

Novel Technique for The Placement of Omental Patch During Repair of Perforated Duodenal Ulcer. A Retrospective Study of Prospectively Collected Data

Oday G Al-Asadi*, Qais K Baqir, Issam M Alnajjar

***Corresponding author:**

Oday G Al-Asadi, FRCS, MRCS, FIBMS
Consultant Surgeon, Lecturer
Savernake road, London, UK
Post code NW3 2JR
0044-7951022270
E-mail: odayalasadi@yahoo.com

Department of Surgery, College of Medicine, University of Basrah, Iraq

ABSTRACT

Objective: To present a novel technique for the placement of omental patch aiming to prevent post-operative leak in order to decrease post-operative morbidity, prolonged hospitalisation and mortality. *Summary Background Data:* Peptic ulcer perforation is a common life-threatening emergency and requires urgent surgical solution. Graham patch and modified Graham patch are the two most widely used techniques for omental patch repair. However, the post-operative leak rate following these techniques could be between 3.33% and 6.7%.

Methods: This is a prospective study on 41 patients with perforated duodenal ulcers conducted in Basrah City over a period of 7 years. All patients were offered a new novel technique developed by Oday for the omental patch repair of their ulcer perforation.

Results: The most common post-operative complication was superficial surgical site infection which happened in 9 patients (21.9%). The second most common complication was post-operative ileus which was seen in 5 patients (12%). Post operative pneumonia was seen in 4 patients (9.7%). The average hospital stay for the patients was 5 days. There were no leaks or death reported in this study.

Conclusion: The results of this study are encouraging to use this novel technique as a surgical solution for the treatment of perforated peptic ulcer disease with lower post operative leak, morbidity and mortality in comparison to the results obtained with other standard techniques (Graham and modified Graham patches).

Key words: omental patch, repair of perforated duodenal ulcer, alternate suture technique, oday patch

INTRODUCTION

Peptic ulcer perforation is a common life-threatening emergency and requires urgent surgical solution (1). Different techniques have been tried recently, such as: Gelatin sponge plugs; fibrin glue sealants; self-expandable stents and endoscopic clipping. However, none of them proved to be superior (2). Exploratory laparotomy and omental patch repair remain the gold standard (2).

Graham patch and modified Graham patch are the two most widely used techniques. However, the post-operative leak rate following these techniques could be between 3.33% and 6.7% (3).

Received: 11.03.2024

Accepted: 20.05.2024

Post-operative leak is associated with higher mortality rate which could raise from 2.7% to 55.6% after re-leak (4).

Hospitalisation could be prolonged in those who survive the re-leak for around 23.6 days (5).

The Graham patch technique consists of applying a piece of omentum over the perforation which is fixed by applying multiple full thickness interrupted sutures (6-12).

Later on, a group of surgeons started performing modified Graham patch as they raised concerns that post-operative leak could happen if closure of the perforation was not done before applying the omentum. Therefore, they have started closing the perforation then they fix the omentum above the closed defect with the same sutures. A disadvantage of this technique is that the knots act as a barrier between the duodenum and the omentum. Furthermore, there will be a narrow surface of contact between them which again could lead to post-operative leak (6,13-20).

We aim to present a novel technique for the placement of omental patch, aiming to prevent post-operative leak to decrease post-operative morbidity, prolonged hospitalisation and mortality.

MATERIALS AND METHODS

This is a prospective study on 41 patients conducted as a single surgeon experience in the department of General Surgery at Basrah Teaching Hospital in Basrah City over a period of 7 years (from February 2009 to February 2016).

Patients with confirmed duodenal ulcer perforation were included. Cases performed by other surgeons in the unit were excluded. The diagnosis was made on the bases of the clinical presentation of acute onset upper abdominal pain with laboratory results suggestive of raised acute inflammatory markers and x-ray finding of air under the diaphragm on erect chest x-ray film, and then were proved by operative findings.

All patients underwent an emergency laparotomy via upper midline incision.

SURGICAL TECHNIQUE

The technique of the repair developed by Oday consists of:

Step 1

Placing an interrupted, full thickness bites of 0/2 or 0/3 vicryl sutures under direct vision, starting from top to bottom of the perforation, approximately 0.5-1 cm

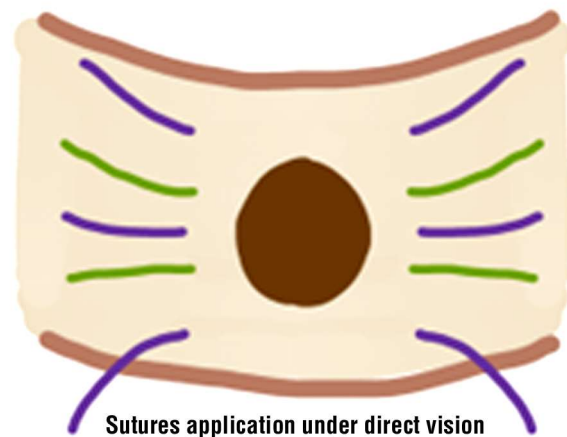


Figure 1 - Application of sutures

lateral to the margin of the perforation and about 2-3 mm from each other (see *fig. 1*). The sutures were then held with mosquito artery clips.

These sutures were assigned into 2 categories in an alternating pattern:

1. The Closure sutures: used to close the perforation (green);
2. The Patch sutures: used to fix the omental patch over the closed perforation (purple).

Step 2

Then the closure sutures (green) are tied and cut to close the perforation, leaving the patch sutures untied (*fig. 2*).

Step 3

After that, a piece of well vascularised omentum (yellow) is placed over the closed perforation and fixed in place by tying the patch sutures (purple) above it (*fig. 3*).

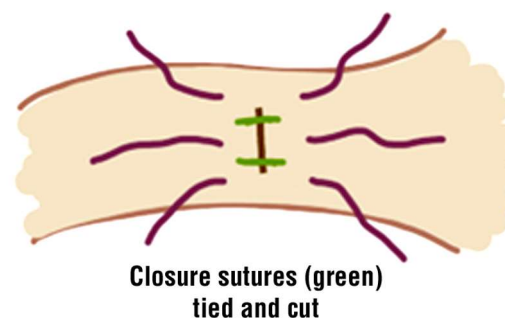
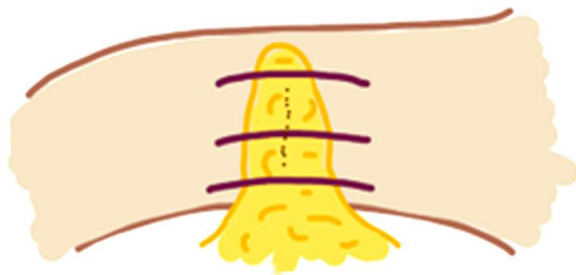


Figure 2 - Tying up the closure sutures



Patch sutures (purple) tied over the omentum

Figure 3 - Tying the patch sutures

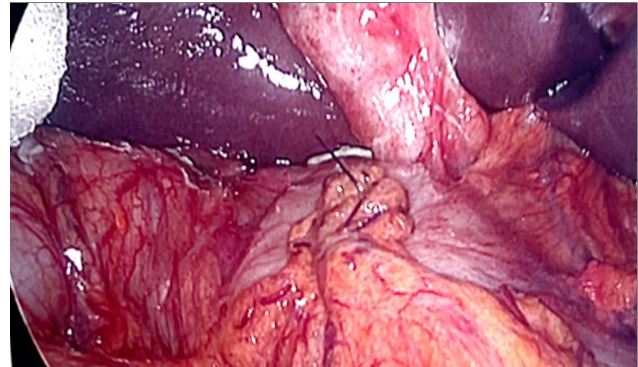


Figure 4 - Operative view (Oday Patch)

The final repair will be a well adherent omentum to a wide area over the site of the closed perforation as shown in the operative view in the *fig. 4*.

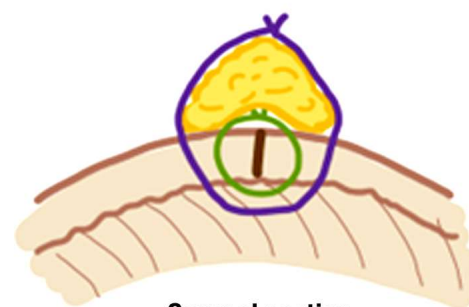
Technical tips:

1. The total number of the sutures should be odd, so that it is properly centred around the defect. Obviously, the larger the opening of the ulcer, the larger number of sutures needed, e.g.: 3, 5, 7 (we used 5 sutures in our example figures).
2. The first and the last sutures should always be patch sutures, with the first one placed above the upper margin of the perforation, while the last one is placed below the lower margin of the perforation. This is to make sure that the upper and lower ends of the defect are well covered by the patch.
3. In general, the bites of the patch sutures should be taken at a further point from the edge of the perforation as compared to the closure suture bites so that they can accommodate the omentum later on.

This will allow closure of the defect together with obtaining tight adherence between the omentum and the inflamed duodenal serosa over a wider area (in comparison to the original configuration of Graham patch and modified Graham patch).

See the coronal section of the configuration of our technique (*fig. 5*) as compared to Graham patch (*fig. 6*) and modified Graham patch (*fig. 7*) which explain how we can get a more secure closure with this technique.

The peritoneal cavity is then washed with about 4- 6 litres of warm saline and the abdomen closed, usually after placing 2 drains (right sub hepatic and pelvic).



Coronal section

Figure 5 - The new technique



Graham patch: the omentum fills the ulcer opening

Figure 6 - Graham patch



Modified Graham patch: Narrow area of attachment between the omentum and the duodenum

Figure 7 - Modified Graham patch

RESULTS

41 patients were included in this study. The average age was 46.58 years (between 18-82 years). Most of them were men - 36 and only 5 were women (male to female ratio of approximately 7:1). The duration between the onset of pain and the start of the operation ranged from 6-36 hours (average 15.8 hours). The size of the ulcer perforation ranged from 5-20 mm (average 10 mm). The length of hospital stay after the operation was around 5 days (ranging from 3-12 days). The patients who stayed relatively longer than others are those who developed Hospital Acquired Pneumonia (HAP) in the post-operative period.

The American Society of Anaesthesiologists (ASA) physical status classification system of the patients were: 14 patients with ASA 1e, 14 with ASA 2e, 12 with ASA 3e and 1 patient with ASA 4e (*table 1*).

The most common post-operative complication was superficial surgical site infection which occurred in 9 patients (21.9%). This had responded to removal of some skin sutures, local wound care and antibiotics.

The second most common complication was post-operative ileus which was seen in 5 patients (12%). Chest infection (pneumonia) was seen in 4 patients (9.7%).

There were no leaks or deaths reported in this study (see *table 2* and *fig. 8*).

DISCUSSION

Kumar K et al, found that the re-leak after omental patch closure of perforated duodenal ulcer is a

Table 1 - ASA grade

ASA Grade	Number of patients
ASA 1e	14
ASA 2e	14
ASA 3e	12
ASA 4e	1
Total	41

Table 2 - Post-operative morbidity and mortality

No.	Morbidity/Mortality	No. of patient	(%)
1	Wound infection	9	21.9%
2	Ileus	5	12%
3	Pneumonia	4	9.7%
4	Leak	0	0%
5	Death	0	0%
	Total	18	43.9%

significant factor affecting mortality rate. The death rate in the re-leak group was 55.6% in comparison to 2.7% in the control group of their study ($p=0.0001$) (4). We believe that this is an important factor in having no deaths reported in our study as the re-leak rate was zero.

Hemmat Maghsoudi and Alireza Ghaffari study found that generalised peritonitis due to omental patch leak was seen in 4% of their patients in their 422-patient retrospective data analysis. The mortality in patients who experienced re-leak was up to 29.4% and the mean hospital stay was 23.6 days (5). Again,

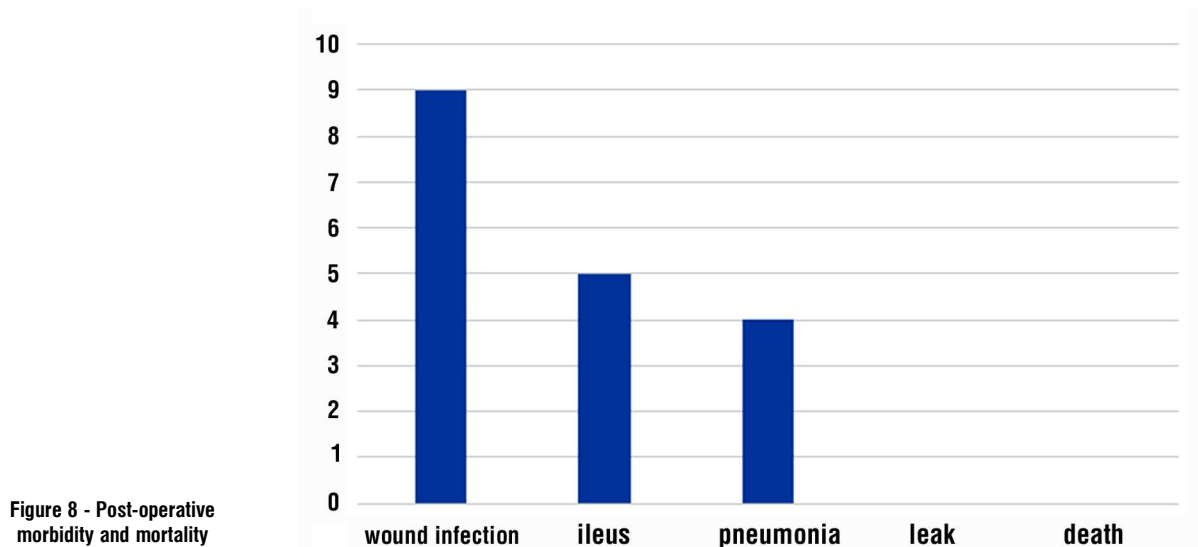


Figure 8 - Post-operative morbidity and mortality

these figures were higher than those found in our series with zero leak rate and zero post operative mortality. Since there were no leaks in our series, which is an important factor for causing prolonged hospitalisation, the average inpatient stay was 5 days only.

Re-leak after perforated peptic ulcer is a complex surgical scenario and the surgeon will be left to choose one of two challenging options: taking the patient back to theatre for another major operation which might carry a high mortality on a septic, frail patient; or continue conservative treatment with multiple drains and nutritional support aiming for spontaneous closure which require an extended period of hospitalisation usually in ITU with all possible consequences of cost, sepsis, HAP, Total Parenteral Nutrition (TPN)-related complications. Therefore, the best way is actually to avoid going into the "re-leak" scenario. This can be obtained by choosing the best possible technique during the first operation with a minimum chance of leak.

Accordingly, we presented our alternate suture tying technique as a possible better way of repair of duodenal perforation which benefits from:

1. Closing the ulcer opening to decrease the amount of gastric and duodenal contents being in contact with the omentum and also to promote faster healing via opposition of the edges of the ulcer hole (which is not obtained with Graham patch technique where the ulcer opening is not closed before the application of the omentum).
2. Ensuring a wider area of intimate contact and tight adherence between the omentum and the inflamed duodenal serosa (which is not obtained with modified Graham patch technique, since the tied knot will act as a barrier between the duodenal wall and the omentum resulting in a narrow area of attachment between the 2 surfaces).

We believe that this had resulted in a more robust closure and therefore decreased the chance of post-operative leak which, if happened, would have significantly prolonged the hospitalisation time with increase in morbidity, cost and mortality.

A lot of other ways of fixing the omental patch were tried by different surgeons by adding more sero-muscular stitches around the ulcer in different configurations. However, we believe that our technique has the superiority of having all the stitches applied as a full thickness suture. We think of this as having less of a chance to cut through or to cause a cheese-wiring effect of the inflamed duodenal wall since it involves the whole layers of the bowel wall including the sub-

mucosa (which is the strongest layer of the wall of the bowel) which is another important factor which we believe might help to prevent a possible post operative leak.

Although our study was done as an open surgery, it might be possible that our technique could be performed via a laparoscopic approach as it provides a more robust sealing. This should only be done when an experienced laparoscopic surgeon is available.

As with Graham and modified Graham patch repairs, this technique cannot be properly accomplished if a well vascularised omentum cannot be obtained due to loss by previous surgery or other reasons.

CONCLUSION

The results of this study are encouraging to use this novel technique as a surgical solution for the treatment of perforated peptic ulcer disease with lower post operative leak, morbidity and mortality, in comparison to the results obtained with other standard techniques (Graham and modified Graham patches). However, a larger study with randomised controlled trials is needed to further validate the results.

Acknowledgment

I would like to express my deepest thanks to Dr F. Aldhafer for her support and advices throughout writing this paper.

Conflict of interest

The authors declare that they have no conflict of interest.

Informed consent

All patients have been formally consented for the procedure.

Disclosure

Nothing to disclose

REFERENCES

1. Nuhu A, Madziga AG, Gali BM. Acute perforated duodenal ulcer in Maiduguri: experience with simple closure and Helicobacter pylori eradication. *West Afr J Med*. 2009;28(6):384-7.
2. Chung KT, Shelat VG. Perforated peptic ulcer - an update. *World J Gastrointest Surg*. 2017;9(1):1-12.
3. Kidwai R, Ansari MA. Graham Patch Versus Modified Graham Patch

- in the Management of Perforated Duodenal Ulcer. *Journal of Nepalgunj Medical College*. 2017;13(1):28.
4. Kumar K, Pai D, Srinivasan K, Jagdish S, Ananthakrishnan N. Factors contributing to leak after surgical closure of perforated duodenal ulcer by Graham's Patch. *Trop Gastroenterol*. 2002; 23(4):190-2.
 5. Maghsoudi H, Ghaffari A. Generalized Peritonitis Requiring Re-Operation After Leakage of Omental Patch Repair of Perforated Peptic Ulcer. *Saudi J Gastroenterol*. 2011;17(2):124-128.
 6. Razvan C Opreanu, MD, MS; Chief Editor: Kurt E Roberts. Omental (Graham) Patch Technique. <https://emedicine.medscape.com/article/1892935-technique#c3>. Updated: Oct 31, 2017.
 7. Arora BK, Arora R, Arora A. Modified Graham's repair for peptic ulcer perforation: reassessment study. *Int Surg J*. 2017;4:1667-71.
 8. Mishra R. K. How to do Laparoscopic repair of duodenal perforation? www.laparoscopyhospital.com/duod.htm.
 9. Lau WY, Leung KL, Kwong KH, Davey IC, Robertson C, Dawson JJ, et al. A randomized study comparing laparoscopic versus open repair of perforated peptic ulcer using suture or sutureless technique. *Ann Surg*. 1996;224(2):131-138.
 10. Nathanson LK, Easter DW, Cuschieri A. Laparoscopic repair/peritoneal toilet of perforated duodenal ulcer. *Surg Endosc*. 1990; 4(4):232-3.
 11. Abdallah HA, Saleem A El A. Comparative study between Graham's omentopexy and modified-Graham's omentopexy in treatment of perforated duodenal ulcers. 2018. DOI: 10.4103/ejs.ejs_61_18.
 12. Gupta S, Kaushik R, Sharma R, Attri A. The management of large perforations of duodenal ulcers. *BMC Surg*. 2005;5:15.
 13. Rhodes A, Evans LE, Alhazzani W, Levy MM, Antonelli M, Ferrer R, et al. Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock: 2016. *Intensive Care Med*. 2017;43(3):304-377.
 14. Smith D, Roeser M, Naranjo J, Carr JA. The natural history of perforated foregut ulcers after repair by omental patching or primary closure. *Eur J Trauma Emerg Surg*. 2018;44(2):273-277.
 15. Pai D, Sharma A, Kanungo R, Jagdish S, Gupta A. Role of abdominal drains in perforated duodenal ulcer patients: a prospective controlled study. *Aust N Z J Surg*. 1999;69(3):210-3.
 16. Bell G D, Powell K U. Eradication of *Helicobacter pylori* and its effect in peptic ulcer disease. *Scand J Gastroenterol*. 1993; 28(suppl):7-11.
 17. Donovan A J, Berne T V, Donovan J A. Perforated duodenal ulcer. An alternative therapeutic plan. *Arch Surg*. 1998;133(11):1166-1171.
 18. Jordan P H, Thornby J. Perforated pyloroduodenal ulcers. Long-term results with omental patch closure and parietal cell vagotomy. *Ann Surg*. 1995;221(5):479-86; discussion 486-8.
 19. Clinch D, Damaskos D, Di Marzo F, Di Saverio S. Duodenal ulcer perforation: A systematic literature review and narrative description of surgical techniques used to treat large duodenal defects. *J Trauma Acute Care Surg*. 2021;91(4):748-758.
 20. Jordan Jr PH, Thornby J. Perforated pyloroduodenal ulcers. Long-term results with omental patch closure and parietal cell vagotomy. *Ann Surg*. 1995;221(5):479-86; discussion 486-8.