

## LAPAROSCOPIC REPAIR OF PERFORATED PEPTIC ULCER

S. Luncă, N.S. Romedea, C. Moroşanu  
Emergencies Surgery Clinic, Emergency Hospital Iaşi  
University of Medicine and Pharmacy „Gr.T. Popa” Iaşi

**LAPAROSCOPIC REPAIR OF PERFORATED PEPTIC ULCER (Abstract):** Since 1990 when Mouret reported the first laparoscopic sutureless repair for a perforated duodenal ulcer and Nathanson the first successful laparoscopic suture repair for perforated peptic ulcer, laparoscopic approach became a widespread procedure. Treatment for perforated ulcer can be performed laparoscopically in 85% of cases, making it possible to avoid a median laparotomy which can lead to wound infection and late eventration. Laparoscopic approach is indicated in any case of suspected gastroduodenal perforation and seems to offer the same advantages as for the vast majority of laparoscopic procedures. Nowadays laparoscopic repair of duodenal perforation seems to be a useful method for reducing hospital stay, complications and return to normal activity if carried on in proper manner. With better training in minimal access surgery and better ergonomics now available the time has arrived for it to take its place in the surgeon's repertoire.

KEY WORDS: LAPAROSCOPIC APPROACH, PERFORATED PEPTIC ULCER

Correspondence to: Sorin Luncă MD, PhD, Assoc. Prof. of Surgery, Emergencies Surgery Clinic, Emergency Hospital Iaşi, Gen. Berthlot Street, no. 2, Iaşi, România; e-mail: sdlunca@yahoo.com\*

### INTRODUCTION

Duodenal perforation is a common complication of duodenal ulcer. Perforated duodenal ulcer is mainly a disease of young men but because of increasing smoking in women and use of NSAID in all the age group, nowadays it is common in all adult population. Up to eighty percent of perforated duodenal ulcers are *Helicobacter pylori* positive.

Treatment for perforated ulcer ranges from conservative treatment (Taylor's approach) to radical surgery (vagotomy, gastrectomy). However, with the use of powerful acid-suppressing medication and the eradication of *Helicobacter pylori*, the need for radical surgery in emergencies has sharply declined. The surgical technique most often used is closure of the perforation combined with extensive peritoneal lavage. Repair of duodenal perforation by Graham patch plication (as was described in 1937) represents an excellent alternative approach.

Perforated duodenal ulcer is a surgical emergency. In 1990 Mouret et al. [1] reported the first laparoscopic sutureless fibrin glue omental patch for perforated duodenal ulcer repair. The first successful laparoscopic suture repair for perforated peptic ulcer was described by Nathanson et al. also in 1990 [2,3]. Soon after that, the laparoscopic approach became a widespread procedure.

Laparoscopic repair of duodenal perforation is a useful method for reducing hospital stay, complications and return to normal activity.

Treatment for perforated ulcer can be performed laparoscopically in 85% of cases, making it possible to avoid a median laparotomy which can lead to wound infection and late incisional hernia. With better training in minimal access surgery now available, the time has arrived for it to take its place in the surgeon's repertoire.

---

\* received date: 8.02.2007  
accepted date: 7.03.2007

In case of sepsis, however, the creation of a pneumoperitoneum involves two risks:

- hypercapnia: carbon dioxide absorption is increased by peritoneal hyperemia;
- bacteremia: either via translocation or direct bacterial passage through the lymphatics of the diaphragm and the thoracic duct.

Some basic principles must be followed. They include intravenous antibiotic therapy before insufflation, intraabdominal pressure between 8 and 12mmHg and initially performing peritoneal lavage.

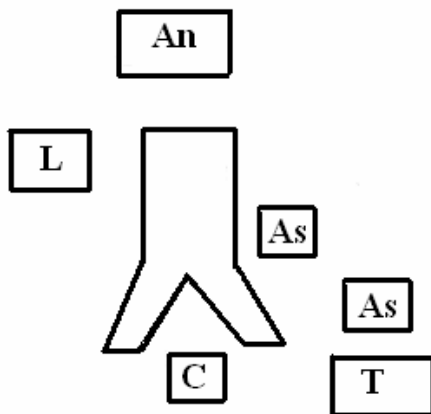
Laparoscopic approach seems to offer in case of perforated peptic ulcer the same advantages as for the vast majority of laparoscopic procedures:

- cosmetically better outcome;
- less tissue dissection and disruption of tissue planes;
- less pain postoperatively;
- low intra-operatively and postoperative complications;
- early return to work.

Laparoscopic approach is indicated in any case of suspected gastroduodenal perforation.

Contraindications for laparoscopic approach are:

- high risk patient -ASA class IV;
- massive ileus;
- advanced purulent peritonitis;



**Fig. 1 Patient, team and equipment position.**

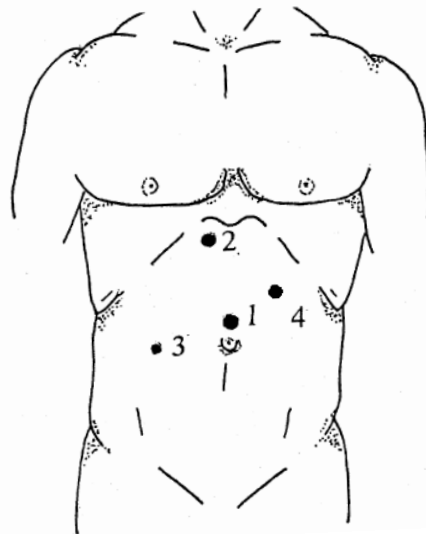
An-anaesthetic unit; L-laparoscopic unit;  
C- surgeon; As- assistant; T-operative table

- surgeon with limited laparoscopic experience;
- suspected perforated gastric cancer.

## **SURGICAL TECHNIQUE**

### ***Patient position***

At the beginning of the procedure the patient is placed in supine position with legs straight and spread out. The patient position is changed several times during procedure: in steep anti-Trendelenburg position during suture and in lateral decubitus and Trendelenburg position during peritoneal lavage.



**Fig. 2 Trocars positions**

**Team position**

The surgical team is placed as for laparoscopic cholecystectomy. The surgeon stands between patient's legs and the assistant to the patient's left (Fig.1). This position is changed during peritoneal lavage with the surgeon to the left of the patient and assistant between patient's legs.

**Equipement position**

The laparoscopic unit is placed on the patient's left side toward the shoulder. The instrument table is placed at patient's legs.

**Trocar position**

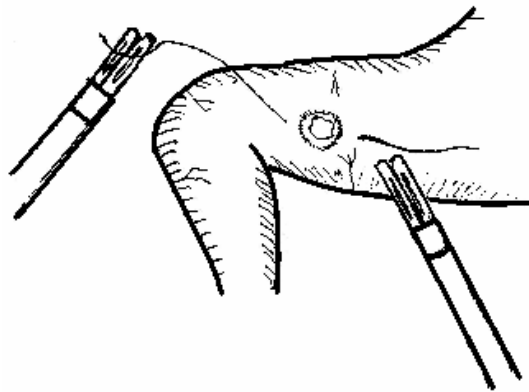
The position and size of the trocars used vary from one center to the other. The standard technique utilizes four trocars (Fig.2). An optical trocar of 10 to 12 mm is introduced in the periumbilical region. One operating trocar of 5 mm is placed in the inferior aspect of the right upper quadrant on the anterior axillary line for the atraumatic grasper. A 5 or 10/11mm trocar is placed in the left flank, generally at umbilicus level on the midclavicular line for the needle holder which should be perpendicular to the pyloroduodenal axis. A fourth trocar of 5 mm is placed in the epigastric region and accomodates one or several means of liver and viscera retraction.

Some surgeons place the trocars in the same position as for laparoscopic cholecystectomy (French position).

In obese patients the position of the trocars needs to be adapted to the morphology of the patients that is to move the trocars closer to the operative region.



**Fig. 3 Perforated duodenal peptic ulcer identified through laparoscopy**



**Fig. 4 Suture of the perforation using standard stitches**

A three trocar technique can be used, the liver being retracted with the help of a percutaneous suture that suspends the round ligament toward the upper left side of the abdomen.

The instruments are similar to those used in most laparoscopic procedures. A 0° laparoscope is commonly used, but a 30° laparoscope may be useful to see better a perforated ulcer placed on the superior surface of the duodenum. The other instruments necessary for this operation are: 2 atraumatic graspers, needle holder, suction-irrigation device, scissors. A liver retractor may be preferred by some surgeons instead of a grasper.

Endotracheal anaesthesia is generally used. Close anesthetic monitoring must be done for such a patient and intravenous antibiotic therapy should be done before insufflation. A H2 receptor antagonist or a proton pump inhibitor injection is also advisable.

**Technique**

The Veress needle or an open technique can be used. The abdomen is entered through a small incision just above the umbilicus. A CO<sub>2</sub> intraabdominal pressure between 8 and 12mmHg is usually sufficient to realize enough room to work properly.

The optic is inserted through the 10-12 mm trocar placed in the supraumbilical position. Once the diagnosis is confirmed the other three ports are placed as mentioned above. Bacteriological samples are done and sends immediately to the laboratory.

The abdomen is explored to identify the perforation and to assess the magnitude of peritonitis. The gallbladder, which usually adheres to the perforation, is retracted by the surgeon's left instrument and moved upwards. The gallbladder is passed to the assistant using the instrument placed in the subxyphoid port. Once the liver is retracted the exposed area is carefully checked and the perforation is usually clearly identified as a small hole on the anterior aspect of the first portion of the duodenum (Fig. 3).

Next step is cleaning the abdomen. The whole abdomen must be irrigated and aspirated with warm saline solution. Each quadrant is cleaned methodically, starting at the right upper quadrant, going to the left, moving down to the left lower quadrant, and then finally over to the right. The tilt of the operating table should be adapted as necessary. Special attention should be given to the rectovesical (-uterine) pouch and to the intestinal loops. Fibrous membranes are removed as much as possible, since they might contain bacteria.

Once the abdominal cavity is clean the attention is returned to the perforation. Two techniques are generally employed to treat the perforation.

1. *The most common technique* is suturing the perforation using standard stitches (Fig. 4). Biopsy of a duodenal ulcer is not necessary. However, for a gastric ulcer, samples of the gastric wall at the level of the perforation should be taken and sent for histological examination. Suturing is realized with 2/0 or 3/0 slowly absorbable or non absorbable sutures. Interrupted sutures are used and usually two or three stitches are placed in a transversal manner over the perforation focused on the pyloroduodenal axis in case of duodenal ulcer. Once the perforation is sealed, a small fragment of the greater omentum can be fixed over the suture line using the upper thread which was left loose after making the knot. Some surgeons prefer to use instead of omental patch fibrin glue which is spread over the suture. When is difficult to approximate the edges of the ulcer, as is the case with chronic callous ulcers, woven sutures of bigger caliber (0 or 1) must be used in order to avoid cutting the gastroduodenal wall.

2. *Closure of the perforation with an omental patch (Graham patch)*. A floppy piece of greater omentum flap is mobilized. The assistant holds the patch of the omentum just over the perforation and the surgeon sutures it to the edges of the perforation with several interrupted sutures.

3. *Alternative options* to seal the perforation may include the use of biological glue and sponge plug as a plasty with the round ligament.

The peritoneal lavage is continued after the suture. Warm saline solution is used until the returned liquid is clear. About 4 to 6 liters of saline are generally used, but sometimes as much as 10 liters are necessary to clean the abdomen (Fig. 5).

Routine drainage of the peritoneal cavity is performed using silicone drains (from 12 to 18 French). Depending on the severity of peritonitis, 1 to 3 drains are placed: one drain in the subhepatic region coming out via the trocar site situated on the right flank, another drain at the level of the rectovesical pouch coming out via the trocar site situated on the left flank and a left subphrenic drain coming out via the epigastric trocar site (Fig. 6).

Before ending the operation the abdomen must be examined for any possible bowel injury or haemorrhage.

Trocars are removed one after the other and hemostasis of the trocar sites is checked. The telescope is removed leaving the gas valve of umbilical port open to let out all the gas.

The musculo-aponeurotic plane is closed only at the level of the 10/11mm trocar sites. The skin is closed using staples or sutures.

### ***Postoperative management.***

The patient may have slight pain initially but usually resolves with mild pain killers. Intravenous H<sub>2</sub> receptor antagonists or proton pump inhibitors are given intravenously and then orally once infusions are stopped. Intravenous antibiotic therapy is maintained depending on the severity of the peritonitis and at least until a culture of the peritoneal fluid taken during the procedure is obtained. If the culture is negative intravenous antibiotic therapy is discontinued after 72 hours. However, if the culture is positive, intravenous antibiotic therapy is continued for 10 days first and then orally after return of bowel function and food intake. The aims of antibiotic therapy are to combat peritonitis and *Helicobacter pylorus*.

The nasogastric tube is removed once peristalsis resumes and a clamping test is successful. Food intake is then restored. Drains are removed once the effluent is less than 100mL per day.

When suturing is difficult or bowel function is resumed late, the gastric tube can be left in place longer. Water-soluble gastroesophageal contrast (Gastrografin<sup>TM</sup>) examination is then performed to check the integrity of the closure and ensure the absence of pyloroduodenal stenosis.

Control gastroscopy is performed usually 4 to 6 weeks after the operation. Patient may be discharged 3 days after operation if every things goes well.



**Fig. 5. Peritoneal lavage**



**Fig. 6 Peritoneal drainage**

### ***Complications***

Suture leak represents one of the most frequent postoperative complications with a rate averaging from 5 to 16 % [4,5]. Other commonly reported complications are pneumonia, which is most likely related to pneumoperitoneum, prolonged dynamic ileus, intraabdominal abscess formation, external fistula, and hemorrhage.

Stenosis at the pyloroduodenal level, notably in the presence of callous chronic ulcer could be a late complication. If needed, an endoscopy performed during the procedure makes it possible to rule out this complication.

### ***Conversion***

The conversion rate varies from 0% up to 60% [5-7]. Inadequate ulcer localization and large ulcer size are commonly reported reason for conversion [4-9]. Other reported reasons for conversions are infiltration and fragility of ulcer edges [9], perforation associated with bleeding [10], cardiovascular instability induced by pneumoperitoneum, peripancreatic

infiltration, prolonged perforation >24 hours, inadequate instruments, abscess, postoperative adhesions.

## DISCUSSION

In 2004 Lau published a meta-analysis summarizing the results of 13 trials that were comparing treatment outcomes for open and laparoscopic repairs [11] and concluded that the minimally invasive approach should be the procedure of choice for patients with no Boey risk factors.

Lunevicius and Morkevicius [12] analyzing 25 retrospective and prospective studies showed that suture repair alone, suture repair with omentopexy or omentopexy only were the most commonly used procedures. The overall morbidity rate ranges from 6% to 10.5%, the postoperative mortality ranges from 0% to 3% and the conversion rate was between 7% and 15%. In these studies the reported operating time was 72 to 90 minutes and median hospital stay was 6 days. The early results of retrospective and prospective emphasized that laparoscopic repair is safe effective and feasible but further studies to define the risk factors and more exact indications for laparoscopic perforated duodenal ulcer repair are necessary.

In a recently published meta-analysis by Lau [11] comparing laparoscopic open repair laparoscopy resulted in lower postoperative analgesic use, lower wound infection and mortality, better cosmesis, fewer incisional hernias but longer operating time and higher reoperation rates.

Nowadays laparoscopic repair of duodenal perforation seems to be a useful method for reducing hospital stay, complications and return to normal activity if carried on in proper manner. With better training in minimal access surgery and better ergonomics now available the time has arrived for it to take its place in the surgeon's repertoire.

## REFERENCES

1. Mouret P, Francois Y, Vignal J, Barth X, Lombard-Platet R. Laparoscopic treatment of perforated peptic ulcer. *Br J Surg.* 1990; 77(9): 1006.
2. Nathanson LK, Easter DW, Cuschieri A. Laparoscopic repair/ peritoneal toilet of perforated duodenal ulcer. *Surg Endosc.* 1990; 4(4): 232-233.
3. Lau WY, Leow CK. History of perforated duodenal and gastric ulcers. *World J Surg.* 1997; 21(8): 890-896.
4. Lee FY, Leung KL, Lai PB, Lau JW. Selection of patients for laparoscopic repair of perforated peptic ulcer. *Br J Surg.* 2001; 88(1): 133-136.
5. Lee FY, Leung KL, Lai BS, Ng SS, Dexter S, Lau WY. Predicting mortality and morbidity of patients operated on for perforated peptic ulcers. *Arch Surg.* 2001; 136(1): 90-94
6. Khoursheed M, Fuad M, Safar H, Dashti H, Behbehani A. Laparoscopic closure of perforated duodenal ulcer. *Surg Endosc.* 2000; 14(1): 56-58.
7. Thompson AR, Hall TJ, Anglin BA, Scott-Conner CE. Laparoscopic plication of perforated ulcer: results of a selective approach. *South Med J.* 1995; 88(2): 185-189.
8. So JB, Kum CK, Fernandes ML, Goh P. Comparison between laparoscopic and conventional omental patch repair for perforated duodenal ulcer. *Surg Endosc.* 1996; 10(11): 1060-1063.
9. Lagoo S, McMahon RL, Kakihara M, Pappas TN, Eubanks S. The sixth decision regarding perforated duodenal ulcer. *JSLs.* 2002; 6(4): 359-368
10. Memon MA. Laparoscopic omental patch repair for perforated peptic ulcer. *Ann Surg.* 1995; 222(6): 761-762.
11. Lau H. Laparoscopic repair of perforated duodenal ulcer: a meta-analysis. *Surg Endosc.* 2004; 18(7): 1013-1016.
12. Lunevicius R., Morkevicius M. Management Strategies, Early Results, Benefits, and Risk Factors of Laparoscopic Repair of Perforated Peptic Ulcer. *World J Surg* 2005; 29(10): 1299-1310.