0%) cases (Table 2).

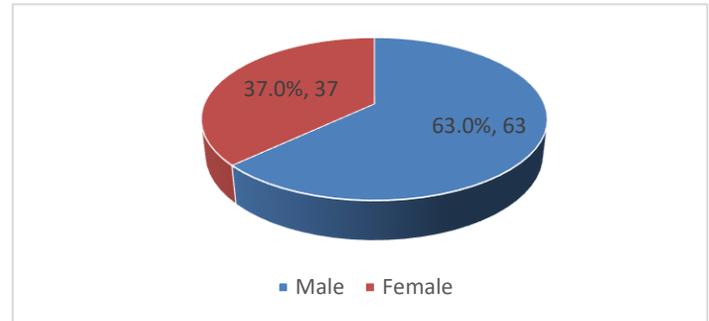


Figure 1: Gender distribution

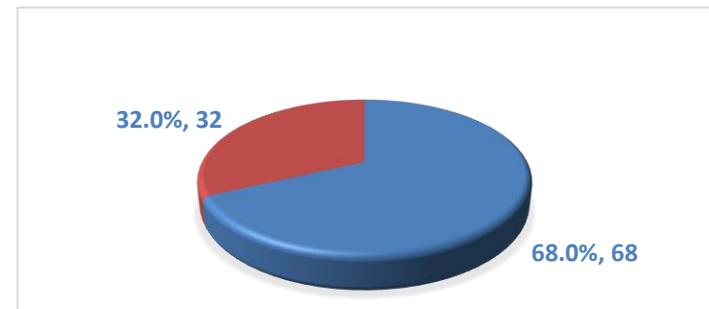


Figure 2: ASA status of the patients

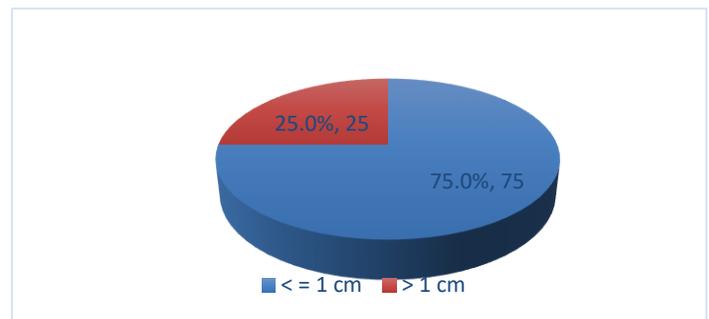


Figure 3: Size of perforation

Table 1: Comorbidities & risk factors of duodenal ulcer

Comorbidities & risk factors of duodenal ulcer		n	%
Smoking	Yes	30	30.0%
	No	70	70.0%
Diabetes	Yes	14	14.0%
	No	86	86.0%
Hypertension	Yes	20	20.0%
	No	80	80.0%
NSAID use	Yes	42	42.0%
	No	58	58.0%
H-pylori	Yes	55	55.0%
	No	45	45.0%
Delayed Presentation (> 24 hours)	Yes	21	21.0%
	No	79	79.0%

Table 2: Postoperative complications of Graham omentopexy

Postoperative complications		n	%	95% CI	
				Lower	Upper
Wound infection	Yes	20	20.0%	0.12	0.29
	No	80	80.0%		
Bile leak	Yes	5	5.0%	0.01	0.11
	No	95	95.0%		
Paralytic ileus	Yes	8	8.0%	0.03	0.15
	No	92	92.0%		
Abdominal Abscess	Yes	6	6.0%	0.02	0.12
	No	94	94.0%		
Pneumonia	Yes	7	7.0%	0.02	0.13
	No	93	93.0%		
Septic shock	Yes	4	4.0%	0.01	0.09
	No	96	96.0%		

Discussion

The demographic profile of the present study revealed a mean age of 44.69 years, which aligns with the age groups reported by Malik et al. and Khare et al., who also reported ages in the early 40s to mid-50s (5, 12). This consistency suggests that perforated duodenal ulcer remains a condition predominantly affecting middle-aged adults. Some studies have reported higher mean ages when focusing on younger populations.

In the present study, the majority of patients presenting with duodenal ulcer were males, a pattern also reported by several studies from Pakistan, such as those by Sidra et al. and Khan et al., which reported a stronger male preponderance (11, 13). The higher male prevalence in this population could be attributed to local lifestyle patterns, smoking prevalence, or occupational exposures. The finding reinforces that male gender is a significant risk factor, though the magnitude of this association may vary.

Regarding comorbid conditions, the prevalence of diabetes (14.0%) and hypertension (20.0%) in this study aligns with figures reported by Sidra et al. and Abrar et al., where diabetes ranged from 14.5% to 22%, and hypertension ranged from 18% to 28% of patients.^{11,12} The rate of smoking was 30.0%, which is a notable figure; smoking has been recognised as a major factor for duodenal ulcer (14). However, the prevalence of smoking in the present was lower than in other regional studies (11, 13). This difference may indicate regional variations in the use of tobacco type or possibly under-reporting by the patients. Smoking remains a well-established risk factor for ulcerogenesis and impaired postoperative recovery.

The aetiological factors identified showed a significant burden of *H. pylori* infection (55.0%), validating its primary role in duodenal ulcer pathogenesis, as highlighted in the literature (15, 16). The history of NSAID use was reported by 42.0% of patients. Studies from Western settings often emphasise NSAID use, mainly in older people, while studies in South Asia report a high prevalence of *H. pylori* (17, 18).

In the present study, 21.0% of patients presented more than 24 hours after symptom onset, a key clinical parameter. Delayed presentation is a strong predictor of adverse outcomes, including higher mortality and septic complications (19). This aligns with the broader literature, which identifies time-to-surgery as a key prognostic factor.

The distribution of perforation size in the present study, with 75.0% being 1 cm or less, aligns with the findings of Reza et al., who reported that most perforations were between 0.6 and 1 cm (20). Larger perforations were present in 25.0% patients in the current study; larger perforations are known to be associated with greater peritoneal contamination and a higher risk of postoperative leakage.⁶

Postoperatively, the infection rate in patients was 20.0%. Khare et al. reported a 12.5% rate of wound infection in their Graham's omentopexy group. In comparison, Khan et al. reported a higher rate of 31.3% (5, 13). This variation can be influenced by surgical technique, antibiotic

protocols, and the patient's preoperative condition. The bile leak rate was reported in 5.0% patients, which is consistent with Khare et al., who reported a slightly higher rate of 7.5% (5).

The incidence of paralytic ileus was observed in 8.0% patients and abdominal abscess in 6.0% patients. Paralytic ileus is a known consequence of peritoneal inflammation, and the extent of contamination and operative handling can influence its rate. The abdominal abscess rate reflects the challenge of controlling localised infection following peritoneal soilage. Pneumonia developed in 7.0% of patients, while septic shock was reported in 4% patients. This lower rate could be attributed to prompt resuscitation and timely surgical intervention.

The present study contributes to the existing knowledge by offering a detailed analysis from a local setting, adding to the geographical diversity of data available on this common surgical emergency.

However, this study has several limitations. The present study was conducted in a single centre, which may limit the generalisability of the results compared to other settings with different patient profiles. The sample size was not large enough to detect statistically significant associations for complications with risk factors. The present study focused only on early complications of the procedure, ranging from 7 to 15 days; long-term outcomes, such as ulcer recurrence or functional status, could not be explored. Factors such as detailed nutritional status and the specifics of surgical technique between surgeons, which may influence outcomes, were not analysed. Future prospective multicentre studies with larger sample sizes and longer follow-up are recommended to validate the findings of the present study and better clarify the complex relationships among pre-operative, intra-operative, and post-operative factors that determine outcomes after Graham's omentopexy.

Conclusion

In conclusion, the present study demonstrates that Graham's omentopexy is a safe and effective surgical procedure for the treatment of duodenal ulcer perforation. The most frequent postoperative complication was wound infection, followed by paralytic ileus and pneumonia. Future efforts should focus on reducing presentation delays and on timely surgical interventions to further improve outcomes.

Declarations

Data Availability statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department concerned. (IRBEC-127/LRH/MTI)

Consent for publication

Approved

Funding

Not applicable

Conflict of interest

The authors declared no conflicts of interest.

Author Contribution

MS (TMO)

Contributed to study design, data collection, and initial manuscript drafting

Assisted in data acquisition, literature review, and manuscript editing Performed statistical analysis and contributed to the interpretation of results

Helped in methodology Development, data organization, and manuscript formatting

AW (Associate Professor)

Contributed to patient recruitment, data entry, and results compilation

Assisted in referencing, proofreading, and final revisions of the manuscript

Guided study execution and critically reviewed the manuscript

Supervised the research, coordinated among authors, finalized the manuscript, and approved the final version

All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

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