A Comparison of Laparoscopic and Open Repair of Perforated Duodenal Ulcer Using Omental Patch: A Prospective Randomized Controlled Trial

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ABSTRACT

Background: *Perforation of duodenal ulcers occurs in nearly 20% of cases of duodenal ulcer patients. Repair of perforated duodenal ulcer disease can be done either by open or laparoscopic approach. Laparoscopic approach has become recently a widespread procedure.* ***Aim of this study:*** *comparison between open and laparoscopic repair in case of perforated duodenal ulcer as regards intraoperative approach and postoperative recovery and complications.* ***Methods:*** *This comparative study included 64 patients who presented to the Emergency unit of Zagazig University hospital with perforated duodenal ulcer during the period from September 2013 to October 2015.These patients were divided randomly into two groups: Open group: 32 patients and laparoscopic group:32 patients.* ***Results:*** *the laparoscopic approach is a feasible, safe option and associated with less pain and shorter length of hospital stay for PDU patients with small perforation size and early diagnosis within 48 hours of the onset of symptomps.* ***Conclusion:*** *Laparoscopic repair of perforated duodenal ulcers is better than open repair.*

Key words: *Perforated duodenal ulcer, Laparoscopy, peritonitis, omental patch.*

INTRODUCTION

Because of the success of medical therapy in the management of peptic ulcer disease (PUD), surgery currently plays only a very limited role, and elective peptic ulcer surgery has been virtually abandoned. In the 1980s, the number of elective operations for PUD dropped and more than 70%; 80% of these procedures were emergency operations **(1).**

Emergency operations for peptic ulcer perforation carry a mortality risk of 6-30% **(2).**

Laparoscopic repair has been used to treat perforated peptic ulcers since 1990, but few randomized studies have been carried out to compare open versus laparoscopic procedures **(3).**

The most accepted method of surgical closure of the perforation is the so-called Graham patch. In 1937, Graham **(4)** described the placement of through-and-through sutures at the site of perforation that was tied over a free graft of omentum.

laparoscopic approach is a feasible, safe option and associated with shorter length of hospital stay for PPU patients with small perforation size presenting to the hospital in less than 48 hours from the onset of symptoms**(5).**

PATIENTS AND METHODS

Patients:

From September 2013 to October 2015, 64 patients with a clinical and radiological diagnosis of perforated peptic ulcer were randomly assigned to undergo either open or laparoscopic omental patch repair at emergency unit at Zagazig University.

All patients diagnosed clinically with perforated peptic ulcers were prospectively randomized to undergo either conventional open or laparoscopic repair. The study protocol was approved by our hospital ethics committee then the trial began. Informed consent was obtained from all patients, with no refusals.

We have excluded patients who presented more than 3days after the start of symptoms, haemodynamically unstable cases in spite of good resuscitation, those aged less than 18 years old or more than 70 years old, perforation size more than 2 cm, clinically and radiologically self-sealed off perforations, intraoperative other finding than perforated duodenal ulcer and laparoscopic cases converted to open due to difficulties.

Methods of randomization:

These patients were randomly divided into open and laparoscopic groups at the time of diagnosis. Each patient was numbered sequentially. The odd number patients entered the laparoscopic group while patients with even number entered open group. If a patient was excluded from the study so the next patient entered instead of him.

The patients signed informed consent regarding the procedure and its possible complications.

Once the diagnosis of PDU was made, nasogastric tube (NGT) was inserted, urinary catheter placed, broad spectrum antibiotics to cover gut flora was initiated, parenteral analgesics before surgery, correction of fluid and electrolyte imbalance, and sometimes central line was inserted then transfer to the theater as soon as possible.

Open surgery group: patient was placed in a supine position. An upper midline incision was used.

Full-thickness simple 3/0 vicryl sutures were placed across the perforation and the sutures were secured. A segment of omentum was placed over the perforation.

Laparoscopic surgery:

Positioning:

1. The operating table was tilted head up 15 degrees.
2. The surgeon stood on the left side of the patients.
3. The camera man stood on the patient's left side.
4. The instrument trolley was placed on the patient's right side .
5. Television monitors were positioned at the top end of the operating table at a suitable height; so surgeon, anaesthetist, as well as the assistant can see the procedure.

Laparoscopy was achieved by using 4-port technique. Once pneumoperitoneum was established, the peritoneal cavity was explored. Perforation size was measured using the jaw length of the Maryland dissector (20 mm). The perforation was repaired with interrupted vicryl 3/0 sutures then a pedicled flap of omentum tied down in place using interrupted sutures .

Peritoneal wash to all 4 quadrants was then performed under direct vision using warmed normal saline. Pelvic and hepato-renal drains were inserted.

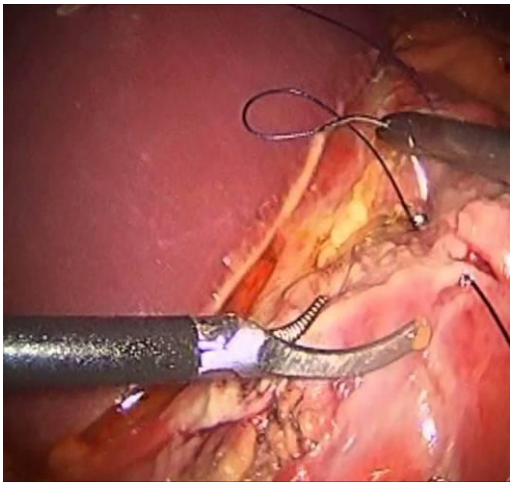

Fig. 1: Repair of perforated duodenal ulcer using intracorporeal suture.

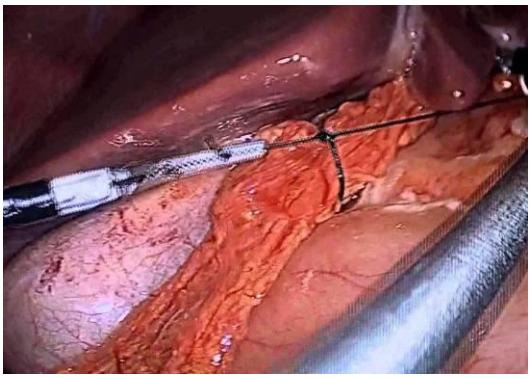

Fig. 2: Using omental patch to cover closed perforated duodenal ulcer.

The following variables were then compared between the 2 groups:

1. Operative time: measured from the time of the skin incision to the time of last suture of the skin.
2. Postoperative pain: The feeling of pain is subjective; therefore, we used the days of opioid analgesic use.
3. Return of bowel habit: detected as the day the patient passed flatus .
4. Length of hospital stay: the operation day was considered day 0.
5. Wound complications: in the form of wound infection, wound dehiscence at the site of the operation.
6. Chest infection: diagnosed in the presence of productive cough, chest pain, wheezes, crepitations.

7. Leakage: diagnosed by the character of the draining fluid , gastrographin meal done for all patients 3 days post operative.

All patients were followed in the outpatient setting one week after discharge and every week after that for one month.

Items checked during these visits were abdominal pain,fever,vomiting, bowel habits , wound condition, compliance for medical treatment .

Statistical analysis

Categorical variables were expressed as a number (percentage). Percent of categorical variables were compared using the Pearson's Chi-square test. All tests were two-sided. $P < 0.05$ was considered statistically significant. All data were analyzed using Statistical Package for Social Science for windows version 18.0 (SPSS Inc., Chicago, IL, USA).

RESULTS

Table 1: Demographic data and history.

Demographic data and history	*All patients (N=64)*	*Laparoscopic repair (N=32)*	*Open repair (N=32)*	*p-value*[§]
Age				
20-40 years	41 (64.1%)	19 (59.4%)	22 (64.1%)	0.529
40-60 years	19 (29.7%)	10 (31.3%)	9 (28.1%)	
60-70 years	4 (6.3%)	3 (9.4%)	1 (3.1%)	
Sex				
Male	38 (59.4%)	18 (56.3%)	20 (62.5%)	0.611
Female	26 (40.6%)	14 (43.8%)	12 (37.5%)	
History of NSAID intake≥ **2 weeks**	52 (81.3%)	28 (87.5%)	24 (75%)	0.200
Tobacco smoking	53 (82.8%)	28 (87.5%)	25 (78.1%)	0.320

N=Total number of patients in each group; Qualitative data were expressed as a number (percentage); § Chi-square test; $p< 0.05$ is significant.

Table 2: Clinical and laboratory examination.

Clinical and laboratory examination	*All patients (N=64)*	*Laparoscopic repair (N=32)*	*Open repair (N=32)*	*p-value*[§]
Onset of symptoms till beginning of operation				
Less than 12 hours	43 (67.2%)	25 (78.1%)	18 (56.3%)	0.168
12 – 23 hours	14 (21.9%)	5 (15.6%)	9 (28.1%)	
24 – 48 hours	7 (10.9%)	2 (6.3%)	5 (15.6%)	

N=Total number of patients in each group; Qualitative data were expressed as a number (percentage); § Chi-square test; $p< 0.05$ is significant.

Table 3: Intra-operative findings

Intra-operative findings	**All patients (N=64)**	**Laparoscopic repair (N=32)**	**Open repair (N=32)**	**p-value**[§]
Size of perforation				
<1 cm	46 (71.9%)	28 (87.5%)	18 (56.3%)	0.005
1-2 cm	18 (28.1%)	4 (12.5%)	14 (43.8%)	
Mean duration of operation (min)				
60 – 90 min	24 (59.4%)	10 (31%)	14 (44%)	0.693
> 90 min	40 (40.6%)	22 (69%)	18 (56%)	

N=Total number of patients in each group; Qualitative data were expressed as a number (percentage); § Chi-square test; $p< 0.05$ is significant.

Table 4: Postoperative care.

Postoperative care	*All patients (N=64)*	*Laparoscopic repair (N=32)*	*Open repair (N=32)*	*p-value*[§]
Nasogastric tube kept for(days)				
<1 day	41 (64.1%)	27 (84.4%)	14 (43.8%)	0.001
>1 day	23 (35.9%)	5 (15.6%)	18 (56.3%)	
Resumption of oral feeding(days)				
<2 days	42 (65.6%)	25 (78.1%)	17 (53.1%)	0.035
>2 days	22 (34.4%)	7 (21.9%)	15 (46.9%)	
Opiod requirements(days)				
<2days	29 (45.3%)	23 (71.9%)	6 (18.8%)	<0.001
>2days	35 (54.7%)	9 (28.1%)	26 (81.3%)	
Mean postoperative hospital stay(days)				
<5 days	37 (57.8%)	25 (78.1%)	12 (37.5%)	0.001
>5 days	27 (42.2%)	7 (21.9%)	20 (62.5%)	

N=Total number of patients in each group; Qualitative data were expressed as a number (percentage); § Chi-square test; p< 0.05 is significant.

Table (5): Postoperative complications.

Postoperative complications	**All patients (N=64)**	**Laparoscopic repair (N=32)**	**Open repair (N=32)**	**p-value**[§]
Chest infection	12 (18.8%)	3 (9.4%)	9 (28.1%)	0.055
Postoperative leaks from suture anastomosis	5 (12.5%)	2 (6.3%)	3 (9%)	0.257
Wound infection	14 (21.9%)	2 (6.3%)	12 (37.5%)	0.002
Wound dehiscence	3 (5%)	0 (0%)	3 (9%)	0.002

N=Total number of patients in each group; Qualitative data were expressed as a number (percentage); § Chi-square test; p< 0.05 is significant.

DISCUSSION

As regards demographic data, this study showed that perforated peptic ulcers are more common in males between 22-50 years, our youngest patient was 22 years while oldest was 65 years. most of the patients received NSAID and are cigarette smokers, our data is similar Bhogal and his coworkers that showed that most of the patients with perforated duodenal ulcers were male patients between 17-70 years and most of them were taking NSAIDs and tobacco smokers [(6)] .

As regards onset of symptoms, most of our patients presented to the hospital on the first day of abdominal pain (43 patients) and lesser numbers on the 2nd day (14 patients), while (7 patients)presented on the 3rd day. This data is similar to results obtained from Bhogal and his coworkers that stated that most of the patients presented within 1-4 days [(7)].

Operative time in laparoscopic repair was longer than open repair, mostly within 1-1.5 hours. This result is similar to other studies by Berteleff and his coworkers and Lau and his coworkers comparing open and laparoscopic approaches and showed that laparoscopy takes longer time than open repair [(8, 9)].

However Siu and his coworkers found that the operative time of laparoscopic repair was lower than that of open repair [(3, 10, 11)].

Peritoneal lavage under laparoscopy is more difficult, and this factor may contribute to the prolonged duration. The slower learning curve of the laparoscopic approach may be another contributing factor.

As regards postoperative course, this study showed lesser duration of naso-gastric tube, earlier oral feeding, and lesser analgesic requirements with shorter hospital stay in laparoscopic repair than in open repair. The different studies in the literature confirmed the

better post-operative course for the laparoscopic technique if compared to the open one [3, 7, 12].

As regards postoperative complications, our study showed that postoperative chest infections were more in open than laparoscopic repair as upper abdominal incision limit respiratory movements that lead to atelectasis Siu and his coworkers found significant reduction in chest infection after laparoscopic repair; infection rate was 0% for the laparoscopic group, and 12% for the open group [3]. Postoperative wound infection and wound dehiscence were common in open than laparoscopic repair because in open repair, the incision was midline incision with extensive dissection that is liable to infection and dehiscence especially with the highly contaminated field. In the study by Siu and his coworkers [3], a significant reduction in wound infection rate was noted; it occurred in 3% of the patients in the laparoscopic repair group, and in 12% of the patients who underwent open repair .

Three patients of the laparoscopic group were converted to open. The reasons for conversion were the difficult identification of the site of perforation due to marked adhesions in one case and a large size of the perforation (more than 20mm) in two patients with difficulty in placing the sutures through the friable edges.

Almerajabi and his coworkers showed no conversion in the laparoscopic group [13] while Siu and coworkers showed nine conversions, [3] this may be attributed to different exclusion criteria and laparoscopic experience.

Leakage, intraabdominal collection, reoperation and mortality rates in our study were zero; this may be due to many factors like exclusion of neglected case, wide defects, hemodynamically unstable patients.

We believe also that copious peritoneal lavage and leaving drains are another added factors. Also, the limited number of studied cases may be a factor.

CONCLUSIONS

This study concluded that laparoscopy is a safe technique for the repair of perforated peptic ulcers as it may be a therapeutic and diagnostic alternative to open surgery with satisfactory postoperative outcomes. Moreover, the benefit and early return to work after laparoscopy may offset the cost incurred in performing a laparoscopic repair.

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