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ORIGINAL ARTICLE

The Use of Abdominal Drains in Perforated Peptic Ulcer

Hast Abdullateef Ahmed [1,*] and Hussein Qadir Ahmed [2]

[1] *General Surgeon, Iraqi Board for Medical Specializations*
[2] *Assistant Professor in General and Laparoscopic Surgery, Consultant Surgeon, Azadi Teaching Hospital, Kirkuk, Iraq.*

[*] *Corresponding author email:hayat4ryan4@gmail.com*

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ABSTRACT

Background: Peptic ulcer disease's second-most common complication is perforation, constituting a surgical emergency with approximately 30% short-term mortality and 50% morbidity. Patients with untreated duodenal ulceration face a 10% lifetime risk of perforation, reduced with initial ulcer healing. The Graham omental patch technique involves leaving two tube drains, one in Morrison's pouch and one in the pelvis. This study aims to elucidate the effects of routine abdominal drain use on postoperative outcomes after closure surgery for peptic ulcer perforation, assessing the efficacy and safety of this approach.

Methods: A prospective observational cross-sectional study enrolled 60 patients conducted between December 2021 and January 2023, with perforated peptic ulcers who underwent repair using the Graham omental patch technique. Two tube drains were utilized. Postoperative follow-up and complication observation involved categorizing patients into two groups (A and B) based on the presence or absence of drain-related complications.

Results: Drain related complications were seen in 40% of study subjects, most common of which was Drain site pain followed by Restriction of mobility and Peri tubal discharge/leakage with skin excoriation. Late presentation (>24 hours), Gastric ulceration, perforations larger than 1 cm and peritoneal spillage of more than 1000 ml significantly influenced the outcome and rate of development of post operative drain related complications in patients operated for perforation peptic ulcer.

Conclusion: All drains carry a risk of significant postoperative complications. In the setting of good surgical technique and the presence of sufficient equipment for the detection of intra-abdominal complications postoperatively like ultrasonography and CT scan, abdominal drains should be used rationally.

Key words: Perforated peptic ulcer; Abdominal drain; Graham omental patch technique.

INTRODUCTION

Peptic ulcer disease remains a significant health concern, with perforation standing as the second-most common complication [1]. While the global prevalence of ulcers has decreased, the incidence of life-threatening complications, including perforation and bleeding, persists. This paradoxical trend is attributed to improvements in socioeconomic conditions reducing Helicobacter pylori infection countered by an increased use of non-steroidal anti-inflammatory drugs (NSAIDs) [2, 3]. Complications occur at a rate of 1–2% per ulcer per year, with a lifetime risk of perforation around 10% for untreated duodenal ulcers [4]. Despite advancements in medical treatment, peptic ulcer perforation necessitates urgent surgical intervention, carrying short-term mortality of approximately 30% and morbidity of 50% [5–7].

The demographics of perforated peptic ulcers are evolving, with a rising incidence among elderly females, often linked to NSAID usage [8]. The elderly may exhibit atypical presentations, necessitating a heightened clinical suspicion for accurate diagnosis. Furthermore, the classic presentation involving severe abdominal pain may not manifest in all cases, posing challenges to timely diagnosis.

Small intestinal ulcers, accounting for 60% duodenal and 40% gastric perforations, exhibit diverse etiologies. NSAID use contributes to one-third of perforated ulcers, primarily affecting elderly individuals. The association between H. pylori infection and perforation remains controversial [1].

Diagnosis involves assessing symptoms, medication history, and physical examinations. Perforation presents as an acute abdomen, progressing through distinct phases, with the third phase marked by abdominal distension and deterioration of the patient's general condition [8].

The diagnostic pathway includes blood tests, serum amylase measurement, and imaging studies such as abdominal x-rays or CT scans [8, 9]. Despite challenges in diagnosis due to various potential causes of acute abdomen, prompt intervention is crucial. Surgical treatment prioritizes resuscitation, analgesia, and, following adequate preparation, employs the Graham omental patch technique, a recognized method for the closure of perforated peptic ulcer [10, 11].

The aim of this study is to investigate the impact of routine abdominal drain insertion on the postoperative clinical course after closure surgery for peptic ulcer perforation. The objectives include assessing the efficacy and safety of drain usage in improving patient outcomes. By addressing these aspects, the study aims to contribute valuable insights into the management of peptic ulcer perforation and inform best practices in surgical intervention.

MATERIALS AND METHODS

This prospective observational cross-sectional study conducted at Azadi Teaching Hospital in Kirkuk from December 2021 to January 2023, enrolled 60 patients with perforated peptic ulcers repaired using the Graham omental patch technique.

The study focused on patients who were presented to the emergency department and were subsequently admitted to the operating theatre for the closure of peptic ulcer perforation. The patients were then followed up in the surgical ward. Inclusion criteria: those with peptic ulcer perforation (gastric and duodenal) admitted to surgical indoors within 72 hours of symptom onset and repaired using the Graham omental patch closure technique. The inclusion criteria also specified patients aged between 20 and 70 years of both sexes who underwent emergency surgery and provided written informed consent.

Exclusion criteria were outlined to exclude patients outside the age range of 20-70 years, those presenting after 72 hours of symptom onset, and those with perforations larger than 2 cm that were not suitable for primary closure. Additionally, patients who died within 72 hours of the operation, those with bleeding diathesis, traumatic perforations, suspected malignant pathology, other hollow organ perforations, chronic liver failure, renal failure, congestive heart failure, pregnant women, and those with proven or suspected COVID-19 infection were also excluded.

The clinical work-up involved a comprehensive assessment of patients presenting with severe abdominal pain, particularly epigastric pain. A thorough history and physical examination were conducted, and radiological examinations, including X-ray abdomen, abdominal ultrasound, and CT abdomen, were performed for confirmation in difficult cases. Initial resuscitation, fluid therapy, stabilization of hemodynamic instability, broad-spectrum antibiotics, nasogastric aspiration, urinary catheterization, and discontinuation of oral intake were part of the standard procedure.

Preoperative investigations included collecting blood samples for complete blood count (CBC), random blood sugar (RBS), blood urea, serum creatinine, viral screening for Hepatitis B, C, HIV, and COVID-19, as well as blood group and Rh. Adequate blood units were prepared for each patient before admission to the operating theatre. Electrocardiography (ECG), chest X-ray, echocardiography, and medical consultations for older

patients were also conducted.

In the surgical procedures conducted for the study, a laparotomy was performed through an upper midline incision. Peritoneal spillage was evacuated and measured, and the size of the perforation was documented. For cases of gastric ulcer perforation, a biopsy from the ulcer margin was obtained for histopathological examination to rule out malignancy. The perforation was then closed using Graham's omental patch technique with interrupted sutures of Polyglactin (Vicryl 0). Warm normal saline irrigation and thorough mopping of the peritoneal cavity were carried out. Two intra-abdominal drains (Ryle tube 20FG) were strategically placed—one in the right subhepatic region and the other in the pelvis through the right flank. The abdominal wound closure involved two layers: the tendinous fascio-muscular layer with monofilament Nylon 2.0 and the skin with silk 0.

Postoperatively, patients were placed in Fowler's position once conscious, and all were kept nil by mouth with nasogastric tube aspiration. Intravenous fluids and gastric anti-secretory drugs were initiated immediately. Combination antibiotics (ceftriaxone + metronidazole) were administered to cover aerobic and anaerobic bacteria. Adequate analgesia was provided for postoperative pain relief. Patients underwent regular assessments for vital signs, abdominal examination, dressing condition, and the return of bowel function. Once bowel function returned, the nasogastric tube was removed, and oral alimentation commenced and advanced as tolerated.

Drainage details, including daily amount and color, drain-related complications, and the timing of drain removal, were meticulously recorded. Drains were kept in place until oral intake occurred without a change in output, suggesting the absence of a leak. Drain removal typically occurred 24 hours after the cessation of drainage, with the upper subhepatic drain often removed first. Abdominal ultrasonography (USG) was performed on postoperative days 3-5 for patients with a high suspicion of intra-abdominal fluid collection or abscess. Discharge instructions included advice to abstain from smoking and alcohol. A regimen targeting H. pylori was prescribed and maintained for two weeks, with proton pump inhibitors continued for an additional four weeks. Gastroscopy was recommended after 12 weeks for follow-up, assessing malignancy evidence, ulcer healing, and confirming H. pylori infection status if not previously confirmed. The study employed statistical analysis through the use of the Statistical Package for the Social Sciences (SPSS) version 26.0. The determination of statistical significance relied on a p-value of <0.05. Descriptive statistics, encompassing means and standard deviations, were computed. Furthermore, various statistical tests were applied to assess age, gender distribution, and residency. Specifically, a Chi-square test was used to ascertain if a significant difference existed among the studied groups.

In examining the duration of pain at presentation, the Chi-square test was employed to compare rates between two distinct groups. Additionally, Chi-square tests were utilized to evaluate specific parameters, such as gastric perforation, perforation size exceeding 1cm, and peritoneal contamination surpassing 1000ml. The objective of these analyses was to discern any notable disparities in the occurrence of drain-related complications between the two groups.

RESULTS

In the emergency department, a total of 82 patients were admitted with perforated peptic ulcers. Exclusion criteria were applied, leading to the removal of four patients presenting after 72 hours of symptoms, two with large perforations (>2 cm), seven with chronic diseases, one with malignant pathology, and two with COVID-19. Additionally, six patients died within 72 hours of emergency laparotomy and were excluded from the study.

The study group's demographic characteristics revealed a mean age of 40.03, with the majority of patients being over 40 years old (43.3%). Of the 60 patients, 60% were male, and 40% were female. In terms of residency, 34 patients lived in urban areas, while 26 resided in rural areas.

The majority of cases (n=33) were presented within the first 24 hours, with the remaining cases presenting within 48 and 72 hours. The first part of the duodenum was the most common site of perforation (44 cases), followed by the pyloric region (12 cases) and pre-pyloric region (4 cases). Perforations less than 1 cm constituted nearly 70% of cases, while 30% had perforations measuring 1-2 cm. Peritoneal contamination varied with 55% having 1000 ml or less, and 45% having more than 1000 ml.

Postoperative complications were monitored for 5 to 10 days after surgery. Nausea and vomiting were observed in 48% of patients, necessitating antiemetics. Diffuse abdominal pain persisted in 68% of patients, leading to additional analgesic doses. Abdominal distension occurred in 34% of patients beyond 48 hours, indicative of prolonged ileus.

Other postoperative complications included fever in 43 patients, laparotomy wound infection in 38 patients, partial wound dehiscence in 13 patients, and adult respiratory distress syndrome (ARDS) in 15 patients. Late postoperative mortality occurred in 5 patients, with four deaths attributed

Table 1. Demographic, preoperative characteristics, general and postoperative complications of the studied groups

Variables (Total no.= 60)	Category	No. (%)
Age groups (Years)	(<30)	13 (21.6)
	(30-40)	21 (35)
	(>40)	26 (43.3)
Gender	Male	42 (60)
	Female	28 (40)
Residency	Urban	34 (56.7)
	Rural	26 (43.3)
Pre-operative and intra-operative findings		
Duration of pain (hours)	0-24	33 (55)
	24-48	13 (21.7)
	48-72	14 (23.3)
Site of perforation	Pre-pyloric	4 (6.7)
	Pyloric	12 (20)
	Duodenal (1st part)	44 (73.3)
Size of perforation (cm)	< 1	42 (70)
	≥ 1	18 (30)
Peritoneal contamination (ml)	≤ 1000	33 (55)
	> 1000	27 (45)
General postoperative complications	Nausea & Vomiting	29 (48.3)
	Diffuse abdominal Pain	41 (68.3)
	Abdominal Distension	20 (33.3)
	Fever	43 (71.6)
	Wound Infection	38 (63.3)
	Partial Dehiscence	13 (21.6)
	ARDS	15 (25)
Drain related complications	Drain site pain	24 (40)
	Peri tubal discharge/leakage with skin excoriation	19 (32)
	Drain Blockage	11 (18)
	Peritoneal collection	6 (10)
	Accidental pull-out	2 (3)
	Restriction of mobility	23 (38)
	Pulling out of omentum	0 (0)
	Erosion of adjacent organs	0 (0)

to ARDS and one to pleural effusion and sepsis.

Drain-related complications included persistent pain at the drain site in 24 patients, peri-tubal discharge with skin excoriation in 17 patients, drain blockage in 11 patients, and peritoneal collection at two sites in 6 patients. Accidental pull-out of the subhepatic drain occurred in 2 patients, resulting in no collection. Mobility issues were noted in 23 patients early postoperatively, while no cases of omentum pull-out or organ erosion were recorded (**Table 1**).

The mean ± standard deviation (range) time for the removal of abdominal drains was 5.12 ± 1.32 (3-6) days for subhepatic drains and 4.82 ± 1.25 (5-9) days for pelvic drains. Eight patients required additional days for drain removal. Notably, subhepatic drains ceased draining earlier than pelvic drains, resulting in their earlier removal. The mean ± standard deviation (range) time for discharge from the hospital was 8.75 ± 2.86 (7-10) days.

After carefully observing and documenting the characteristics of the study participants, including their clinical history, examination details, and postoperative complications, patients were categorized into two groups: Group A and Group B. This division was based on the presence or absence of complications related to drainage, respectively.

The majority of patients (n=36) fell into Group B, as they did not experience any complications related to drainage. In contrast, Group A comprised 24 patients who encountered two or more complications associated with drainage.

To evaluate the impact of various factors on the development of drain-related complications and the correlation between drain complications and general postoperative complications, a thorough statistical analysis was conducted. This analysis considered factors such as age, gender, residency, as well as different pre-operative and intra-operative findings as potential predictors.

In terms of age, no significant difference was observed between the two groups, Chi-square = 1.24, p-value= 0.24, Odd ratio (OR 1.8). Similarly, gender did not show a significant difference between the two groups (Chi-square = 2.2, p-value= 0.145, OR 0.382).

Residency was also not found to be a statistically significant factor between the two groups (Chi-square = 1.71, p-value= 2.02, OR 2.1).

However, the duration of pain at presentation did exhibit a significant difference between the two groups (Chi-square

Table 2. Demographic, Pre and intraoperative predictors for drain related complications.

Variables (no.=60)	Category	Group A	Group B	Chi-Square value	P value	OR
Age	(<30) (30-40) (>40)	13 (21.6) 21 (35) 26 (43.3)	13 (21.6) 21 (35) 26 (43.3)	1.24	0.24	1.8
Sex	Male Female	16 8	29 7	2.2	0.145	1.382
Residency	Urban Rural	17 7	17 19	1.71	2.02	2.1
Duration of pain (hours)	<24 24-48 >48	5 9 10	28 5 3	7.5	**0.007**	9.4
Site of perforations	Gastric Duodenal	11 13	5 31	4.7	**0.032**	3.67
Size of perforations (cm)	≥1 <1	10 14	8 28	6.02	**0.02**	4.22
Peritoneal contamination (ml)	> 1000 ≤ 1000	17 7	10 26	9.4	**0.003**	5.41

Group A = patients with drain related complications, Group B = patients without drain related complications, OR= Odd's ratio.

=7.5, p-value=0.007, OR=9.4). Patients presenting between 48-72 hours had a higher complication rate.

Several other factors demonstrated a significant difference in the development of drain-related complications between the two groups. These included gastric perforation (p-value= 0.032, OR=3.67), perforation size greater than 1cm (p-value= 0.02, OR=4.22), and peritoneal contamination exceeding 1000ml (p-value= 0.003, OR 5.41) **(Table 2)**.

DISCUSSION

The Perforation of peptic ulcer is conventionally treated by classical Graham patch technique. Omental patching began in 1937, when Dr Roscoe Graham from Toronto reported 50 cases of perforated peptic ulcer successfully treated. He concluded that routine gastroentorostomy was unnecessary, and the omental patch was more than sufficient for closure of the duodenal perforation [12, 13].

Abdominal drainage has always been a subject of controversy. The rationale behind abdominal drainage following major abdominal surgery is that drains forewarn the surgeon of potential intra-abdominal complications [14]. Role of the drain is to evacuate intraperitoneal collection like, blood, bile and intestinal contents. But, high rate of drain-related complications negates the concept of the routine drainage [15].

Robinson classified surgeons aptly into three categories based on their preference for the use of drain: those who believe that intra peritoneal operations should always be drained, those who think that drainage is useless and those who sit on a fence and insert the drain as a safety valve [16].

Petrowsky et al concluded that the "omental patch technique for perforated ulcer appears to be safe without prophylactic drainage, and routine drainage is not recommended". He also says a Futile Reliance on the Drain, when a Leak develops, postpones lifesaving re-operation and hastens death [17]. Moreover, the use of drains is not a substitute for adequate peritoneal lavage in cases of peritonitis due to perforation of a peptic ulcer as emphasized by Sir Alfred Cuschieri [17, 18].

Several complications resulting from drainage were discussed in our study. These include drain site pain, peri tubal leakage, obstruction and blockage of the tube drain, accidental pull-out, restriction of mobility and pulling out of omentum through drain wound during its removal. Some of these complications are illustrated with case histories and authors warn against too liberal or long-term drainage [19–21].

The use of thinner and softer tube drains is usually ineffective as there is risk of these tubes getting blocked or kinked [22].

Also, it has been considered that these drains provide a risk for intra-abdominal infections by providing a route for ascending infections as they act as a foreign body [20, 23, 24]. Sheng et al, stated that these acquired infections have an important impact on the length of hospital stay and medical care cost [25].

Increased age, by itself is usually considered to be associated with increased risk of development of post operative complication. Sivaram P et al. [26], Bojananpu S et al. [27] and several other studies have reported that patients aged 45 years or more have significantly higher rates of complications compared with younger patients [28–31] and this finding was mostly due to the increased incidence of comorbid diseases in the elderly patients [32].

But in our study, age more than 45 was not found to be associated with increased risk of development of the drain related complications. This has also been reported by Sharma SS et al. in a recent study [33].

Some studies mentioned that late presentation was not a predictor of the outcome as it had not been associated with development of drain related complications, but our study showed that patients presenting in 48-72 hours from onset of pain were at greater risk of development of complications and the earlier presentation led to better outcome with less morbidity and mortality. Late presentation as a risk factor has been reported in many other studies and the duration of delay in presentation has been directly proportional to increasing grades of peritoneal contamination [34–37].

As Sharma Ss reported that presentation as abdominal distension may indicate the amount of peritoneal spillage and that it is meaningful predictor of the risk and number of postoperative complications, therefore we evaluated the amount of the peritoneal spillage as a risk factor and the statistical analysis proved the association between the spillage >1000cc and the drain related complications [33].

Presence of vomiting episodes may suggest that subhepatic drain produces gastric over-activity with or without reverse peristalsis directly through the drain contact and irritation of the adjacent duodenum or indirectly through the drain contact with the adjacent liver, leading to diaphragmatic irritation with resultant vomiting.

Post-operative fever was recorded in most of patients in our study with significant difference between Group A and group B. This finding supports the concept of "Drain Fever" as reported in 1962 by Myers and can be attributed to the use of drain and its complications in addition to other causes of post operative fever. That is why this concept remained controversial. Pai and Ansari did not find any statistical difference between the two groups with respect to the post-operative fever [15, 21].

Wound infection at the drain site and partial dehiscence of the wound were significantly much lower in the group B as compared to the group A in the present study. These observations are in agreement with the majority of other investigators [17, 21] who found drains are risk factor for wound infection.

Present study confirms that intraperitoneal collections can occur in patients even in presence of the tube drain. This may be attributed to that drains may possibly stimulate fluid collection by acting as foreign bodies and do not allow apposition of tissue surface, therefore leave a space which promotes continued exudation and intra peritoneal collection [15, 21].

Risk of ARDS and mortality was unrelated to the presence or absence of drain-related complications observed in the present study in agreement with other studies [21, 38].

Several limitations were present in our study, including a small sample size and the restriction to cases presenting to the emergency department of Azadi Teaching Hospital. To address these limitations, we recommend that future research prioritize scheduled trials with larger sample sizes.

Furthermore, we suggest conducting additional studies to compare postoperative complications between cases with and without drains for a more comprehensive understanding of the outcomes.

CONCLUSION

All drains carry a risk of significant postoperative complications. In the setting of good surgical technique and the presence of sufficient equipment for the detection of intra-abdominal complications postoperatively like ultrasonography and CT scan, abdominal drains should be used rationally.

ETHICAL DECLARATIONS

- **Acknowledgements**

  None.

- **Ethics Approval and Consent to Participate**

  This study received approval from the Local Scientific Council of the Iraqi Board of Medical Specializations in General Surgery. The study's objectives were clearly communicated, and informed consent was obtained from all participants, ensuring their understanding and voluntary participation in the research.

- **Consent for Publication**

  Non.

- **Availability of Data and Material**

  The datasets are available from the corresponding author upon reasonable request.

- **Competing Interests**

  The authors declare that there is no conflict of interest.

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- **Authors' Contributions**

All stated authors contributed significantly, directly, and intellectually to the work and consented it to be published.

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