

The growing role of laparoscopic repair in patients with early diagnosed peptic ulcer perforation

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ABSTRACT

Objective: Laparoscopy is gaining more importance in emergency abdominal surgery. Peptic ulcer perforation (PUP) constitutes a significant portion of surgical emergencies. The aim of this study was to evaluate the methods and results of patients who underwent surgery due to PUP in our department.

Material and Methods: Patients who were admitted to the hospital in the early period and received Graham-patch (GP) repair due to PUP from January 2009 to January 2013 were divided into two groups as laparoscopic (group L) or open (group O) surgery. Demographic data of the patients, duration of the operation, conversion to open surgery, length of hospital stay, secondary interventions, re-admissions, morbidity and mortality rates were retrospectively evaluated. Patients with conversion to open surgery were included in Group O.

Results: Two hundred and nineteen patients were included in the study, 148 of which were in Group O (including the 47 patients with conversion), and 71 in group L. In patients with early admission, the rate of laparoscopically completed GP was 19.6% in the first year of the study, whereas this rate was 61.8% in the fourth year ($p < 0.001$). The rate of conversion to open surgery was 50% in 2009, and 24.4% in 2012 ($p = 0.028$). Length of hospital stay was shorter in group L ($p = 0.35$). The complication rate was 4.2% in patients who had laparoscopic procedures, and was 6.1% in patients who underwent open surgery ($p = 0.57$). Seventy-three percent ($n = 11$) of re-hospitalized patients in the perioperative period ($n = 15$) were treated conservatively. When costs related to secondary interventions and re-hospitalization were included, there was no significant difference between laparoscopic and open surgery groups in terms of cost ($p = 0.06$).

Conclusion: Laparoscopic surgery for PUP is a reliable method and has been used increasingly over the years in our department. The operative time is longer, the length of hospital stay is shorter, the complication rates are less than open surgery, and the conversion rate is significantly reduced. Laparoscopic GP is feasible in early-admitted patients with PUP, due to the above-mentioned advantages. We believe the rate of conversion to open surgery decreases with increasing experience in laparoscopy.

Key Words: Laparoscopy, peptic ulcer perforation, Graham-patch

INTRODUCTION

Laparoscopy is gaining more importance in emergency abdominal surgery, with a constantly expanding field of application (1). Series are being published from both experienced centers and international consensus reports including multicenter studies (2). The most important advantages of this technique are its ability to facilitate diagnosis by enabling better exploration of the abdomen by the surgeon and the reduced complication rates as compared to open surgery. The requirement for advanced technological systems and tools, and surgical experience are the disadvantages of emergent applications. The incidence of peptic ulcer perforation (PUP) is reported as 7 to 10 per 100,000 people (3). Despite the increase in access to medical treatment facilities and improved living conditions, PUP is still a common cause of emergency surgery admissions among adult patients and is the leading cause of death (4). Currently, the use of histamine (H_2) receptor blockers and proton pump inhibitors resulted in a decrease in peptic ulcer surgery; nevertheless, surgery is still the most effective treatment for its complications such as perforation. It has been reported that if laparoscopy is used for peptic ulcer surgery in experienced centers and in appropriate cases, the results are equivalent to open surgery (5).

In this study, we aimed to evaluate the success of surgical methods and their results in patients who underwent surgery due to PUP in our department.

MATERIAL AND METHODS

Patients who were admitted to the emergency service and received Graham-patch (GP) repair due to PUP from January 2009 to January 2013 were retrospectively evaluated. Data regarding demographic properties, duration of the operation, conversion to open surgery, length of hospital stay, secondary interventions, re-admissions, morbidity and mortality rates, and cost were recorded. Patients older than 16 years of age, who were admitted within the first 8 hours after onset of symptoms, and was diagnosed with PUP after preliminary results of examinations and tests were included. Patients with longer than 8 hours of delay between onset of symptoms and hospital admission, with high enteral

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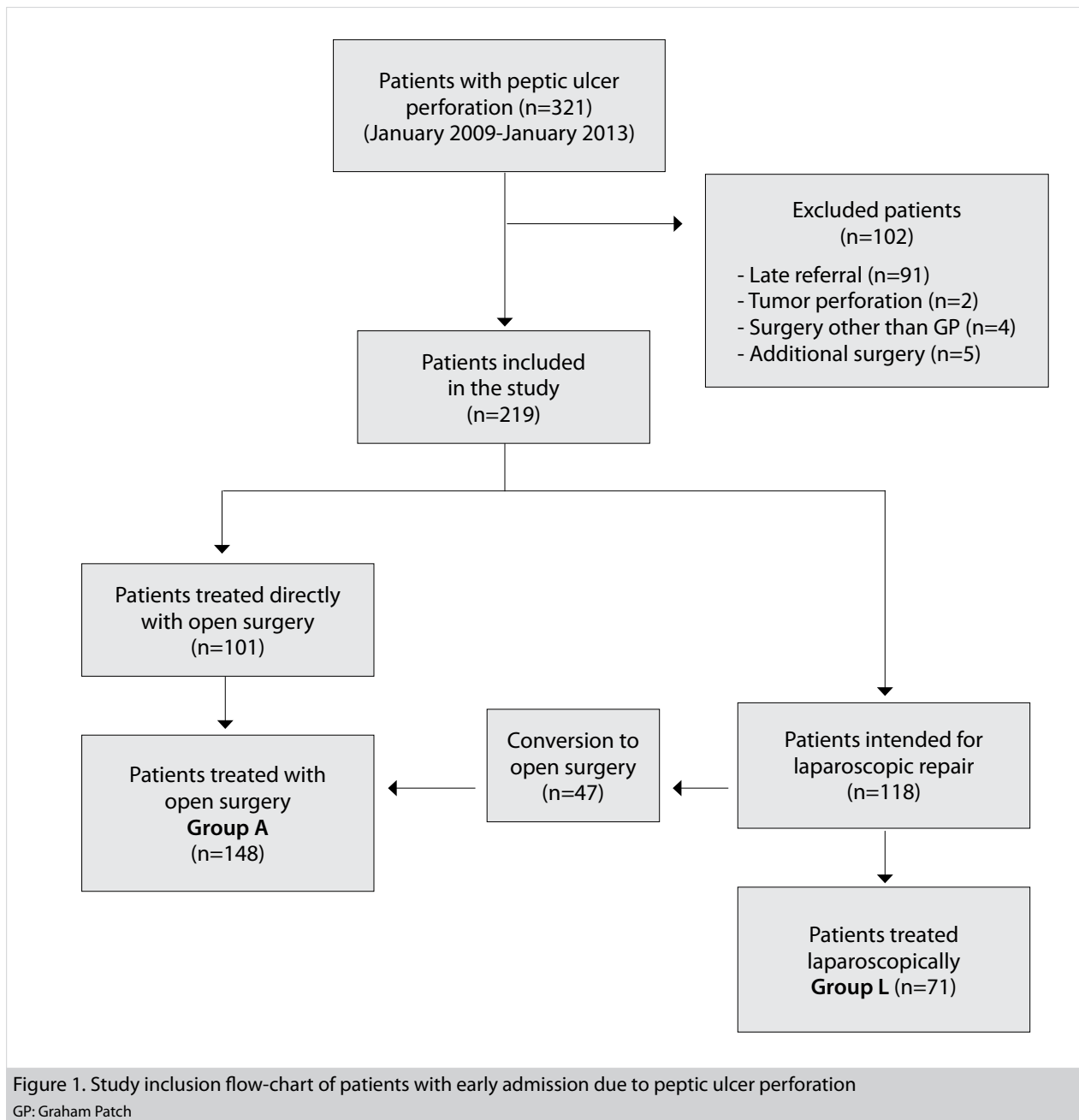
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contamination at the time of surgery, with different pathologies detected during surgery, in whom surgical treatments other than GP had been used, and who received additional procedures during the same surgical session were excluded (Figure 1).

The cases were divided into two groups according to the type of surgical procedure. Laparoscopic surgery was performed via a 10 mm port placed below the umbilicus for camera and two 5 mm ports placed at the right and left upper quadrants. Open surgery was performed via a supra-umbilical median incision. In both methods, first, the abdomen was explored, then GP repair was applied and a silicone drain was placed after intra-abdominal irrigation. The nasogastric tube decompression that was initiated perioperatively was continued until gas discharge or bowel movement. Oral feeding was started after withdrawal of the nasogastric tube.

Statistical Analysis

Patient data was evaluated by Statistical Package for the Social Sciences (SPSS Inc., Chicago, IL, USA) 15 for Windows statistical software. Parametric data were defined as mean±standard deviation. The χ^2 test was used for comparison of categorical variables, and Student's t-test was used for comparison of continuous variables. A p-value below 0.05 was considered statistically significant.

RESULTS

The mean age and body mass index (BMI) of patients (n = 219), was 36.6 (16-68) years and 23.6, respectively, and the F/M ratio was 23/196. Group O contained 148 patients, including 47 patients with conversion from laparoscopic surgery, and Group L included 71 patients with total laparoscopic repair.

The rate of total laparoscopic GP in patients who presented in the early period was 19.6% in 2009, 17% in 2010, 31.3% in

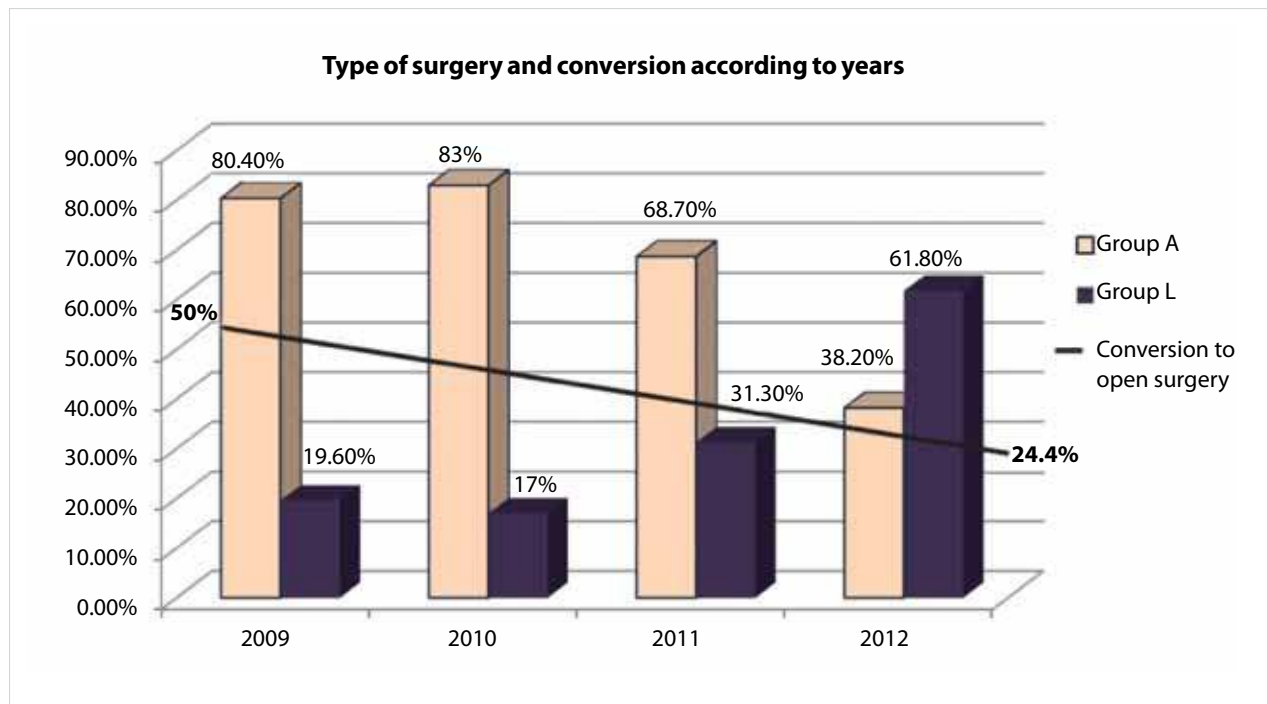


Figure 2. Patients, type of surgery and conversion to open surgery in the treatment of peptic ulcer disease according to years

Table 1. Demographic data, short-term findings and cost according to groups

	Group A (n=148)	Group L (n=71)	p
Age	38.9±18.8	31.9±11.9	0.04
BMI	23.66±2.5	23.46±2.4	0.56
Operation time (minutes)	64.23±27.0	88.12±32.24	<0.01
Length of hospital stay (days)	3.05±1.03	2.92±0.93	0.35
Cost (TL)	995.41±109	1089.4±404	0.06

BMI: Body mass index

2011 and 61.8% in 2012 ($p<0.001$), and the rate of conversion to open surgery decreased from 50% (2009) to 24.4% (2012) during the same period ($p=0.028$) (Figure 2). The mean operative time was similar in patients with total laparoscopic repair during the study period ($p=0.87$). The length of hospital stay was 2.92 ± 0.93 in group L, and was 3.05 ± 1.03 days in group O ($p=0.35$) (Table 1).

The main reasons for conversion to open surgery were abdominal contamination and generalized peritonitis ($n=6$) as well as technical reasons ($n=41$) (Table 2).

The complication rate was 4.2% in Group L, and was 6.1% in group O ($p=0.57$) (Table 3). Eleven of 15 patients who were readmitted in the perioperative period were managed conservatively, while surgical and/or invasive procedures were required in four patients (Table 4). One patient in Group L underwent re-operation due to adhesions. There were no perioperative mortalities in either group. Together with secondary interventions and re-hospitalization, there were no differences between laparoscopy and open surgery in terms of cost ($p=0.06$) (Table 1).

DISCUSSION

Laparoscopy is becoming increasingly important and being applied more commonly in emergency abdominal surgery (1). Although advanced radiological techniques are available, abdominal laparoscopy is often used to assess the abdomen in a better way for the purposes of diagnosis and simultaneous treatment. In addition to these advantages, due to the low rate of postoperative complications and cosmetic benefits laparoscopy has become an increasingly preferred method in emergency surgery as well as elective surgery.

Due to advances in medical therapy, the number of patients who undergo elective peptic ulcer surgery has decreased dramatically in the last quarter of the 20th century (6). Nevertheless, the number of patients requiring surgical treatment due to complications such as perforation remained relatively unchanged. Peritoneal lavage and omental patch is the accepted surgical approach in peptic ulcer surgery in many centers (6). There are also reports of patients treated without the use of omental patch in the literature. Ateş and Dirican (7) reported a study in 2011 that included 21 patients who were treated without the use of omental patch repair, and they detected postoperative leak only in one case. However, a low-risk patient group (early admission, low Mannheim Peritonitis Index and small perforation diameter) was selected for this study.

Roscoe Reid Graham successfully applied omental patch for the first time in 1929, for a patient with insulinoma (8). Mouret performed the first laparoscopic peptic ulcer repair in 1989, by using omental patch and fibrin glue (9). The feasibility of laparoscopic repair has been validated by various randomized clinical trials (5, 10, 11). The success rate of laparoscopic approach is higher in patients with early hospital admissions as compared to patients with late presentation due to the severity of peritonitis, and with increased experience the operative time decreased close to open surgery.

Table 2. Reasons for conversion to open surgery in patients who were intended for laparoscopic repair

Reason for conversion	n
Presence of extensive peritonitis*	6
Technical reasons**	41
• Difficulty in exploration	17
• Perforation site not suitable for laparoscopic repair	9
• Laparoscopy system related reasons	6
• Not being able to identify site of perforation	5
• Obvious leak on methylene blue applied through the nasogastric tube	4
Total	47

*There were no objective criteria stated in the operative note
 **The reason stated in the operative note as the reason for conversion to open surgery

Table 3. Complications

Complications (n)	Group A	Group L	p
Admission with non-specific reasons	5	5	0.18
Repair leak	1	1	0.55
Pancreatitis	2	-	0.34
Wound infection	6	-	0.09
Adhesion*	-	2	0.03
Intra-abdominal abscess	-	1	0.5
Total (n/N)	9/148	3/71	0.57
Total (%)	6.1	4.2	

*Only one patient with adhesions required surgery

Table 4. Re-admission reasons and management of patients

	Group A (n=148)		Group L (n=71)		p
	n	%	n	%	
Conservative	5	3.3	6	8.4	0.11
Surgical/interventional procedure required	2	1.3	2	2.8	0.45
• Adhesion (Surgery)	-	0	1	1.4	0.5
• Abscess (Percutaneous drainage)	-	0	1	1.4	0.5
• GI bleeding (Diagnostic gastroscopy)	2	1.3	-	0	0.34

Siu et al. (6) reported their series of 121 patients in 2002, 63 patients were operated with laparoscopy and 58 patients with the open method. The mean operative time was shorter in the laparoscopic group (42 min.) than the open surgery group (52 min.). The perforation diameter was stated as 5.2 mm in the laparoscopic group, and 4.7 mm in the open surgery group, and they demonstrated that laparoscopy can be applied even in large perforations by reporting a conversion rate of 14% (9 patients). Wound infection was identified in 2 patients from the laparoscopic group, and in 7 patients in the open surgery group, pulmonary infection was detected only in one patient from the open group, and mortality was higher in the open surgery at a rate of 3/1. There were no intra-abdominal collections in the open surgery group, whereas two patients in

the laparoscopic group developed collections, and the re-operation rate was higher in the laparoscopic group at a rate of 5/1. The postoperative analgesic requirement was significantly lower, and the mean length of hospital stay was 6 days in the laparoscopic group and 7 days in the open surgery group.

Bertleff et al. (10) reported a similar study with 101 patients, 52 with laparoscopic and 49 with open surgery, and despite a larger perforation diameter in the laparoscopic group (10 mm and 7 mm) the conversion rate remained as low as 8%. The mean operative time was longer in the laparoscopic group, similar to our result. The length of hospital stay was shorter in the laparoscopic group, while there were no significant differences in terms of complications (18% and 36%) and mortality (2 to 4).

Our hospital emergency department is a high volume clinic with 5856 general surgery consults and 1976 patients operated on by general surgery in 2012. 55.2% of these surgeries (n=1092) were performed laparoscopically. Therefore, in our department, laparoscopy has an important role in emergency surgical procedures. Five percent of patients who underwent emergency surgery (n=55) were operated due to PUP in 2012. During the study period, 321 patients were operated due to PUP. During this four-year period, the rate of laparoscopic repair has significantly increased (p<0.001). Although there was a reduction in the mean operative time, since patients that require more advanced surgery were also treated laparoscopically with increased experience, a statistically significant reduction in time was not detected. Similar to other studies in the literature, short-term parameters such as length of hospital stay and postoperative complication rate were in favor of the laparoscopic group. Since only patients with early admission were examined perioperative mortality was not seen in both groups.

The difficulty in exploration of the perforation site, inability to determine the perforation site, the presence of generalized peritonitis and leak from the repair site detected by methylene blue dye after the repair were determined as reasons for conversion to open surgery. In our study, it was observed that the rate of conversion to open surgery decreased up to 50% during the study period. With increasing experience and with the use of advanced hand tools we believe that the conversion rate will be even lower.

The retrospective design and the relatively subjective reasons for conversion to open surgery are the major limitations of our study. We believe that surgical standardization should be provided and objective criteria (Mannheim Peritonitis Index) should be more widely used for the evaluation of presence of peritonitis in PUP.

CONCLUSION

Laparoscopic surgery for PUP, especially in experienced centers, is a proven method that is being increasingly used in our department over the years. The operation time decreases in association with an increase in experience. In our study, the operation time was longer than open surgery, consistent with the literature, but the length of hospital stay was shorter, the complication rates were less and the conversion rate was significantly decreased. Therefore, we recommend application of laparoscopic GP in PUP cases with early admission, and we believe that the conversion rate will be less with increasing experience.

Ethics Committee Approval: Due to the retrospective design and anonymous data from patient charts, ethical approval was not obtained.

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - M.F.Ç., A.C.D., O.K.; Design - İ.G., M.F.Ç., C.A.; Supervision - C.A., M.G., H.A.; Data Collection and/or Processing - C.A., O.K., İ.G.; Analysis and/or Interpretation - M.G.Ü., M.G., H.A.; Literature Review - İ.G., O.K., M.G.Ü.; Writer - M.F.Ç., A.C.D., M.G.Ü.; Critical Review - A.C.D., M.G., H.A.

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