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Perforated Peptic Ulcer, Comparison Between Laparoscopic and Open Repair.

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Abstract:

Introduction: Increasing evidence is presenting in favor of laparoscopic repair of perforated peptic ulcer (PPU). A selected group of patients may benefit more with laparoscopic repair than with open surgery. Taking advantage from experiences of other workers, we tried to define this group of patients.

Materials and Methods: This is a retrospective study comparing laparoscopic repair of PPU with open repair. We excluded patients with shock, generalized peritonitis, previous upper abdominal surgery, large ulcer (>10mm), gastric ulcer, and concomitant peptic ulcer complications from both groups. Closure of perforation in both groups was performed by simple suture closure with omental patch.

Results: patients underwent laparoscopic repair required less analgesic post-operatively, returned to normal diet earlier, and had a shorter postoperative hospital stay. Laparoscopic repair took more time than open surgery.

Conclusion: laparoscopic repair of perforated peptic ulcer is advantageous to open surgery by less postoperative pain, earlier return to normal diet, and earlier discharge from hospital. It may be considered as a safe treatment option for selected patients in routine clinical practice.

Keywords: peptic ulcer, perforation, repair, laparoscopy.

Introduction:

Perforated peptic ulcer (PPU) is a relatively common acute abdominal condition.⁽¹⁾ Except for sealed perforation, PPU is a surgical emergency that mandates urgent operative intervention. Different surgical procedures have been advocated for these patients, ranging from simple suture closure to gastrectomy.⁽²⁻⁵⁾

With the advent and widespread availability of potent acid reducing agents, chronic peptic ulcer disease (PUD) associated with eroding ulcer is now infrequently encountered. Because of recognition of the role of *Helicobacter pylori* in PUD and its eradication by effective drug therapy, complicated peptic ulcer (PU) has now become a rarity. Therefore, most PPUs seen in recent decades are of acute type associated with non-steroidal anti-inflammatory drugs (NSAIDs) and stressful conditions.⁽⁶⁻¹²⁾ Considering this changing pattern of PPUs, performing a surgical acid-reducing procedure is rarely indicated.⁽¹³⁾ Thus, the principle surgical procedure applied in most cases mainly consists of closing the perforation. Cumulative experience has proven the effectiveness and adequacy of simple suture closure, with or without omental patch, for repair of acute PPU.⁽¹⁴⁻¹⁷⁾ At present, suture closure of PPU with an omental patch has found its place as the procedure of choice in many surgical units.^(18, 19)

Laparoscopic surgery has the advantage of exempting the patient from a laparotomy; however, limitations inherent to its technical features may preclude exten-

sive procedures in the absence of adequate instrumentation and expertise. Therefore, to start introduction of laparoscopic surgery in any operative field, the cases that require less intervention are suited best. When repair of a PPU can be achieved by suture closure with no further major action needed, laparoscopic approach seems to be appropriate. Data is gathering in favor of laparoscopic over open surgical repair with acceptable results.⁽²⁰⁻²²⁾ We began laparoscopic repair of PPU in recent years. This is a retrospective analysis of our experience with laparoscopic repair of PPU compared to open surgery.

Materials and Methods:

Records of patients operated for PPU from January 2005 to December 2006 were retrieved. Patients fell in 2 categories: laparoscopic and open repair. There were 2 surgery teams: one team (first author and coworkers) considered every patient for laparoscopic repair (laparoscopic team). The other team conducted open repair for all patients (open team). Informed consent was obtained from all patients in the laparoscopic group with special attention to description of risks and benefits of laparoscopic approach.

For the first team, the exclusion criteria for laparoscopic repair were either pre-operative or intraoperative. Preoperative exclusion criteria were presence of upper abdominal incision, presence of concomitant peptic ulcer disease complications such as bleeding or outlet obstruction, signs of advanced generalized peritonitis and/or sepsis, and shock. Intraoperative

exclusion criteria which led to converting to open surgery were diffuse peritonitis (defined as massive or diffuse peritoneal contamination, fibrin deposition, inflammatory adhesions, and inter-loop collection or abscess formation), gastric ulcer (defined as ulcer more than 2 cm proximal to the pylorus), and large ulcer (defined as an ulcer more than 10 mm in greatest diameter). Shock was defined as systolic blood pressure less than 85 mm Hg on admission. No patient with shock was included in both groups. Patients with acute abdominal symptoms of more than 24 hours duration were considered as delayed presentation but were not excluded from laparoscopic repair. Exclusion criteria were adopted according to the published experiences.⁽²³⁻³⁰⁾

Laparoscopic repair was performed via 3 ports; one port above umbilicus for camera, and 2 working ports at right and left upper abdomen. Patients were placed supine with head up position and mild left tilt. The surgeon stood at the left side of the patient. One to 3 silk sutures (2/0-3/0) were used to close the perforation. Omental patch was applied routinely.⁽³¹⁾ Thorough upper abdominal irrigation was then performed. No drains were used. Open surgery was performed through upper midline incision, with suture closure of the perforation by interrupted silk sutures. Thorough peritoneal decontamination and irrigation was then performed. No drains were left except for walled off infected collections (abscesses). Skin was primarily closed except when diffuse peritonitis was present.

Patients operated on by laparoscopic surgery were considered as the group 1 and

an equal number of patients who underwent open surgery were selected as group 2. In order to match the groups; age, gender, and the aforementioned exclusion criteria were applied while selecting the control group patients. The following variables were compared between two groups: operative time, parenteral analgesic requirement after surgery, return to normal diet, length of postoperative hospital stay, complications and death. Operative time was calculated from making the (first) incision to tying the last suture. This was collected according to the registered times in records. Parenteral postoperative analgesic requirement was the sum of analgesic (morphine sulfate in mgs) administered to the patient after surgery in the ward. Length of postoperative hospital stay was the number of days (including overnight stay) in hospital beginning right after surgery. Return to normal diet was defined as the patient willing to have a normal diet upon offering one, as is our routine subsequent to allowing the patient per oral (PO). Complications included in the study were: chest infection diagnosed by pulmonary symptoms and signs with or without fever (>38.5 C), chest x-ray changes or positive sputum culture; wound complications including wound collection (infectious or noninfectious), wound pain (pain at incision site) and wound dehiscence; deep infection (intra-abdominal collection), and leakage at repair site. All of patients received some type of intravenous antibiotic before surgery, ranging from a first generation cephalosporin to wide-spectrum third generation cephalosporin. After operation empiric antibiotic regimen was continued

for a minimum of 3 days and discontinued according to the status of systemic inflammatory responses.

All data were recorded in a standard data form and then entered into a dedicated database (Microsoft Access 2003). Data were analyzed using SPSS 11.5 for Windows. For comparison of categorical data, chi square or Fisher's exact test were used, and for comparing continuous data t-test for independent variables was applied.

Results:

There were 27 patients in the group 1 and 27 patients in the group 2. There were 20 males (74.1%) in each group. The mean age was 46.19 (20-65) years and 44.44 (20-64) years in the groups 1 and 2, respectively (p value = 0.609). Table 1 summarizes other pre-operative clinical conditions in the two groups. No significant difference could be detected while comparing these conditions. The mean symptom-surgery interval (period of time between beginning of symptoms and surgery) was 12 (5-22) hours in the group 1 and 11 (4-23) hours in the group 2 (p value = 0.492). All patients had a single ulcer. The mean diameter of the

ulcer was 6.85 (4-9) mm in the group 1 and 6.26 (4-9) mm in the group 2 (p value=0.175). A simple ulcer closure with omental patch was performed for all patients in both groups. The mean operative time was 55.74 (40-80) and 47.41 (35-65) minutes in the groups 1 and 2, respectively (p value =0.004).

The mean amount of morphine administered for patients in the group 1 was 11.30 (0-30) mg and that for patients in the group 2 was 26.30 (15-40) mg (p value < 0.001). Patients in the group 1 could proceed to normal diet after 2.48 (2-4) days. Patients in the group 2 received normal diet after 4.7 (4-6) days (p value < 0.001). The mean post operative hospital stay was 4.67 (3-7) days and 6.52 (5-8) days for the groups 1 and 2, respectively (p value < 0.001).

Table 2 shows the complications in both groups. There were no cases of abscess/collection formation or repair site leakage. The rates of other complications were similar and all patients were discharged alive.

Table 1. Pre-operative clinical conditions in group 1 (laparoscopic repair) and group 2 (open repair)

Clinical Condition	Group		p-value	Sum
	1	2		
History of peptic ulcer disease	7 (25.9%)	3 (11.1%)	0.161	10 (18.5%)
Diabetes	4 (14.8%)	1 (3.7%)	0.159	5 (9.2%)
Hypertension	4 (14.8%)	2 (7.4%)	0.386	6 (11.1%)
Coronary artery disease	2 (7.4%)	4 (14.8%)	0.686	6 (11.1%)
Chronic lung disease	4 (14.8%)	2 (7.4%)	0.386	6 (11.1%)
History of steroid use	0	2 (7.4%)	0.150	2 (3.7%)
History of non-steroidal anti-inflammatory drugs	11 (40.7%)	9 (33.3%)	0.575	20 (37%)
Cigarette smoking	10 (37%)	9 (33.3%)	0.776	19 (35.2%)

Table 2. Complications in group 1 (laparoscopic repair) and group 2 (open repair)

Complication	Group		p-value	Sum
	1	2		
Wound collection	1 (3.7%)	3 (11.1%)	0.299	4 (7.4%)
Wound pain	3 (11.1%)	13 (28.1%)	0.003	16 (29.6%)
Wound dehiscence	0	2 (7.4%)	0.150	2 (3.7%)
Respiratory infection	4 (14.8%)	4 (14.8%)	1	8 (14.8%)

Initial reports of laparoscopic repair in PPU appeared in literatures at early 90s.^(32, 33) Since then, several published studies have pointed to the safety and advantage of this procedure.^(20-27, 30) Different techniques for repair of PPU have been trialed. We chose simple suture closure as our standard procedure for laparoscopic repair. Technically, it is relatively simple and may be directly compared to, matched, open repair. Due to limitations with instrumentation, we did not conduct a prospective randomized trial in the first place, because we could only assign patients to laparoscopic repair in day time working hours when laparoscopic surgery suite was available. As mentioned earlier, we applied similar exclusion criteria to both control and study groups, trying to minimize the effect of non-randomization. We also selected the control group from patients with demographic features close to study group so as to further obviate mismatch bias. Considering our experience with this procedure, which is passing through learning curve, we introduced utmost safety margins into our practice. This is reflected in our exclusion criteria. Perhaps an experienced, well-equipped, surgeon may be able to repair a complicated large perforated ulcer, but this is not easily reproducible. Therefore, we believe that our experience is worth for those

who are willing to adopt laparoscopic repair of PPU into their practice.

As it is with all laparoscopic operations, pain after laparoscopic PPU repair is less than open surgery. This is largely due to incising less of abdominal wall, minimal intra-operative abdominal wall retraction, and less injury to sensory nerve endings. Less pain leads to less postoperative analgesic requirement. We experienced the same finding in patients with PPU operated on by laparoscopic surgery compared to those who underwent open surgery ($p < 0.001$). Laparoscopic surgery is associated with minimum unwanted bowel manipulation. In contrast, frequent manipulation of the bowel is inevitable during open surgery. This manifested clinically as post operative ileus. Resolution of ileus must take place before the patient is able to tolerate PO. Return to normal diet may be taken as a sign for complete resolution of postoperative paralytic ileus and establishment of normal bowel peristalsis. In our study patients operated on through laparoscopic surgery had significantly earlier return to normal diet compared to those in open surgery group (p value < 0.001). Shorter hospital stay is a well proven advantage of laparoscopic procedures. Less pain and short-lived post operative ileus result in earlier full ambulation and discharge

from hospital. Those patients who had laparoscopic repair of PPU had a significantly shorter postoperative hospital stay compared to patients who underwent laparotomy (p value < 0.001). In our hands, laparoscopic repair of PPU took longer than open surgical repair. Although the difference in mean operation times does not seem to be large, just about 8 minutes, it is significant ($p=0.004$). Other workers have experienced the opposite.⁽³⁴⁾ This may be attributable to the course of learning curve. We believe that with cumulative experience our operative time will reduce, as it is expected for every surgeon with any procedure. Thus we do not consider longer duration of laparoscopic repair of PPU as a major disadvantage. There were no cases of deep (intra abdominal) infection or repair site leakage with laparoscopic repair. Due to nonrandomized retrospective design of our study, we may not be able to make a statistically valid statement about this result. Also, we excluded those patients at risk of developing deep infection or repair site leakage.

In our view, laparoscopic closure of a small gastrointestinal perforation is not a great task. A laparoscopic surgeon familiar with basic skills of intracorporeal suture placement and knot tying is able to close a small perforation. Therefore we suggest that this surgical procedure should be offered to the selected patients with PPU, as a treatment option, in routine clinical practice. Over time, with increased experience and expertise, patients with more severe conditions may also be selected for laparoscopic repair.

Conclusion:

Laparoscopic repair of PPU is associated with less postoperative pain, shorter duration of postoperative ileus, earlier return to normal diet, and earlier discharge from hospital. In our study a selected group of patients with small peri-pyloric PPU, little peritoneal contamination, and no concomitant complication(s) of peptic ulcer gain more benefit from laparoscopic surgery than from open surgery. Laparoscopic repair of PPU may be considered as a treatment option in routine clinical practice.

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