



Laparoscopic treatment versus open treatment of gastroduodenal perforations: our decades of retrospective experience and literature review

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Background: The aim of our work is to evaluate the laparoscopic treatment of gastroduodenal ulcers (GDU) perforated in a territory where the population is multiethnic and where, given that the main activity is agriculture, the presence of non-EU citizens (EX) and of Eastern European citizens (EE) is considerably higher.

Methods: From January 2007 to December 2017, 97 patients were operated for perforated GDU in our department all treated within 24 h from admission and/or from the beginning of the symptomatology, 70 males and 27 females, in most cases they were foreign citizens, the average age was 34 for foreigners and 58 for Italians. In total, 68 were treated by laparoscopy (LS) and 25 by laparotomy (LT), the cases of conversion from LS to LT were 4 included in a third group. Usual direct suture accompanied by omentopexy (OP) if ulcer > of 5 mm and/or if it is in the stomach.

Results: The majority of patients treated were foreign: 69 (24 EX and 45 EE, age: 18–55), while 28 were Italians (age: 30–86). In the foreigners the most frequent cause was alcohol and smoking: pre-sent in 60 patients, in the remaining 9 the cause is abuse of nonsteroidal anti-inflammatory drugs (NSAIDs) or corticosteroids. In the Italians 21 had abused in NSAIDs and/or corticosteroids and 7 had GD pathologies not treated. The average hospitalization was 6 days for the LS and 9 for the LT and average duration was 91 minutes in LT and 65 in LS.

Conclusions: The gold standard in the treatment of perforated GDU is LS; LS that we can perform in almost all cases treated both because the majority of patients is foreign and has a lower average age compared with Italians and because we have an operating team trained to deal with this disease. 24 h from the symptomatological manifestation has favored us both in terms of endoabdominal col-lections and in the inflammatory state of the perilesional area. In our experience LS treatment is far superior to LT treatment both in terms of patient benefit and health expenditure and combines the advantages of LS with the reliability of LT treatment.

Keywords: Gastroduodenal ulcers; gastroduodenal perforation; laparoscopic treatment of gastroduodenal perforation; peritonitis

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Introduction

The incidence and prevalence of uncomplicated peptic ulcer have decreased in recent years, largely because of the

availability of treatment to eradicate *Helicobacter pylori* and the decreasing prevalence of *H. pylori* infection (1-4). However, the use of acetylsalicylic acid (ASA) and other

nonsteroidal anti-inflammatory drugs (NSAIDs) that are associated with adverse gastrointestinal events (5) is becoming more widespread (6). It is therefore possible that there may have been no corresponding decrease in peptic ulcer complications such as upper gastrointestinal hemorrhage or perforation.

The incidence of bleeding ulcers and its related mortality have decreased and its management—mainly guided by endoscopy and interventional radiology—have largely substituted surgery (7). In contrast the incidence of perforated peptic ulcers (PPUs) is largely unchanged, counting 2–4% of peptic ulcers which remain the second most frequent cause of abdominal perforation that requires surgery as well as the most frequent indication for gastric emergency surgery (7–9). In southern Italy the incidence of gastroduodenal perforations has always been lower than in the North, this in general due to reduced alcohol consumption; in recent years we have noticed an increase in cases of peptic perforations due to the greater presence of immigrants in our area with different eating habits than ours.

These complications of peptic ulcer disease have a substantial economic impact. The total cost of peptic ulcer disease in the USA, incorporating both direct costs and loss of work productivity, has been estimated to be USD 5.65 billion per year (10). It is likely that disease-related complications contribute substantially to these costs. A study in the Netherlands calculated the per person costs of hemorrhage, perforation, or a combination of both to be EUR 12,000, EUR 19,000 and EUR 26,000, respectively (11).

The aim of our work is to evaluate the laparoscopic treatment of gastroduodenal ulcers (GDU) perforated in a territory where the population is multiethnic and where, given that the main activity is agriculture, the presence of non-EU citizens (EX) and of Eastern European citizens (EE) is considerably higher. Based on our experience, the laparoscopic treatment of GDU perforated has become our gold standard, our first surgical approach with considerable advantages especially for the patient and also for health spending in view of the spending review.

Methods

From January 2007 to December 2017, 97 patients were operated for perforated GDU in our department all treated within 24 h from admission and/or from the beginning of the symptomatology, 70 males and 27 females, in most cases they were foreign citizens: 69 foreigner (71.1%) of

which 45 from EE and 24 from EX and 28 Italians (28.9%), the average age was 34 [18–55] for foreigners and 58 [30–86] for Italians. In total, 68 (70.1%) were treated by laparoscopy (LS) and 25 (25.8%) by laparotomy (LT), the cases of conversion from LS to LT were 4 (4.1%) included in a third group. Usual direct suture accompanied by omentopexy (OP) if ulcer > of 5 mm and/or if it is in the stomach. We do not use any other ingredients during surgery (for example fibrin glue or omental caps) and we are not used to perform vagotomies. We usually perform abundant washes of the abdominal cavity (temporally they can be performed both at the beginning and, most of the time, at the end of the operation depending on the intra-abdominal situation that we are facing), place one or more drainages both perilesional and Douglas (depending on the size of the intra-abdominal sperm and the type of spilled contents), place a nasogastric tube that is held until the patient is channeled, perform broad-spectrum antibiotic therapy, antithrombotic therapy based on the patient's state, therapy with proton pump inhibitors according to guidelines and early mobilization. The average hospital stay was 6 days for LS (5–8 days) and 9 days for LT (8–10 days). At discharge, all patients were asked to perform two-month EGDS for evidence of successful healing or to perform targeted eradication therapy.

Our surgical procedure: All cases of LS were performed either by the attending consultants or by trainees under their supervision. LS was achieved by using 3- or 4-port technique. In the 4-port technique, the additional port was sometimes used to assist in liver retraction. Once pneumoperitoneum was established, the peritoneal cavity was explored and the degree of contamination was determined. The perforation was repaired with a tongue of omentum tied down in place using absorbable 3/0 sutures in interrupted fashion. Intracorporeal knot tying was frequently used. Peritoneal wash to all 4 quadrants was then performed under direct vision using several litres of warmed saline. We place always one or more drainage around the perforation and/or in Douglas cavity.

For the LT group, a midline LT incision was used. Following identification of the perforation area, extensive peritoneal toilet was performed using warm saline.

Patch repair was then done in standard fashion. Similarly, drain placement was a routine. Mass closure of fascia was performed using 1/0 suture and interrupted closure to skin incision subsequently done with either Prolene suture or skin stapler.

Table 1 Results

Parameters	Laparoscopic group	Open group	Conversion	Probability (P<0.05)
Operative duration (mean) (minutes)	66.3 [25–170]	93 [60–210]	93.75 [80–105]	P<0.005 in laparoscopic group
Nasogastric tube duration (days)	2.5	3.5	3.5	P<0.005 in laparoscopic group
IV fluid duration (days)	2.5	4	4	P<0.005 in laparoscopic group
Urinary catheter duration (days)	2	4	4.5	No significant
Drainage stay (days)	4	6	5	P<0.005 in laparoscopic group
Canalization (days)	2.5	4	5	P<0.005 in laparoscopic group
IV postoperative analgesic therapy (days)	3	6	6	P<0.005 in laparoscopic group
Resume diet day (days)	4	6	5.5	P<0.005 in laparoscopic group
Hospital stay (mean) (days)	6 [5–8]	9 [8–10]	9 [8–10]	P<0.005 in laparoscopic group
Middle age (years)	46.8	58.8	68.75	No significant

The relationship between all parameters were analyzed using the Pearson's chi-square test or Fisher's exact test. A P value of <0.05 was considered to be statistically significant.

Results

Of the 97 patients treated for GD ulcer the majority were foreign (69 patients, 71.1% of the total, of which 24 of EX and 45 of EE) between the ages of 18 and 55, while 28 (28.9% of the total) were Italians aged between 30 and 86 years. Among the strangers with a history the most frequent cause attributable to the onset of this pathology is the consumption of alcohol and smoking: present in 60 patients (87%) out of 69, instead in the remaining 9 the abuse of NSAIDs or corticosteroids in the days before the hospitalization seems to be the triggering cause. Among the Italians 21 had abused in NSAIDs and/or corticosteroids (75%) and 7 had at the anamnesis gastroduodenal diseases not adequately treated (25%).

All patients were treated in the same operative way, no difference of surgery treatment was applied between EU and non-EU patients.

Of the 97 patients hospitalized for gastroduodenal ulcer perforated in 24 (24.7% of the total) we found a perforated gastric ulcer, in 69 (71.2% of the total) a perforated duodenal ulcer (mostly at the anterior wall level, 62 patients i.e., 90% of cases) and in 4 cases (4.1%) a perforated pyloric ulcer (which we treat with the same behavior that we use in perforated duodenal ulcer); in most cases of perforated duodenal ulcer the perforation diameter was between 0.5–1 cm (58 cases, 84% of the total) and this required an OP while in the others (11, 16%) the perforation was <5 mm and we are limited to the raffia (for all perforated

gastric ulcers we usually perform OP regardless of the size of the perforation, allowing anatomy). Of all 97 patients undergoing emergency surgery, 68 (70.1% of the total) are laparoscopically treated, 25 (25.8% of the total) laparotomic and 4 (4.1% of the total) patients were converted from LS to LT for cardiorespiratory complications that occurred during surgery attributable to pneumoperitoneum or due to difficulties to identify LS perforation. The median duration of the intervention was of 93 minutes in LT [60–210] and of 66.3 minutes in LS [25–170] with reduction of the laparoscopic timing as more manuality was acquired. The average hospitalization of patients operated in LS was 6 days (5–8 days) with canalization to the gas and consequent removal of the nasogastric tube occurred between the II and III days postoperatively, the feeding to the liquids was resumed immediately after removal of the nasogastric tube and the semi-liquid diet the next day, usually in IV postoperative day; in patients operated in LT the average hospitalization was 9 days (8–10 days) with canalization to the gas and consequent removal of the nasogastric tube occurred between the III and the V postoperative day, the feeding to the liquids was resumed immediately after the removal of the SNG and the semi-liquid diet the next day, usually in V–VI postoperative day (*Table 1*). The only complications found in LS were: a postoperative hyperthermia in II and/or in III postoperative day in 5 patients resolved spontaneously, in one case a small perivesical collection (2 cm) found a month away from the intervention that determined a bridle of an intestinal

loop resulting in intestinal obstruction and laparotomic reintervention and 2 bronchopneumonia outbreaks resolved after targeted antibiotic therapy. In LT we had: in one case of advanced sepsis the patient died in resuscitation at XV postoperative day operated by laparotomic route given the already very serious initial conditions to hospitalization and in three cases we had surgical wound infections resolved after appropriate dressings.

Laparoscopic repair of GDU is believed to reduce the post-operative morbidity and mortality. A recent systematic review of 3 randomized controlled trials with a total of 315 PPU patients compared LS with open surgery (12). This study failed to demonstrate differences in abdominal septic complications, pulmonary complications, mortality and re-operation. However, the operative time was shorter in laparoscopic group in contrast with previous study (9). A systematic review of 56 studies comparing laparoscopic vs open approach for PPU concluded that there was no consensus on the perfect operating techniques (10). The overall conversion rate for laparoscopic surgery was 12.4% mainly due to the size of perforation. Ulcer size more than 9 mm is a significant risk factor for conversion to open surgery (13). The operating time was longer and recurrent leakage was higher in laparoscopic group. However, the laparoscopic group also showed less postoperative pain and a shorter hospital stay. Furthermore, laparoscopic approach offers an alternative treatment with less pain, shorter hospital stays, and improved complications rate (11). For others, the laparoscopic treatment is also associated with equivalent costs compared with the open surgery as it reduces duration of hospital stays (8,12-19).

Conclusions

According to our experience given by the numerous cases of gastroduodenal perforation mostly in foreign subjects who find themselves in our territory for work purposes, since the main source of work is represented by the agriculture that in our town and in our territory in general involves the majority of the agri-food sector, the gold standard in the treatment of perforated gastroduodenal ulcer is represented by LS. LS that we can perform in almost all cases treated both because we have observed that in the foreigner the median age is lower respect to the Italians and, therefore, is more easy to perform LS in the foreigner respect to the Italians because of the minor cardiopulmonary complications that can determine its conversion, both because we have an operating team fully trained to deal

with this disease. Another factor that has determined the success of the laparoscopic procedure is the treatment of the perforated patient within 24 hours from the symptomatological manifestation, even in the majority of the patients we managed to intervene within 18 hours from the beginning of the symptoms of pain, this precociousness of action has favored us both in terms of intra-abdominal collections (almost nil in our patients, only more or less noticeable) and in the inflammatory state of the periwound zone: the granulations around the site of perforation were minimal and this determined a greater resistance of the raffia and less difficulty in managing it. In our experience, laparoscopic treatment for perforated GDU is far superior to the laparotomic treatment both in terms of patient benefit and health expenditure and combines the advantages of LS with the reliability of laparotomic treatment.

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Footnote

Conflicts of Interest: The authors have completed the ICMJE uniform disclosure form (available at <http://dx.doi.org/10.21037/ls.2018.12.04>). The authors have no conflicts of interest to declare.

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References

- Xia B, Xia HH, Ma CW, et al. Trends in the prevalence of peptic ulcer disease and Helicobacter pylori infection in family physician-referred uninvestigated dyspeptic patients in Hong Kong. *Aliment Pharmacol Ther* 2005;22:243-9.
- Wong SN, Sollano JD, Chan MM, et al. Changing trends in peptic ulcer prevalence in a tertiary care setting in the Philippines: a seven-year study. *J Gastroenterol Hepatol* 2005;20:628-32.
- Lassen A, Hallas J, Schaffalitzky de Muckadell OB. Complicated and uncomplicated peptic ulcers in a Danish county 1993-2002: a population-based cohort study. *Am J Gastroenterol* 2006;101:945-53.
- Everhart JE. Recent developments in the epidemiology of Helicobacter pylori. *Gastroenterol Clin North Am* 2000;29:559-78.
- McCarthy DM. Prevention and treatment of gastrointestinal symptoms and complications due to NSAIDs. *Best Pract Res Clin Gastroenterol* 2001;15:755-73.
- Schiffmann L, Kahrau S, Berger G, et al. Colon perforation in an adolescent after short-term diclofenac intake. *ANZ J Surg* 2005;75:726-7.
- Thorsen K, Søreide JA, Søreide K. Scoring systems for outcome prediction in patients with perforated peptic ulcer. *Scand J Trauma Resusc Emerg Med* 2013;21:25.
- Sanabria A, Villegas MI, Morales Uribe CH. Laparoscopic repair for perforated peptic ulcer disease. *Cochrane Database Syst Rev* 2013;CD004778.
- Lagoo S, McMahan RL, Kakihara M, et al. The sixth decision regarding perforated duodenal ulcer. *JLS* 2002;6:359-68.
- Sonnenberg A, Everhart JE. Health impact of peptic ulcer in the United States. *Am J Gastroenterol* 1997;92:614-20.
- de Leest H, van Dieten H, van Tulder M, et al. Costs of treating bleeding and perforated peptic ulcers in The Netherlands. *J Rheumatol* 2004;31:788-91.
- Antoniou SA, Antoniou GA, Koch OO, et al. Meta-analysis of Laparoscopic Versus Open Repair of Perforated Peptic Ulcer. *JLS* 2013;17:15-22.
- Bertleffcorresponding MJ, Lange JF. Laparoscopic correction of perforated peptic ulcer: first choice? A review of literature. *Surg Endosc* 2010;24:1231-9.
- Kim JH, Chin HM, Bae YJ, et al. Risk factors associated with conversion of laparoscopic simple closure in perforated duodenal ulcer. *Int J Surg* 2015;15:40-4.
- Wright GP, Davis AT, Koehler TJ, et al. Cost-efficiency and outcomes in the treatment of perforated peptic ulcer disease: laparoscopic versus open approach. *Surgery* 2014;156:1003-7.
- Bertleff MJ, Halm JA, Bemelman WA, et al. Randomized clinical trial of laparoscopic versus open repair of the perforated peptic ulcer: the LAMA Trial. *World J Surg* 2009;33:1368-73.
- Varcus F, Lazăr F, Beuran M, et al. Laparoscopic treatment of perforated duodenal ulcer -- a multicenter study. *Chirurgia (Bucur)* 2013;108:172-6.
- Laforgia R, Balducci G, Carbotta G, et al. Laparoscopic and Open Surgical Treatment in Gastroduodenal Perforations: Our Experience. *Surg Laparosc Endosc Percutan Tech* 2017;27:113-5.
- Agaba EA, Klair T, Ikedilo O, et al. A 10-Year Review of Surgical Management of Complicated Peptic Ulcer Disease From a Single Center: Is Laparoscopic Approach the Future? *Surg Laparosc Endosc Percutan Tech* 2016;26:385-90.

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