

Comparative study between Graham's omentopexy and modified-Graham's omentopexy in treatment of perforated duodenal ulcers

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Background

Peptic ulcer perforation is an emergency and requires urgent surgical treatment. In spite of rare incidence of elective surgery for duodenal ulcer, frequency of emergency operations is on the rise.

Objective

This study is aimed at comparing success rate between Graham's omentopexy (GO) and modified-Graham's omentopexy (MGO) as an emergency management technique for duodenal perforation.

Patients and methods

A prospective study was carried out for 2 years with 80 patients. GO was done in 40 patients and 40 patients underwent MGO between March 2015 and March 2017 in the Department of Surgery in Aswan University. Data regarding age, sex, time elapsed between onset of symptoms and hospital admission, comorbid diseases, morbidity, and mortality were recorded.

Results

MGO was associated with longer operative time, but the incidence of reperforation is less than GO. Mean hospital stay in GO group is higher than MGO group.

Conclusion

Graham's patch repair is as effective as modified-Graham's patch repair in terms of morbidity and mortality. There is no statistically significant difference in undergoing either procedure for repair.

Keywords:

Graham's omentopexy, modified-Graham's omentopexy, peptic perforation

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Introduction

Peptic ulcer perforation is a frequent cause of hospitalization, which affects 2–10% of patients with peptic ulcer. Peptic ulcer perforation presents with an overall mortality of 10%, although various authors have reported incidences between 1.3 and 20%, so selection of the most appropriate operative approach becomes an important issue for surgeons [1].

Several surgical procedures have been devised to treat complicated peptic ulcer. Omentopexy is commonly used in emergency management of duodenal ulcer perforation. Omentopexy was first described by Cullen Jones in 1929 and was later modified by Graham in 1937 [2]. The surgical approaches for omental patching rely on two principles, that is, direct and indirect omentopexy [3].

Various complex procedures have been described for treatment of duodenal perforations. These include resection of the perforation bearing duodenum and gastric antrum in the form of a partial gastrectomy, conversion of the perforation into a pyloroplasty, or the closure of the perforation using a jejunal serosal patch

or jejunal pedicle. In patients who present with unstable hemodynamics, these procedures may neither be feasible nor desirable because each of the aforementioned options not only prolongs the surgical time but also requires a high degree of surgical expertise and facilities, which may not be available in the emergency setting [4].

Peptic ulcer perforation is a common life-threatening emergency and requires special attention with prompt resuscitation and appropriate surgical management [5]. Many modalities of treatment are available ranging from nonoperative option to laparoscopic repair [6].

To date, there are still some debatable issues on treatment of perforated duodenal ulcer. Options exist in this situation, which include conservative treatment, omental plugging, closure of ulcer with free omentum, closure of perforation with use of pedicled omentum,

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control tube duodenostomy, definitive treatment with truncal vagotomy and drainage procedures, or proximal gastric vagotomy [7].

It is nonetheless customary to avoid definitive treatment with truncal vagotomy and drainage procedures or proximal gastric vagotomy and instead perform simple closure of perforation to halt the consequences secondary to peritoneal contamination in those patients who are acutely unwell. Roscoe Graham published his results by placing three sutures with a piece of free omentum laid over these sutures, which are then tied (without any attempt for primary closure of the perforation) [8].

Modifications came with the principal aim to close the perforation, keeping the omentum sandwiched between two layers of knots in an effort to prevent leaking (the major concern with Graham's technique) [9].

In the patients with duodenal perforation who present with unstable hemodynamics and gross peritoneal contamination, it may be more prudent to close the perforation with a Graham's patch using omentum. This Graham's patch is still relevant and useful in emergency surgery for perforated peptic ulcer in selected patients [10].

The aim of this study was to assess whether there is a direct benefit associated with modified-Graham's omentopexy (MGO), above and beyond the benefit associated with Graham's omentopexy (GO) in the treatment of perforated duodenal ulcers. We attempted to answer the question whether primary closure of the perforation in MGO will affect the outcome of surgery. Complication rates were compared for the two alternative surgical procedures.

Patients and methods

The study included 80 cases of perforated chronic duodenal ulcer. They were treated in the Department

of Surgery in Aswan University Hospital between March 2015 and March 2017. The criteria of case selection were thorough history, clinical examination, and radiological findings with diagnosis of perforation of chronic duodenal ulcer, and having undergone operative treatment. Data on patient comorbidities, presenting symptoms, vital signs, laboratory studies, and diagnostic procedures were documented.

All patients, on hospitalization, received intravenous fluids, antibiotics, nasogastric aspirations, and timely monitoring of vitals until surgical intervention. Good urinary output and stable hemodynamics were ensured in all the patients before being taken for surgery.

Data on patients' profile were collected, which included age, sex, socioeconomic status, risk factors (smoking, alcohol, tobacco chewing, use of ulcerogenic drugs, and history of acid peptic disease), symptoms, signs, chest radiography findings, ultrasonography abdomen findings, day of presentation, presence of shock at presentation, chest condition, and laboratory investigations (hemoglobin concentration).

The patients were divided into two groups of 40 patients each based on the technique of simple randomization. Patients were allotted to groups A and B.

Group A: Graham's omentopexy

Graham's technique of omentopexy was performed by closing the perforation by placing interrupted full thickness 2-0 vicry sutures along the margins of the ulcer with a patch of pedicled omentum laid over these sutures, which are then tied (without any attempt for primary closure of the perforation before placing the omentum as a plug; Fig. 1).

Group B: modified-Graham's omentopexy

The modification of the Graham's patch has been used in this group, where 2-0 vicry sutures are passed between the edges of perforation and tied to close the perforation. A pedicle of omentum based on

Figure 1



Primary closure of perforated duodenal ulcer by Graham's technique of omentopexy. (a) perforated duodenal ulcer as seen from anterior; (b) Through and through sutures; (c) pedicled omentum laid over these sutures; (d) sutures are then tied; (e) Final repair of the defect with omentum secured in place on to the defect itself.

right omental artery is brought between these sutures, and these sutures are tied again with pedicle of omentum between knots over the perforation (thus the omentum remains sandwiched between the two levels of secured knots; Fig. 2).

Both groups were compared in terms of postoperative complications and surgical outcome. Postoperatively, all patients were prescribed for 2-week treatment of standard triple drugs therapy to eradicate *Helicobacter pylori*. All patients were followed-up for 3 months in an outpatients department.

Outcome was compared based on mean operative time, intraoperative and postoperative mortality within 30 days, development of bile leak, septicemia, intra-abdominal abscess, wound infection, burst abdomen and lung complications, commencement of oral feeding from day of surgery, and duration of hospital stay.

Results

Of 80 cases, 71 were males and nine were females. Data revealed that 40 patients (34 males and six females) had undergone GO and 40 patients (37 males and three females) had undergone MGO technique. Most of the perforations were in the range of 0.6–1 cm (Table 1). Comparison between the two groups was made in terms of mean operative time, intraoperative, and postoperative mortality within 30 days, development of bile leak, septicemia, intra-abdominal abscess, wound infection, paralytic ileus, burst abdomen and lung complications, commencement of oral feeding from day of surgery, duration of hospital stay, and necessity of reoperation. The postoperative complications in group A (GO) were wound infection in 11 (27.5%) cases, biliary leakage in three (7.5%) cases, intra-abdominal abscesses in three (7.5%) cases, and two (5.0%) deaths, but in group B (MGO), wound infection was noted in nine (22.5%) cases but

there was no biliary leakage and intra-abdominal abscess. There was one (2.5%) mortality in group B. The hospital stay in group A was 11.6 days and in group B 9.7 days. The postoperative complications of both techniques are shown in Table 2. Data were analyzed by using Fisher's exact test and found statistically significant, with *P* value less than 0.0001.

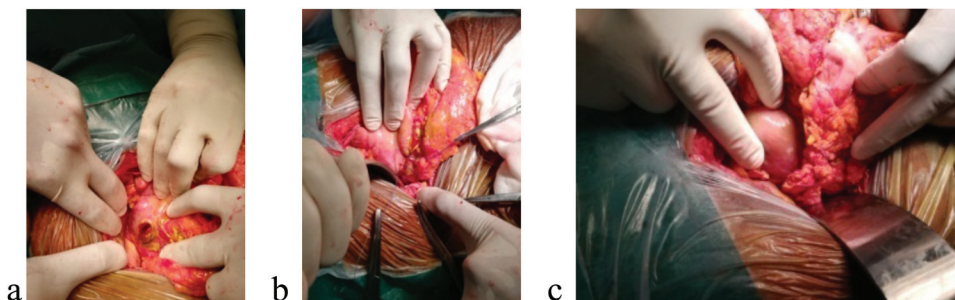
Discussion

In modified-Graham's technique, a segment of omentum is brought on top of the already approximated perforation with second level of knots. The use of vascularized pedicled omentum besides reducing the risk of cutting through the sutures used for perforation closure also induces neovascularization, which accelerates ulcer healing [11].

Table 1 Analysis of data (preoperative and intraoperative) in perforated duodenal ulcers

Factors	n (%)
Age of the patients (years)	
20–29	9 (11.25)
30–39	31 (38.70)
40–49	20 (25.00)
50–59	9 (11.25)
>60	11 (13.75)
Sex	
Male	71 (88.75)
Female	9 (11.25)
Time interval between onset of symptom and operation (h)	
<24	28 (35.00)
>24	52 (65.00)
Size of duodenal perforation (cm)	
<0.5	9 (11.25)
0.6–1	49 (61.25)
>1	22 (27.5)
Concurrent medical diseases	
Present	21 (26.25)
Absent	59 (73.73)
Preoperative shock	
Present	8 (10.00)
Absent	72 (90.00)

Figure 2



Closure of perforated duodenal ulcer by Modified Graham's Omentopexy. (a) perforated duodenal ulcer as seen from anterior; (b) first layer of knots; (c) Second layer of knots secured over the free vascularized omentum.

Table 2 Outcomes of both techniques

Outcomes	Graham's omentopexy (n=40) [n (%)]	Modified-Graham's omentopexy (n=40) [n (%)]	P value
Mean operative time (min)	72.2±8.42	74.3±9.38	0.425 (NS)
Bile leak/fistula	3 (7.5)	0 (0.0)	0.594 (NS)
Wound infection	11 (27.5)	9 (22.5)	<0.04*
Wound dehiscence	3 (7.5)	1 (2.5)	<0.04*
Pneumonia	3 (7.5)	2 (5.0)	0.374 (NS)
Paralytic ileus	1 (2.5)	1 (2.5)	1
Septic shock	2 (5.0)	2 (5.0)	1
Abdominal abscess	3 (7.5)	0 (0.0)	<0.02*
Mean hospital stay (days)	11.6±1.93	9.7±1.58	<0.01*
Commencement of oral feed (mean days)	4.1±0.98	3.5±0.82	0.264 (NS)
Reoperation	2 (5.0)	0 (0.0)	<0.02*
Death	2 (5.0)	1 (2.5)	0.264 (NS)

*P<0.05, significant.

Graham's concluded that routine gastroenterostomy was unnecessary and that omental patch was sufficient for closure of perforated duodenal ulcer. In the treatment of perforated duodenal ulcer, a minimum of two are required: one to ensure adequate closure of perforation and the other to control acid production. Although the control of acid production is recommended, acid-reducing procedure like vagotomy and gastrojejunostomy/pyloroplasty in the emergency setting is never safe. In such situation, it may be more prudent to control acid production with proton pump inhibitors [7].

High intragastric pressure, the tendency of duodenal mucosa to extrude through the suture line, and autodigestive enzymes of pancreas and bile are factors contributing to leakage. Thus, further research is needed to standardize the procedure of choice [12].

Various experimental studies have shown that pedicled omentoplasty is being replaced by use of a glued patch of biodegradable material to be applied on outer surface of peptic perforation. The application of patch avoids suturing of friable edges of peptic perforation, thus saving valuable operative time [13].

In MGO, we followed the principle of indirect omentopexy as adopted by Rajput *et al.* [3] and Kumar [9], keeping the omentum sandwiched between the two layers of knots. Wound infection and biliary fistula were the major postoperative complications in the present study (Table 2).

The incidence of wound infection was closely comparable in both groups, that is, 11 patients in GO group and nine in MGO group. Biliary fistula, burst abdomen, and mortality are slightly higher in GO group. Releaking is postulated to result from

incomplete and insecure sealing of the perforation by the omentum, leading to releaking, with the aforesaid complications. Postoperative wound infection was the major complication seen in 22.5–27.5% of our cases, which is comparable to few studies [3].

Previously published trials are unclear as to whether MGO is better or worse than GO [3,14]. In the present study, mortality rate ranges from 2.5 to 5.0%, which varies compared with the mortality rate in other literatures, with range from 6.5 to 20% [9]. In the present study, the mean hospital stay was 11.6 days in GO group and 9.70 days in MGO group, which is similar to another study [14].

The MGO focuses on primary closure of the perforation. The applied tension to the sutures should be strong enough to stabilize the omentum in place, but loose enough to preserve the omental blood supply, provided the ligature is neither too tight to cause tissue damage nor too loose to have recurrence with the goal to secure the omentum that enables sealing of the perforation. If the omental patch is strangulated owing to increased tension on the knots, then the chance of giving way of the suture line is high [9].

Many surgeons have felt that if patients could be brought to operation earlier in the course of their attacks, the morbidity and mortality might be substantially reduced. The most important factors jeopardizing the outcome are delay in admission to the hospital, concomitant diseases, and preoperative shock. This necessitates early admission, adequate resuscitation, and treatment of concomitant diseases and early surgical intervention [15].

The shortcoming of this study is the small sample size. Further study with more cases is needed on the question of GO versus MGO to evaluate and apply a suitable method for treating this acute catastrophe.

Conclusion

Based on our results, it seems that Graham's patch repair is as effective as modified-Graham's patch repair in terms of morbidity and mortality.

Although widely practiced, MGO remains a treatment with appreciable complications whose potential benefits above and beyond the benefit associated with GO have not been clearly demonstrated.

There is no statistically significant difference in undergoing either procedure of repair. Failure to prove significant difference may reflect the small number of patients randomized within this study. The choice between GO or MGO is based on surgeon preference.

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Conflicts of interest

There are no conflicts of interest.

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