

Vishwanath Golash

Abstract

Background: Aim of this study was to compare the result of open and laparoscopic repair of perforated peptic ulcers in terms of operation time, postoperative pain, hospital stay, and wound infection.

Methods: Clinical notes of 152 patients who underwent the operative closure of perforated peptic ulcers from 1996 to 2006 were available for study. All patients were offered laparoscopic approach from 1998 onward. Repair was done using omentum patch. Open approach was used in 57 patients and laparoscopic in 95 patients. Results were analyzed in terms of requirement of analgesia, hospital stay, return to work, complications, and mortality.

Results: Closure was successful in all cases using omentum patch. There was no conversion to open in laparoscopic group. The mean operation time was less in laparoscopic versus open ($P<0.001$). The mean number of analgesic injection given were 3 and the hospital stay was 4 days in laparoscopy, the corresponding figure in laparotomy were 6 and 9 respectively ($P<0.001$). Total numbers of complication in laparoscopic repair were 9 compared to 35 in open

($P=0.011$). Two patients died in each group. Incidental significant incidences of perforations was observed in men ($P<0.001$), fasting during Ramadan ($P<0.001$), smokers ($P<0.001$), past history of peptic ulcer disease ($P=0.007$), and use of non-steroidal anti-inflammatory drugs ($P=0.035$).

Conclusion: Compared to open approach, laparoscopic repair required shorter operation time, lesser analgesia, had fewer complications, shorter hospital stays and early return to work.

Keywords: Perforated Peptic Ulcer; Laparoscopy; Omentum Patch; Ramadan; Helicobacter Pylori

Submitted: 15 Aug 2008

Reviewed: 29 Aug 2008

Accepted: 18 Sept 2008

From the Department of Surgery, Sultan Qaboos Hospital, Salalah

Address correspondence and reprint requests to: Dr. Vishwanath Golash, Sr. Consultant, Department of Surgery, Sultan Qaboos Hospital, P.O. Box 98, P.C. 211 Salalah, Sultanate of Oman

E-mail: haritagolash@hotmail.com

Introduction

Since the eradication of *Helicobacter pylori* the incidence of peptic ulcer disease has decreased considerably and the definitive surgical procedures are rarely performed these days. But correspondingly the incidence of perforated peptic ulcer disease has not reduced significantly (Fig 1). The *Helicobacter Pylori* infection, smoking, fasting during Ramadan, use of non-steroidal anti-inflammatory drugs and past history of peptic ulcer are all statistically significant contributing factor for perforation.¹⁻⁴ The perforated peptic ulcer disease is a surgical emergency and the conventional surgical management has been laparotomy with either simple closure or omentum patch. The surgical technique has not changed but the minimal access approach has been increasing used for the closure of perforated peptic ulcer. Since the first successful laparoscopic closure of a perforated peptic ulcer, several prospective and retrospective studies have shown better results compared to open approach.⁵⁻⁷ Encouraged by these studies we analyzed the outcome of open and laparoscopic approach in our hospital in last ten years. Aim was to compare the results in terms of operation time, postoperative pain, hospital stay, and wound infection.

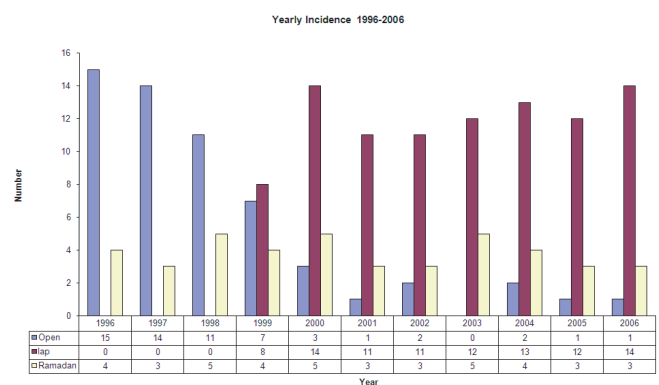


Figure 1: Year incidence of perforated peptic ulcer 1996-2006

Methods

Clinical notes of 152 patients who underwent the operative closure of perforated peptic ulcers from October 1996 to December 2006 were available for study. The patients in laparoscopy and in open group were comparable in parameters like time period, skills & the seniority of the surgeons involved, age, sex, time lag before

presentation, history of smoking, history of peptic ulcer, NSAID use, alcohol use, Ramadan fasting, associated medical illnesses and ulcer size, site and ASA classification. (Table 1). Mean age of the patients was 43 years (range 14-76). There were 147 male and 5 female patients (Male/Female ratio of 30:1).

The time of presentation after perforation based on the patient's history varied from few hours to 72 hours. Majority of the patients presented in the early hours of morning. History of smoking, peptic ulcer, non steroidal anti-inflammatory drugs and alcohol was present in significant number of patients (Table 1). Mean Number of perforation seen per year was 14 (range 11-17) A total 42 perforation (mean 4) occurred during Ramadan (range 2-5 per year). Of the 42 perforations during Ramadan 32 patients had the past history of peptic ulcer and approximately half of them had not been taking the proton pump inhibitors or H2 antagonists (Fig 2). Preoperative clinical diagnosis of perforated peptic ulcer was confirmed by gas under the diaphragm in upright chest x-ray in 125 patients (82%). Gastrograffin studies showed leak in 23 patients (15%). Ultrasound demonstrated free fluid in 56 patients (37%) and free fluid with gas in 22 (14%) which was not seen in upright chest x-ray (Table 2).

In 25 patients with peritonitis, diagnosis was confirmed by laparoscopy in 21 patients (14%)^{8, 9} Associated medical illnesses were present in 17 patients (Table 3). Patients were resuscitated with intravenous fluid, naso-gastric tube, parental antibiotics (combination of Metronidazole, cephalosporin and gentamycin) and analgesic. Open repair was performed in 57 patients and laparoscopic repair in 95 patients, using omentum patch in all. Mean size of ulcer was 5mm (Range 3-10 mm). Peritonitis was present in all patients & perforation was situated in 1st part of duodenum. Laparoscopy was not offered in patients with densely scarred abdomen from previous surgery, in pregnancy, concomitant bleeding ulcer, and gastric outlet obstruction and in patients with known gastric malignancy. Pethidine was used as an analgesic agent in postoperative period. Pain scoring was done on Visual Analogue Scale (VAS). A simple assessment tool of a 10 points was used on a visual pain scale with 0 on one end, representing no pain, and 10 on the other, representing the worst pain ever experienced, which a patient marks to indicate the severity of his or her pain).^{10,11}

Table 1: Demography of Patients of peptic ulcer perforation

Variables	number	p value	95% CI ‡
Age (mean)	43		
Male (n=147)/Female (n=5)	152	0.001*	0.01 to 0.08
Perforation during Ramadan	42	0.001*	0.21 to 0.35
use of NSAID	20	0.035†	0.05 to 1.22
History of peptic ulcer	32	0.007*	0.22 to 1.24
Smoking	66	0.001†	0.65 to 2.26
Alcohol	2		
Site of ulcer perforation:			
Duodenum	150	0.001*	0.95 to 0.99
Gastric	2		
Mean size of ulcer in mm	5		

* Fisher exact test
 † unpaired t test
 ‡ Modified Wald Method

NSAID: Nonsteroidal Anti-Inflammatory Drugs; CI: Confidence Interval; P: Probability

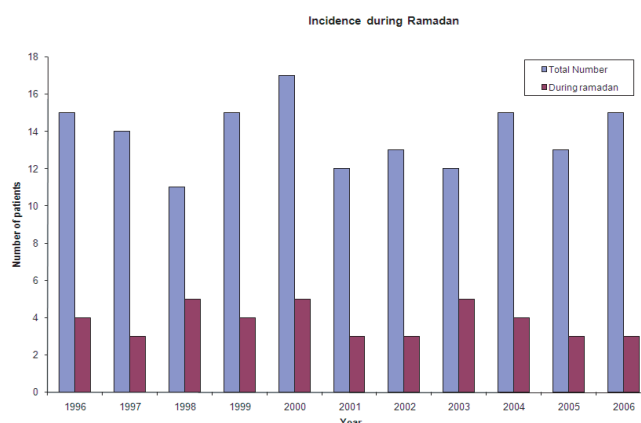


Figure 2: Incidence of Perforated Peptic ulcer during Ramadan

Table 2: Preoperative Clinical Diagnosis of Perforated Peptic Ulcer Patients

Investigations	Findings	Number (%) of Patients	95% Confidence Interval
Upright chest x-ray	Gas under Diaphragm	125 (85%)	0.78 to 0.90
Ultrasound abdomen	Free fluid	56 (37%)	0.30 to 0.45
Ultrasound abdomen	Free gas	22 (14%)	0.10 to 0.21
Gastrograffin studies	Dye leak	23 (15%)	0.10 to 0.22
Laparoscopy	Perforated DU	21 (11%)	0.07 to 0.17
Laparotomy	Perforated DU	4 (3%)	0.01 to 0.07

graphPad software 2002-2005;
 DU: Duodenal Ulcer

Table 3: Associate Medical Illnesses

Associated Medical Illnesses	
CVA	1
IHD	1
AF	1
LVH	1
HTN	3
VPC	1
BPH	1
BRONCHIAL ASTHMA	2
DM	5
QUADRIPLÉGIA	1

Operation techniques: An informed consent was taken and the risk and complications explained to patients. A standard upper midline laparotomy was used in open repair and four port techniques for the laparoscopic repair. Laparoscopy was performed under general anaesthesia, patient lying supine and surgeon standing on left side of patient. A CO₂ pressure of 13mm Hg. was used. A 0° laparoscope was introduced through the umbilical port and the diagnosis was confirmed (Figure 3). Patients were put in slight anti trendelenburg position. Three 5mm ports were inserted two in midclavicular line on left side and one on right side. After through peritoneal inspection peptic ulcer perforation was located. Free peritoneal fluid & pus was removed & sent for culture/sensitivity. No biopsy was taken from the duodenal ulcers. Size of ulcer was roughly measured by the tip of the grasper. The perforations were closed using 2-3 interrupted 2 '0' Vicryl sutures tied over the omentum flap using intracorporeal knot tying technique.

On completion, thorough peritoneal lavage was done with warm normal saline till the return was clear. The peritoneal cavity was drained by leaving drains in right subhepatic space and pelvis in all the cases. Postoperatively gastrograffin studies were not done routinely. Nasogastric tube was removed after 24-72 hours and feeding was resumed. We used Graphpad 2002-2005 software for statistical analysis. 'T' test was used to compare the mean and standard deviation between the two groups (open and laparoscopic) which were identical. Since our samples were small Fisher's exact test was used to provide the p values. Confidence intervals were calculated by modified Wald method.



Figure 3. Standard Port Positioning for Laparoscopic closure of perforated peptic ulcer

Results

Mean operation time was 45 minutes (range 24-88) in laparoscopy and 61 minutes (range 44-90) in open repair. Mean days stay in hospital was 4 days (range 1-21) in laparoscopy group, 9 days (range 7-44) in open (Fig 4.). Mean VAS score on the first and third postoperative days was 2 and 1 in laparoscopy versus 6 and 4 in laparotomy (Fig 5). Mean number of injection Pethidine (1mg/kg body weight) was 3 for laparoscopic and 6 for open group. Total numbers of complications were 35 in open and 9 in laparoscopy (Table 4).

Since 1998 onward percentage of laparoscopic closure increased and all were offered laparoscopic closure. No patient had conversion from laparoscopy to laparotomy and closure was successful all patients. Two patients of gastric ulcer perforation biopsy were reported benign. Clinically there was no suture site leak. 11 patients had laparotomy wound infection and 4 patients had minor port site infection. 12 patients had chest infection in open repair group and none in laparoscopy. There were four death (mortality rate 3%) 2 in each group. All four patients died from severe chest infection and pneumonia. The age group of patients who died varied from 45-76 yrs. These patients presented more than 18 hours after onset of abdominal pain and were in peritonitis on presentation. Two of the patients who died in laparoscopic group one had co-morbidity of CVA with hemiplegia and other was quadriplegia, both were offered laparoscopy. Mean number of

sick leave taken before joining the work in laparoscopic group was 12 day (range 10-18) compared to 31 days (range 21-45).

All patients were discharged home on triple therapy for Helicobacter Pylori. Record of review of 77 patients was available in surgical outpatient department at the end of three months. As per the record from endoscopy department, 45 patients were willing or had endoscopy in follow up and were negative for Helicobacter Pylori. Of these 45 patients, 20 had laparoscopic closure and rest open repair. No Recurrence was seen in the group of reviewed patients ranging from three months to 7 years (mean of 40 months). An upright chest x-ray was the main diagnostic tool in clinical practice (95% Confidence interval of 0.78 to 0.90) and other investigations were contributory. Preoperative diagnosis was possible in 86% of the patients. In our study the mean operation time was less in laparoscopic versus open ($P<0.001$), laparoscopic repair had fewer analgesic doses ($P<0.001$), VAS score on first and third day was better in laparoscopy ($P<0.001$). Number of days stay in hospital was shorter in lap ($P<0.001$). Patient returned to work earlier in laparoscopic group 12 days versus 31 days in open (95% confidence interval extends from 0.07 to 0.21 vs. 0.42 to 0.67). The site of perforation was mainly in duodenum in our study ($P<0.001$). There were no statistically significant differences in terms of time of oral feeding, readmission, intraabdominal abscesses, reoperation, and mortality but chest infection rate was significantly higher in patients with laparotomy. Main causes of readmission were wound infection, intrabdominal abscesses, and intestinal obstruction (Table 4). One patient with intestinal obstruction secondary to adhesions and three patients of intrabdominal abscess were reoperated (after unsuccessful attempts of ultrasonographic/CT guided drainage). Total numbers of wound infections were much less in laparoscopy ($P=0.013$).

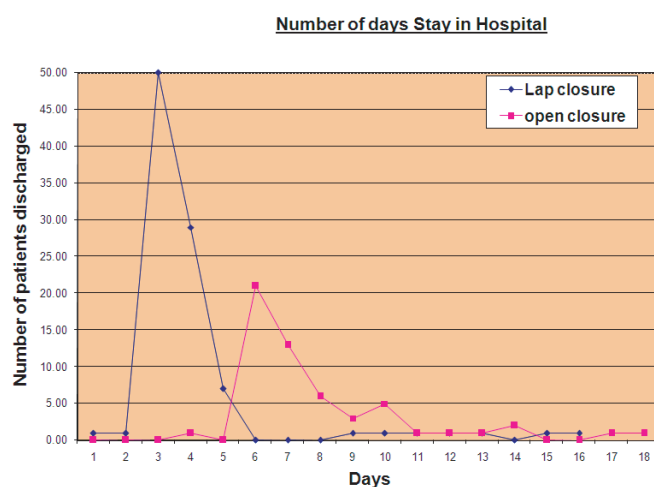


Figure 4: Number of Hospital Stay vs. No. of Patients discharged

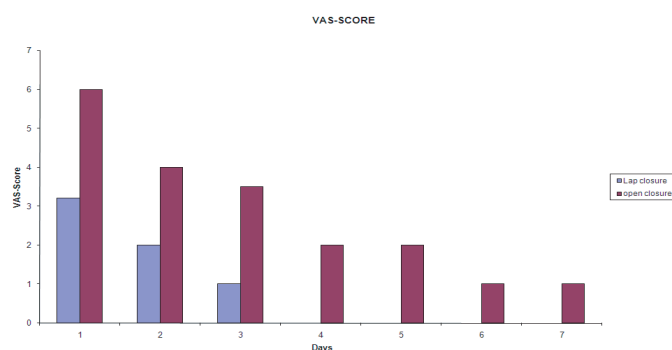


Figure 5: VAS (Visual Analogue Scale) Score vs. No. of Hospital Stays

Table 4: Total number of complication in Open Closure Surgery and Laparoscopic Surgery

Variables	Lap.(n=95)	Open (n=57)	p value	95% CI (of mean)
Mean operation time(SD)	45 (10.60)	61(11.60)	0.001†	0.51 to 0.75 ‡
VAS score(mean):				
Mean 1 day (SD)	2.2 (0.80)	5.8 (0.92)	<0.001*	0.09 to 0.70 ‡
Mean 2 day (SD)	2.4 (1.99)	4 (0.86)	<0.001*	0.15 to 0.85 ‡
Mean 3 day (SD)	1 (0.50)	3.5 (1.00)	<0.001*	0.03 to 0.71 ‡
Mean No of injections (SD)	3 (1.05)	6 (1.08)	<0.001*	0.19 to 0.81 ‡
Mean days in hospital (SD)	4 (3)	9 (6)	<0.001*	0.19 to 0.73 ‡
No. of complications(Total):	9	35	0.001†	0.14 to 0.42 ‡
Wound Infection/port	4	11	0.011	
Prolonged ileus	2	4	0.206	
intrabdominal abscess	2	3	0.075	

Intestinal obstruction		1		
reoperation	1	3	0.110 *	
chest infection		12	0.001	
Burst abdomen		1		
Readmission	1	5	0.030 *	0.020 to 0.640 ‡
mortality	2	2		
suture site leak	none	none		
Oral feeding(range)	1-3 days	1-3 days		
Removal NG tube (range)	1-3 days	1-3 days		
* t test				
† Fisher's exact test				
‡ Modified Wald Method				

SD: Standard Deviation; CI: Confidence Interval; NG: Nasogastric Tube; VAS: Visual Analogue Scale

Discussion

With the invent of curative medical treatment for *Helicobacter Pylori* the incidence of peptic ulcer and related complications have been reduced considerably. But surprisingly the incidence of perforation has not decreased which indicate that there are possibly more than one factors involved in the etiology of perforated peptic ulcer disease. Surgery is the mainstay of treatment for perforated peptic ulcer by closing the perforation with or without omental patch. There are no controversies in the surgical treatment of perforated peptic ulcer but the best approach to surgery is still debatable. Most of the studies available on laparoscopic closure of perforated duodenal ulcer are retrospective and very few are prospective and randomized.

This retrospectively study has shown laparoscopic repair patient recover faster and required lesser analgesia compared to open repair. There were far less wound infections in laparoscopic group. Cougard et al in their multicentral retrospective study showed less reoperations rate, mortality and morbidity in laparoscopic approach while Druat et al in their multicentral prospective trial reported comparable results to open approach except the postoperative comfort was increased in laparoscopic closure. Studies by Seeling et al have shown better results with laparoscopy in terms of lesser postoperative pain in their prospective trials.¹² The postoperative outcome was better in terms of postoperative naso-gastric tube insertion, ileus and resuming diet as reported by Tsumura et al with laparoscopic approach.¹³

The Benefits of laparoscopic cholecystectomy were recognized early due to greater number of patients available, but the experience in laparoscopic repair of peptic ulcer was limited. Several reports have shown superiority of laparoscopic approach in terms of lesser

analgesic requirement, hospital stay and wound infection.¹⁴⁻¹⁸ Testino Mario et al reported higher mortality and postoperative abdominal wound infections after emergency open surgery while Sanabria et al have shown lesser septic abdominal complications with laparoscopy.^{19,20} Demography of peptic ulcer has changed with increasing number of female patients seen in developed countries, although our patients were mainly male ($P < 0.001$).²¹ Role of *helicobacter Pylori* infection in peptic ulcer disease is well known and all patients were given triple eradication therapy postoperatively. A large number of our patients had other risk factors of smoking ($P = 0.001$), the use of NSAID ($P = 0.035$ and past history of peptic ulcer ($P = 0.007$)). Fasting during Ramadan ($P < 0.001$) was one of the single significant predisposing factors in the etiology of perforated peptic ulcer disease in our study, most of these patients had the history of peptic ulcer disease and it is likely that they didn't take their medications regularly. Sa'nchez-Bueno et al have reported a drop in incidence of perforated peptic ulcer disease but we have not observed the similar decrease in incidence in Oman.²²

Conclusion

This retrospective study has shown better outcome and lesser morbidity with laparoscopic approach in terms of shorter operation time, shorter hospital stay, early return to work, lesser analgesic requirement, lesser wound infections. It is a safe alternative to open surgery.

Advances in Knowledge

Perforated peptic ulcer disease is a surgical emergency which is conventionally managed by laparotomy and closure of

perforation. However, the advance in minimal access surgery has made it possible to close perforated peptic ulcers laparoscopically. This retrospective study aims to compare the results of open and laparoscopic closure in the last ten years from a single hospital.

Application to patient care

Our results showed that minimal access surgery had less morbidity in terms of postoperative pain, wound infection and hospital stay. We also observed a higher incidence of peptic ulcer perforation during the Ramadan fasting month, and as the majority of these patients had past history of peptic ulcer, compliance with medical treatment should be emphasized during the fasting month.

References

1. Svanes C. Trends in perforated peptic ulcer: incidence, etiology, treatment, and prognosis. *World J Surg* 2000 Mar;24(3):277-283.
2. Huang JQ, Sridhar S, Hunt RH. Role of Helicobacter pylori infection and non-steroidal anti-inflammatory drugs in peptic-ulcer disease: a meta-analysis. *Lancet* 2002 Jan;359(9300):14-22.
3. Ramsoekh D, van Leerdam ME, Rauws EA, Tytgat GN. Outcome of peptic ulcer bleeding, nonsteroidal anti-inflammatory drug use, and Helicobacter pylori infection. *Clin Gastroenterol Hepatol* 2005 Sep;3(9):859-864.
4. Kucuk HE, Censur Z, Kurt N, Ozkan Z, Kement M, Kaptanoglu L, et al. The effect of Ramadan fasting on duodenal ulcer perforation: a retrospective analysis. *Indian J Surg* 2005;67:195-198.
5. Siu WT, Leong HT, Law BK, Chau CH, Li AC, Fung KH, et al. Laparoscopic repair for perforated peptic ulcer: a randomized controlled trial. *Ann Surg* 2002 Mar;235(3):313-319.
6. Cougard P, Barrat C, Gayral F, Cadière GB, Meyer C, Fagniez L, et al; French Society of Laparoscopic Surgery. Laparoscopic treatment of perforated duodenal ulcers. Results of a retrospective multicentric study. *Ann Chir* 2000 Oct;125(8):726-731.
7. Druart ML, Van Hee R, Etienne J, Cadière GB, Gigot JF, Legrand M, et al. Laparoscopic repair of perforated duodenal ulcer. A prospective multicenter clinical trial. *Surg Endosc* 1997 Oct;11(10):1017-1020.
8. Golash V, Willson PD. Early laparoscopy as a routine procedure in the management of acute abdominal pain: a review of 1,320 patients. *Surg Endosc* 2005 Jul;19(7):882-885.
9. Warren O, Kinross J, Paraskeva P, Darzi A. Emergency laparoscopy—current best practice. *World J Emerg Surg* 2006;1:24-28.
10. Acute Pain Management: Operative or Medical Procedures and Trauma, Clinical Practice Guideline No.1.AHCPR Publication No. 92-0032; February 1992. Agency for Healthcare Research & Quality, Rockville, MD; p. 116-117.
11. Ed C. The Management of Postoperative Pain: Practical procedures; Issue 7. Article 1997;2:1-7.
12. Seelig MH, Seelig SK, Behr C, Schönleben K. Comparison between open and laparoscopic technique in the management of perforated gastroduodenal ulcers. *J Clin Gastroenterol* 2003 Sep;37(3):226-229.
13. Tsumura H, Ichikawa T, Hiyama E, Murakami Y. Laparoscopic and open approach in perforated peptic ulcer. *Hepatogastroenterology* 2004 Sep-Oct;51(59):1536-1539.
14. Golash V, et al. Laparoscopic closure of perforated peptic ulcer. *Oman Med J* 2002;18:34-38.
15. Mehendale VG, Shenoy SN, Joshi AM, Chaudhari NC. Laparoscopic versus open surgical closure of perforated duodenal ulcers: a comparative study. *Indian J Gastroenterol* 2002 Nov-Dec;21(6):222-224.
16. Lunevicius R, Morkevicius M. Systematic review comparing laparoscopic and open repair for perforated peptic ulcer. *Br J Surg* 2005 Oct;92(10):1195-1207.
17. Sauerland S, Agresta F, Bergamaschi R, Borzellino G, Budzynski A, Champault G, et al. Laparoscopy for abdominal emergencies: evidence-based guidelines of the European Association for Endoscopic Surgery. *Surg Endosc* 2006 Jan;20(1):14-29.
18. Lau H. Laparoscopic repair of perforated peptic ulcer: a meta-analysis. *Surg Endosc* 2004 Jul;18(7):1013-1021.
19. Sanabria AE, Morales CH, Villegas MI. Laparoscopic repair for perforated peptic ulcer disease. *Cochrane Database Syst Rev* 2005;(4):CD004778.
20. Testini M, Portincasa P, Piccinni G, Lissidini G, Pellegrini F, Greco L. Significant factors associated with fatal outcome in emergency open surgery for perforated peptic ulcer. *World J Gastroenterol* 2003 Oct;9(10):2338-2340.
21. Broadbent MR, Atkinson HD, Waldron B. An audit of perforated peptic ulcer disease in west Lothian. *J.R. Coll.Surg.Edinb.* 2001;46:358-371.
22. Sánchez-Bueno F, Marín P, Ríos A, Aguayo JL, Robles R, Piñero A, et al. Has the incidence of perforated peptic ulcer decreased over the last decade? *Dig Surg* 2001;18(6):444-447, discussion 447-448.