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The Application of Laparoscopic Techniques in Treating Perforated Duodenal Ulcers, With an Emphasis on Efficacy, Safety, and Postoperative Results

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Abstract: Background:

Perforation is a pries that develops in 4—15% of cases of duodenal ulcers, usually on the anterior aspect of the duodenal bulb.

Aim:

The present study is designed to analyze the role of laparoscopic procedures in the treatment of patients with perforated duodenal ulcers. Additionally, it is designed to assess the patient's general health and quality of life post-laparoscopy.

Methods:

This cross-sectional study was designed on 70 patients with perforated duodenal ulcers aged 32–48 years. All patients underwent endoscopic treatment at different hospitals in Iraq during the follow-up period, which began in April 2023 and lasted until April 2024. Demographic characteristics and intra- and postoperative outcomes, including time spent, mortality, complications, satisfaction, and pain, were recorded. Postoperative quality of life was assessed using the SF-36 questionnaire.

Results:

Our study enrolled the surgical data of 70 patients. Males got 80%, obesity with 50%, smokers included 42.86%, alcohol consumers have 12.86%, common symptoms and causes were severe abdominal pain with 72.86%, and pylori infection was 67.14%. According to laparoscopic procedure outcomes, operation time was 116.80 ± 14.95 minutes; pneumoperitoneum pressure was 12.55 ± 2.19 mmHg; length of hospital stays < 5 days have 94.29%, only one case had dead; time to the first bowel movement was 47.81 ± 9.02 hours, excellent satisfied with 77.14%, and post-operative complications had 11.43%, where abdominal abscess, pneumonia, and bowel obstruction had 2 cases for each factor. In the evaluation of the SF-36 questionnaire, we found physical functioning (86.14 ± 6.02) and psychological functioning (84.11 ± 2.89).

Conclusion:

Laparoscopy for perforated duodenal ulcers is safe and effective, decreasing complications and improvement of general health and quality of life.

Keywords: Perforated Duodenal Ulcers; Laparoscopic Technique; Post-operative Complications; and SF-36 Questionnaire.

II. Introduction

Duodenal ulcer perforation was a serious complication in peptic ulcer disease, which happens between 5 - 16% for duodenal ulcer patients along with accounts up seventy percent of deaths associated of peptic ulcer disease. [1,2]

Laparoscopic treatment is currently the most common technique utilized to treat perforated duodenal ulcers [3]. This lowers postoperative pain and the need for analgesics, and it is not associated to an increased risk of intra-abdominal or pulmonary issues [4,5]. Only 8% of patients required conversion to open surgery. [6]

Based on three predictive indicators for postoperative mortality—a systolic blood pressure < 90 mmHg, a period of signs > 24 hours, and an ASA score ≥ 3—the Boey score enables the identification of patients whose conditions warrant a laparoscopic procedure [7,8,9]. A postoperative mortality rate in excess of 50% should be a contraindication for laparoscopic treatment if all three criteria are met. [10]

However, in cases of peritonitis, these techniques could prove to be appropriate. Given the natural course of ulcer illness and the development of new medications, they are only warranted in around one-third of instances. [11,12]

III. Patients and Methods

A study was conducted on 70 patients in different hospitals in Iraq during the follow-up period, which ranged from April 2023 to April 2024. Our study recorded the demographic and clinical data and characteristics of the patients in the hospital's medical records. Demographic characteristics included age, sex, body mass index (BMI), smoking, alcohol consumption, ASA class, comorbidities, and marital and work status. Surgery was performed only on patients aged 32–42 years, with 80% of males and 20% of females. Our study also recorded the symptoms and etiologies associated with perforated duodenal ulcers, which were distributed among all patients participating in the study. Preoperative preexaminations included appropriate abdominal and chest X-rays, abdominal CT scanning, and selective esophagoscopy. Two scoring systems, in terms of ASA classifying and Bowie classification, assessed the status of the patient's conditions. For inclusion and exclusion criteria, the study included the following patient parameters: patients aged 32-42 years, some smokers, some alcoholics, and other comorbidities; only patients with perforated duodenal ulcers who underwent laparoscopic repair; patients with previous surgery, pregnancy, osteoporosis, anemia, patients under 32 and over 42 years of age, and patients with severe bleeding were excluded.

For surgical procedures, this study recorded data from hospitalized patients. Patients underwent laparoscopic repair of perforated duodenal ulcers. For surgical parameters, surgical data parameters included operative time, bleeding rate, pneumoperitoneum pressure, and mortality rate, time to oral intake, time to first bowel movement, time to return to normal activities, satisfaction rate, pain, length of hospital stay, and pain rate. In addition, we conducted a general questionnaire for patients to assess their overall health and quality of life using the SF-36 questionnaire, which was defined in four domains: physical, emotional, psychological, social, and daily activity.

IV. Results

TABLE 1. BASELINES DEMOGRAPHIC CHARACTERISTICS OF PATIENTS.

Items	Variables	No. of cases, 70	Percentage, %
Age {years}			
	32 – 36	27	38.57%
	37 – 42	43	61.43%
Sex {M/F}			
	Male	56	80%
	Female	14	20%
Body mass index {Kg/m2}			
	Normal weight	11	15.71%
	Overweight	24	34.29%
	Obesity	35	50%
ASA Class			
	1	5	7.14%
	2	32	45.71%
	3	27	38.57%
	4	5	7.14%
	5	1	1.43%
Smoking consumers			
	Yes	30	42.86%
	No	40	57.14%
Alcohol consumers			
	Yes	9	12.86%
	No	61	87.14%
No. of comorbidities			
	No	33	47.14%
	Hypertension	30	42.86%
	Diabetes types II	25	35.71%
	Skin disorders	7	10.0%
	Others	5	7.14%
Marital status			
	Single	7	10%
	Married	56	80%
	Divorced	5	7.14%
	Widow	2	2.86%
Working status			
	Employed	44	62.86%
	Un – employed	17	24.29%
	Retired	9	12.86%

TABLE 2. FREQUENCY DISTRIBUTION SEVERITY OF DISEASE OVER PATIENTS USING BOEY SCORE.

Boey scores	*No. of cases, 70*	*Percentage, %*
0	30	42.86%
1	32	45.71%
2	6	8.57%
3	2	2.86%

TABLE 3. FREQUENCY DISTRIBUTION SYMPTOMS OF PERFORATED DUODENAL ULCERS IN PATIENTS.

Symptoms	No. of cases, 70	Percentage, %
Severe abdominal pain	51	72.86%
Tenderness	11	15.71%
Nausea and vomiting	26	37.14%
Fever and chills	32	45.71%
Tachycardia	7	10.0%
Decreased bowel sounds	6	8.57%
Shoulder pain	14	20%

TABLE 4. FREQUENCY DISTRIBUTION CAUSES OF PERFORATED DUODENAL ULCERS IN PATIENTS.

Causes	No. of cases, 70	Percentage, %
Pylori infection	47	67.14%
Chronic NSAID use	10	14.29%
Burns/Trauma	7	10%
Zollinger-Ellison syndrome	9	12.86%
Smoking and alcohol use	39	55.71%
Steroid use	6	8.57%

TABLE 5. DETERMINING DELAY PERIOD AMONG PERFORATION AND SURGERY.

Delay Period, {Hours}	No. of cases, 70	Percentage, %
< Hour	2	2.86%
One hour to seven hours	28	40%
Eight hours to 10 hours	32	45.71%
Up to 10 hours	7	10%

TABLE 6. SURGICAL OUTCOMES OF LAPAROSCOPIC PROCEDURE.

Variables	No. of cases, 70	Percentage, %
Operation time, minutes	116.80 ± 14.95	
Pneumoperitoneum pressure, mmHg	12.55 ± 2.19	
ICU admission	3	4.29%
Length of hospital stays, days		
< 5	66	94.29%
> 5	4	5.71%
Blood loss, mL	667.28 ± 28.63	
Intraoperative adverse parameters		
NOV%	3	4.29%
Bleeding	2	2.86%
Mortality rate		
Yes	1	1.43%
No	69	98.57%
Time to oral intake, hours	36.14 ± 7.51	
Time to the first bowel movement, hours	47.81 ± 9.02	
Return of normal activities, weeks		
< 2 week	56	80%
≥ 2 weeks	14	20%

Satisfaction levels		
Excellent	54	77.14%
Good	10	14.29%
Fair	4	5.71%
Poor	2	2.86%
Pain. NRS Scores		
1st	4.16 ± 2.09	
3rd	2.74 ± 0.63	
6th	1.02 ± 0.21	

TABLE 7. POSTOPERATIVE COMPLICATIONS.

Complications	No. of cases, 70	Percentage, %
Abdominal abscess	2	2.86%
Surgical site infection (SSI	1	1.43%
Leakage from the repair site	0	0%
Bleeding	0	0%
Pneumonia/atelectasis	2	2.86%
Recurrent ulceration	0	0%
Bowel obstruction	2	2.86%
Reoperation	1	1.43%
Total	8	11.43%

TABLE 8. ASSESSMENT OF GENERAL HEALTH QUALITY–LIFE OF PATIENTS AFTER OPERATION USING SF – 36 QUESTIONNAIRE DURING FOLLOW–UP PERIOD.

Items	SF – 36 Scores
Physical Functioning	86.14 ± 6.02
Psychological Functioning	84.11 ± 2.89
Social and Emotional Functions	75.40 ± 8.12
Daily Activity Functioning	79.53 ± 4.63

V. Discussion

Despite being significantly more common versus elective peptic ulcer surgery, perforated peptic ulcers continue to be a difficult condition for surgeons to treat. Nearly 10% of the total duodenal ulcers result in perforation, which frequently serves as the disease's initial clinical manifestation [13]. Since Taylor's groundbreaking work, conservative treatment for perforated ulcers has gained support since, with the right nasogastric suction and resuscitation, 75–80% of these ulcers can eventually heal on their own. [14]

The surgeon's involvement with elective therapy for peptic ulcer disease has diminished because to the widespread use of proton pump inhibitors, histamine2 (H2)-receptor blockers, and, more recently, successful treatment regimens for the eradication of H pylori [15,16]. Perforated ulcers still account for around 5% of all duodenal ulcers, and their incidence may be increasing due to older women's greater use in nonsteroidal anti-inflammatory medicines. The frequency of severe ulcer illness, which requires surgery, has remained constant. The viability and efficacy in laparoscopic closure on perforated ulcers have been demonstrated in many large series with the development of laparoscopic procedures. [17]

Patients with crack cocaine-induced perforated ulcers, along with ulcers brought on by the consumption of nonsteroidal anti-inflammatory medicines, can both benefit from simple laparoscopic patch closure when their perforations are not linked to acid hypersecretion. [18,19,20]

The benefits of the laparoscopic method are being shown in other established procedures [21]. We have shown other important benefits, such as a speedier return to work, a shorter hospital stay, and a quicker resumption with oral intake, in contrast to previous data where the main advantage of a laparoscopic repair was a lower need for postoperative analgesics [23,24]. The lower age of our patient population in comparison to the older age group of other series may be the cause of this discrepancy. Furthermore, our stringent criteria for identifying the phases of postoperative recovery were different from those of other series, where the postoperative course appeared less clear and frequently protracted due to social and nursing issues, resulting in a mean hospital stay for up to 17 days for one series. [25]

Additionally, the minimally invasive technique offers the significant benefits of better cosmesis and less abdominal wall stress. Up to 15% of patients who have large abdominal incisions made while suffering from peritonitis will develop postoperative incisional hernias and a serious risk of wound infection. [26]

However, broad adoption of this approach is bound to result in a lower incidence of illness and death, especially for the elderly. Because laparoscopic surgery has fewer complications than traditional laparotomy, particularly parietal adverse effects as well as general issues at patients over 65, it appears to be a desirable conservative treatment option for perforated ulcers. [27]

The findings of this multicenter trial demonstrate the feasibility of the laparoscopic technique of perforated peptic ulcer repair at a manageable morbidity and mortality rate. Our results reinforce the notion that elderly patients (> 60 years) with septic shock who also have chronic peritonitis or other related conditions continue to be at high risk.

According to previous studies, pneumoperitoneum may be dangerous when peritonitis is already present [28,29]. According to a nonrandomized trial, peritonitis, as well as septic complications, claimed the lives of two out of every fourteen patients who received laparoscopic treatment for a perforated stomach ulcer (with a 15 mmHg pneumoperitoneum) [30]. Turbulence and rising abdominal pressure may be linked to the greater incidence in bacteremia during insufflation, which spreads tainted fluids and prolongs the severity of peritonitis. [31]

VI. Conclusion

The laparoscopic intervention is effective for treating perforated duodenal ulcers in selected cases. Laparoscopic repair of perforated peptic ulcers is technically feasible and carries acceptable rates of morbidity and mortality, thus reducing complications, enhancing recovery rate, and improving health-related quality of life. More prospective randomized trials are necessary to determine the effectiveness of laparoscopic repair of perforated duodenal ulcers.

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