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OUTCOME OF OPEN REPAIR VERSUS LAPAROSCOPIC SURGERY IN PATIENTS WITH DUODENAL ULCER PERFORATION

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ABSTRACT

Background: Duodenal ulcer perforation is a life-threatening surgical emergency. With the advancement of minimally invasive techniques, laparoscopic repair has emerged as an alternative to conventional open surgery. However, comparative data on postoperative outcomes remains limited, especially in local contexts.
Objective: To compare postoperative pain between laparoscopic and open surgical repair in patients with duodenal ulcer perforation.
Methods: A randomized controlled trial was conducted at the Department of Surgery, Saidu Group of Teaching Hospital, Swat, over six months. Sixty patients with CT-confirmed duodenal ulcer perforation were enrolled and randomly assigned to laparoscopic (n=30) or open repair (n=30). Postoperative pain was assessed on postoperative day 3 using the Visual Analog Scale (VAS). Opioid consumption and time to return to normal activity were also recorded. Data were analyzed using IBM SPSS version 21. An independent sample t-test was used with a significance level of $p<0.05$.
Results: The mean VAS pain score was significantly lower in the laparoscopic group (4.5 ± 0.7) than in the open group (6.7 ± 0.8; $p<0.001$). Opioid requirement in

	the first 24 hours was also significantly reduced in the laparoscopic group (40 ± 14 mg vs. 60 ± 12 mg; p=0.002). Return to normal activity was faster in the laparoscopic group (14 ± 2 days) compared to the open group (21 ± 4 days; p<0.001). Although operative time was longer in the laparoscopic group (140 ± 18 minutes vs. 110 ± 15 minutes), this did not affect clinical outcomes. **Conclusion:** Laparoscopic repair of duodenal ulcer perforation is associated with significantly lower postoperative pain, reduced analgesic needs, and faster recovery than open repair, despite a longer operative time. These findings support the broader adoption of laparoscopic techniques in suitable patients, with the caveat of a small sample size and need for further large-scale trials.

INTRODUCTION:

Duodenal perforation is a lethal condition first reported by Lenepneau and described by Muralto in 1688 **[1]**. There are two types of duodenal perforation: open and closed. When intestinal contents escape easily into the abdominal cavity, a condition known as "free perforation," it causes widespread peritonitis. When an ulcer produces a full-thickness hole, although free leakage is restricted by adjacent organs like the pancreas, this is known as a contained perforation. Duodenal perforation is commonly brought on by peptic ulcer disease **[1,2]**. Individuals who suffer from duodenal ulcers often experience nighttime hunger or stomach pain. Acute, excruciating pain throughout the upper abdomen is a common symptom of perforation **[3]**. The past decade has seen a dramatic increase in the popularity and prevalence of minimally invasive surgical procedures. Material, optical, surgical technique, and production advancements have greatly enhanced minimally invasive surgery **[4]**. Colorectal operations, anti-reflux procedures, and cholecystectomies are only some of the invasive elective surgeries that have been substituted by laparoscopic surgery. Although laparoscopy has the potential to replace open surgery for a wide variety of operations, further study is needed to determine how best to duodenal ulcer perforation during laparoscopic procedures **[5,6]**. Even though the laparoscopic treatment technique has revolutionized the medical research world, there is still a lot of uncertainty around it. Since the beginning, laparoscopic repair of duodenal ulcer perforation has been found to be more practical and successful than open surgery **[7]**. Nonetheless, a study found that open repair is a safer and more efficient method of treating duodenal ulcer perforations. A dangerous illness that presents a unique surgical challenge globally is duodenal ulcer perforation. On this, no such data is available locally. Thus, the purpose of this study is to evaluate the post-operative discomfort of laparoscopic surgery for duodenal ulcer perforation with that of open repair. With the aim of lowering the risk to patients' health and raising the possibility of a successful course of treatment and the patient's life expectancy, the study's current findings will help medical professionals create treatment plans for patients with duodenal ulcer perforation.

The objective of this study is to evaluate the difference in post-operative pain between open repair vs laparoscopic surgery for patients who have a perforated duodenal ulcer. Duodenal ulcer perforation will be diagnosed based on findings from a CT scan in patients who present with symptoms such as abdominal pain, a sensation of fullness, and bloatedness. The diagnosis will be supported by the presence of at least three of the following CT features: pneumoperitoneum, intraperitoneal fluid, mesenteric fat streaking, thickening of the bowel wall, and the presence of extra-luminal water-soluble contrast.

Post-operative pain will be assessed on the third day after the procedure in both groups using the Visual Analog Scale (VAS). This scale ranges from 0 to 10, where 0 indicates no pain and 10 indicates the worst possible pain.

Methods:

This randomized controlled trial was conducted at the Department of Surgery, Saidu Group of Teaching Hospital, Swat, over a duration of six months following the approval of the study synopsis. The sample size was calculated using the WHO sample size calculator. The mean post-operative pain scores from a previous study were taken as 2.3 ± 2.0 for open surgery and 1.1 ± 1.2 for laparoscopic surgery in patients with duodenal ulcer perforation. With a 95% confidence level and 80% power, the calculated sample size was 60 patients, with 30 in each group. A consecutive non-probability sampling technique was used to enroll the patients. The inclusion criteria consisted of male and female patients aged between 18 and 75 years with duodenal ulcer perforation diagnosed according to the operational definition. Patients were excluded if they had a history of upper abdominal surgery, gastric outlet obstruction, or concomitant ulcer bleeding.

Following ethical approval from the hospital's board and the research department of CPSP Head Office Karachi, the study was initiated. Informed written consent was obtained from all eligible patients after explaining the study's purpose, potential benefits, and associated risks. Demographic information such as age, gender, and address was recorded, along with a detailed medical history and physical examination. Patients diagnosed with duodenal ulcer perforation were randomly assigned into two equal groups using a blocked randomization technique. All surgeries were conducted under local anesthesia. Patients in Group A underwent open surgical repair through an upper midline laparotomy, where the perforation site was sutured using Vicryl 3-0 with a round body needle, with or without an omental patch. Patients in Group B received laparoscopic surgery. In this technique, pneumoperitoneum was established using either a Veress needle or direct trocar insertion, maintaining an intra-abdominal pressure of 12–14 mmHg. The first 10 mm trocar was inserted infraumbilically for the 45-degree telescope. A fan liver retractor was introduced through a 10 mm trocar in the right subcostal region at the midclavicular line, and two additional 5 mm trocars were placed in the left subcostal region at the anterior axillary line and the right subcostal region at the midclavicular line. Once the perforation was identified, it was repaired with a PDS 3-0 or Caprofil 3-0 suture over an omental patch using either internal or external knotting techniques. Post-operative pain was assessed on the third day following surgery in both groups, using the Visual Analog Scale as defined in the operational criteria. All assessments were carried out under the supervision of a surgeon with at least five years of post-fellowship experience. Patient data were recorded on a structured proforma. The collected data were analyzed using IBM SPSS version 21. Numerical variables were presented as mean ± standard deviation. Categorical variables such were expressed as frequencies and percentages. Post-operative pain scores between the two groups were compared using the independent sample t-test, with a p-value of less than 0.05 considered statistically significant. Study findings were presented in tabular form.

Results:

The study included a total of 60 patients, divided equally into two groups: the laparoscopic group (Lap group, $n = 30$) and the open surgery group (Open group, $n = 30$). The mean age of patients in the Lap group was 47.4 ± 19.8 years, which was comparable to the Open group with a mean age of 47.1 ± 17.8 years, indicating no significant age difference between the two groups. In terms of gender distribution, the Lap group consisted of 21 males and 9 females, while the Open group included 22 males and 8 females, showing a predominance of male patients in both groups.

As seen in **table 1**, smoking status was similar across the groups, with 6 smokers in the Lap group and 5 in the Open group. The use of non-steroidal anti-inflammatory drugs (NSAIDs) was reported in 8 patients from the Lap group and 9 patients from the Open group. A history of peptic ulcers was noted in 11 patients undergoing laparoscopic surgery and 13 patients in the open surgery group, suggesting a comparable prevalence of ulcer history between groups. The duration of symptoms before presentation ranged from 6 to 13 hours in the Lap group and from 6 to 14 hours in the Open group, indicating a similar clinical profile regarding the onset of symptoms.

Table 1: Basic characteristics

Characteristic	Lap group (n=30)	Open group n=(30)
Age (years)	47.4±19.8	47.1±17.8
Gender Male Female	 21 9	 22 8
Smoker	6	5
History of NSAIDs use	8	9
Patients having history of ulcers	11	13
Duration of symptoms (range,hours)	6-13	6-14

As shown in **table 2**, the operative findings between the laparoscopic and open surgery groups showed some differences. The average size of the perforation in the Lap group was 5 mm, with a range of 4 to 7 mm, whereas in the Open group, it was slightly smaller at 4 mm, ranging from 3 to 6 mm. The mean operative time was longer in the Lap group, averaging 140 ± 18 minutes, compared to 110 ± 15 minutes in the Open group. This indicates that the laparoscopic procedures generally required more time to complete than the open surgeries.

Table 2: Operative findings

Operative finding	Lap group (n=30)	Open group (n=30)
Size of perforation (mm)	5 (4-7)	4 (3-6)
Operative timing (mean+-SD) (min)	140 +- 18	110 +- 15

As shown in **table 3**, postoperative recovery outcomes demonstrated statistically significant differences between the laparoscopic and open surgery groups. On the 3rd postoperative day, the mean pain score assessed by the Visual Analog Scale (VAS) was significantly lower in the Lap group (4.5 ± 0.7) compared to the Open group (6.7 ± 0.8), with a **p-value < 0.001**, indicating a significant reduction in postoperative pain with the laparoscopic approach. Similarly, opioid consumption within the first 24 hours post-surgery was lower in the Lap group, averaging 40 ± 14 mg, compared to 60 ± 12 mg in the Open group (**p = 0.002**), suggesting a statistically significant decrease in analgesic requirement. Furthermore, the time to return to normal daily activity was significantly shorter in the Lap group, with a mean of 14 ± 2 days, compared to 21 ± 4 days in the Open group (**p < 0.001**). These results collectively highlight the benefits of laparoscopic surgery in terms of improved postoperative recovery and reduced morbidity.

Table 3: Comparison of laparoscopic and open approaches

Criteria	Lap group (n=30)	Open group (n=30)	P value
Pain score, day 3rd, by VAS (mean ± SD)	4.5 ± 0.7	6.7 ± 0.8	<0.001
Opioid requirement in first day (mean ± SD)	40 ± 14	60 ± 12	<0.002
Return to normal activity (mean ± SD) (days)	14 ± 2	21 ± 4	<0.001

Discussion:

The present study's findings on the comparative outcomes of laparoscopic (Lap) and open surgical repair for duodenal ulcer perforation support existing literature that emphasizes the benefits of minimally invasive techniques in specific perioperative parameters. Baseline demographic characteristics such as age, gender, smoking status, NSAID use, ulcer history, and duration of symptoms were comparable between the two groups, providing a well-matched cohort for meaningful comparison. The mean age in both groups was approximately 47 years, and the male-to-female ratio was similar, aligning with the known male predominance in duodenal ulcer perforation cases as reported in previous studies **[8,9]**. The operative findings revealed a slightly larger average perforation size in the Lap group (5 mm, range 4–7 mm) compared to the Open group (4 mm, range 3–6 mm). Although the difference was not statistically significant, it is consistent with prior literature indicating that small perforations, typically less than 10 mm, are more amenable to laparoscopic repair **[10]**. The operative time, however, was significantly longer in the Lap group (140 ± 18 minutes) than in the Open group (110 ± 15 minutes). This extended duration for laparoscopic procedures is consistent with other studies attributing the increase to the complexity of intracorporeal suturing and the learning curve associated with laparoscopy **[11,12]**. Postoperative outcomes strongly favored the laparoscopic approach. The mean pain score on postoperative day one, measured using the Visual Analog Scale (VAS), was significantly lower in the Lap group (4.5 ± 0.7) compared to the Open group (6.7 ± 0.8), with a p-value < 0.001. This finding concurs with several randomized controlled trials and meta-analyses which demonstrate reduced postoperative pain with laparoscopic repair of duodenal ulcer perforation **[13,14,15]**. Furthermore, the opioid requirement in the first 24 hours post-surgery was significantly lower in the Lap group (40 ± 14 mg vs. 60 ± 12 mg; p = 0.002), echoing results from previous studies that highlighted reduced analgesic needs as a key advantage of laparoscopic interventions. The meta-analysis by Lau **[11]** showed 10 trials that compared the amount of analgesic consumption by the laparoscopic and open repair groups. A significant reduction in the dosage of opiate analgesic required in the laparoscopic group was observed in eight of the studies. In a study by Robertson et al. **[16]**, it was 15 mg morphine in the laparoscopic group and 100 mg morphine in the open group. Siu et al. **[17]** showed that the number of opioid injections in the laparoscopic group was zero, and in the open group the number was six. In a study by Katkhouda et al. **[18]**, opioid analgesics in the laparoscopic group was three doses, and in the open group it was nine doses, whereas the other two studies by Naesgaard et al. **[19]** and Johansson et al. **[20]** showed comparable results.

Another notable finding was the significantly shorter time to return to normal activity in the Lap group (14 ± 2 days) compared to the Open group (21 ± 4 days), with a p-value < 0.001. This accelerated recovery is widely recognized in the literature and is attributed to the smaller

incisions, reduced trauma, and lower postoperative morbidity associated with laparoscopy **[21,22]**. While the longer operative time might be considered a disadvantage of laparoscopic repair, the overall benefits in terms of reduced pain, decreased opioid consumption, and faster return to normal activity make it a favorable option, particularly in hemodynamically stable patients without extensive contamination. The current findings reinforce that with appropriate patient selection and surgical expertise, laparoscopic repair of duodenal ulcer perforation can lead to superior outcomes compared to the open approach. Small sample size is the limitation of our study and further RCTs carried out on this topic will help explore the subject further.

Conclusion:

In conclusion, this randomized controlled trial demonstrated that laparoscopic repair of duodenal ulcer perforation is associated with significantly lower postoperative pain, reduced opioid requirements, and a faster return to normal activities compared to open repair, despite a longer operative time. These findings support the growing body of evidence favoring minimally invasive approaches for suitable candidates, reaffirming the advantages of laparoscopy in terms of enhanced patient recovery and reduced morbidity. However, the small sample size limits generalizability, underscoring the need for larger, multicenter trials to further validate these outcomes and guide optimal surgical management strategies for duodenal ulcer perforation.

REFERENCES:

1. Ansari D, Torén W, Lindberg S, Pyrhönen HS, Andersson R. Diagnosis and management of duodenal perforations: a narrative review. Scand J Gastroenterol. 2019;54(8):939-44.
2. Clinch D, Damaskos D, Di Marzo F, Di Saverio S. Duodenal ulcer perforation: a systematic literature review and narrative description of surgical techniques used to treat large duodenal defects. J Trauma Acute Care Surg. 2021;91(4):748-58.
3. Lanas A, Chan FKL. Peptic ulcer disease. Lancet. 2017;390(94):613-24.
4. Asghar MS, Zaman BS, Zahid A. Past, present and future of surgical simulation and perspective of a developing country: a narrative review. J Pak Med Assoc. 2021;71(12):2770-6.
5. Jaafari J, Douzi S, Douzi K, Hssina B. The impact of ensemble learning on surgical tools classification during laparoscopic cholecystectomy. J Big Data 2022;9(1):1-20.
6. Siddaiah-Subramanya M, Tiang KW, Nyandowe M. A new era of minimally invasive surgery: progress and development of major technical innovations in general surgery over the last decade. Int J Surg. 2017;3(4):163–6.
7. Quah GS, Eslick GD, Cox MR. Laparoscopic repair for perforated peptic ulcer disease has better outcomes than open repair. J Gastrointest Surg. 2019;23(59):618-25.
8. Lee FY, Leung KL, Lai BS, et al. Predicting mortality and morbidity of patients operated on for perforated peptic ulcers. Arch Surg. 2001;136(1):90–94.
9. Bertleff MJ, Lange JF. Perforated peptic ulcer disease: A review of history and treatment. Dig Surg. 2010;27(3):161–169.
10. Siu WT, Leong HT, Law BK, et al. Laparoscopic repair for perforated peptic ulcer: a randomized controlled trial. Ann Surg. 2002;235(3):313–319.
11. Lau H. Laparoscopic repair of perforated peptic ulcer: a meta-analysis. Surg Endosc. 2004;18(7):1013–1021.
12. Nathanson LK, Easter DW, Cuschieri A. Laparoscopic repair/peritoneal toilet of perforated duodenal ulcer. Surg Endosc. 1990;4(4):232–233.
13. Bertleff MJ, Halm JA, Bemelman WA, et al. Randomized clinical trial of laparoscopic versus open repair of perforated peptic ulcer. Br J Surg. 2009;96(4):396–403.

14. Lee YT, Liu SY, Chuang CH, et al. Outcomes of laparoscopic vs. open surgery for perforated peptic ulcer. World J Gastroenterol. 2014;20(43):16018–16023.
15. Chung KT, Shelat VG. Perforated peptic ulcer - an update. World J Gastrointest Surg. 2017;9(1):1–12.
16. Robertson GS, Wemyss-Holden SA, Maddern GJ. Laparoscopic repair of perforated peptic ulcers: the role of laparoscopy in generalised peritonitis. Ann R Coll Surg Engl 2000; 82:6–10.
17. Siu WT, Chau CH, Law BK, Tang CN, Ha PY, Li MK. Routine use of laparoscopic repair for perforated peptic ulcer. Br J Surg 2004; 91:481–490.
18. Katkhouda N, Mavor E, Mason RJ, Campos GM, Soroushyari A, Berne TV. Laparoscopic repair of perforated duodenal ulcers: outcome and efficacy in 30 consecutive patients. Arch Surg 1999; 134:845–850.
19. Naesgaard JM, Edwin B, Reiertsen O, Trondsen E, Faerden AE, Rosseland AR. Laparoscopic and open operation in patients with perforated peptic ulcer. Eur J Surg 1999; 165:209–214.
20. Johansson B, Hallerback B, Glise H, Johnsson E. Laparoscopic suture closure of perforated peptic ulcer: a nonrandomized comparison with open surgery. Surg Endosc 1996; 10:656–665.
21. Sanabria JR, Morales CH, Villegas MI, et al. Laparoscopic repair of perforated peptic ulcer: A meta-analysis. J Laparoendosc Adv Surg Tech A. 2005;15(4):384–391.
22. Miserez M, Peeters P, Penninckx F. Laparoscopic repair of perforated peptic ulcers: A prospective cohort study. Surg Endosc. 2001;15(6):603–606.