

EFFECTIVENESS OF LAPAROSCOPIC TECHNOLOGIES IN THE TREATMENT OF PATHOLOGIES OF THE DUODENUM

<https://doi.org/10.5281/zenodo.22052414>

Saidnabiyev Shoxrux Hakim o'g'li

Lecturer, Department of Medicine, Turon University

Saidnabiyevshohruh8@gamil.com

<https://orcid.org/0009-0006-8273-9854>

Abstract

This article analyzes duodenal pathologies, particularly perforated duodenal ulcer, pyloroduodenal stenosis, peptic ulcer disease complicated by bleeding, and the clinical effectiveness of laparoscopic technologies in their management. A review of the literature shows that, in hemodynamically stable patients, laparoscopic suturing, omental patch repair, diagnostic laparoscopy, and other minimally invasive approaches reduce operative trauma, decrease pain, lower the risk of wound infection, and facilitate early mobilization. At the same time, an open surgical approach may be a safer option in cases of shock, diffuse peritonitis, large perforation, severe cardiopulmonary insufficiency, or insufficient technical capability. Along with the advantages of laparoscopy, the article also discusses limitations related to conversion, suture failure, intra-abdominal abscess, prolonged operative time, and the surgeon's experience.

Keywords

duodenum, duodenal ulcer, perforation, pyloroduodenal stenosis, laparoscopy, omental patch repair, minimally invasive surgery, operative trauma.

INTRODUCTION

Duodenal pathologies are among the conditions frequently encountered in general surgery and gastroenterology and, when diagnosed late, may pose a threat to the patient's life. Duodenal ulcer disease, ulcer perforation, stenosis, penetration, and bleeding may require emergency or elective surgical intervention. In the modern clinical approach, conservative treatment, endoscopic hemostasis, radiologic embolization, and surgical methods are not viewed as competing options, but rather as stepwise alternatives selected according to the patient's condition. In this context, laparoscopic technologies have become one of the most important minimally invasive approaches in the treatment of duodenal pathologies.

The relevance of the problem lies in the fact that duodenal pathologies often present with an acute abdomen, diffuse peritonitis, fluid and electrolyte disturbances, and a risk of sepsis. In such situations, the choice of surgical method is determined not merely by a smaller incision or a cosmetic result. The patient's hemodynamic stability, perforation diameter, ulcer location, degree of intra-abdominal contamination, the surgeon's endovideosurgical experience, operating-

room equipment, and anesthetic risk must be assessed together. An inappropriate choice may lead to prolonged operative time, suture failure, or the need for repeat intervention.

Proponents of laparoscopy emphasize its lower invasiveness, magnified visualization, the possibility of a complete examination of the abdominal cavity, less pain, shorter hospitalization, and faster rehabilitation. The opposing view is that the method is not universal: in the presence of a large perforation, massive peritonitis, unstable blood pressure, severe comorbidity, or insufficient experience, laparoscopic intervention may not reduce risk and may instead lead to loss of valuable time. Therefore, the main question addressed in this article is not whether laparoscopy is good or bad, but in which patient, under what conditions, and with which technical algorithm it is effective.

The aim of the study was to analyze the clinical effectiveness of laparoscopic technologies in the treatment of duodenal pathologies, identify their advantages and limitations compared with conventional open surgical methods, and substantiate practical selection criteria. The objectives were to identify the principal situations in which laparoscopy is used for duodenal pathology, define effectiveness criteria, compare outcomes reported in local and international literature, assess the risk of conversion and complications, and develop practical recommendations.



Figure 1. Intraoperative view during laparoscopic duodenal surgery.

Source: Chiarenza S.F. et al. Tips and Tricks in the Laparoscopic Treatment of Type I Duodenal Atresia: Description of a Technique. Children, 2025.

<https://www.mdpi.com/2227-9067/12/4/517>



Figure 2. General laparoscopic surgical procedure: real operating-room image.

Source: Laparoscopic.MD. What is Laparoscopic Surgery?

<https://www.laparoscopic.md/surgery>

MATERIALS AND METHODS

The article was prepared using a literature review and a comparative analysis of clinical and practical outcomes. The analysis included scientific studies on duodenal ulcer, perforation, pyloroduodenal stenosis, and endovideosurgery published by researchers from medical institutions in Uzbekistan, as well as international guidelines and meta-analyses. Sources were selected according to their direct relevance to the topic, availability of clinical outcome indicators, the possibility of comparing surgical techniques, and their practical significance in recent years. Particular attention was paid to laparoscopic suturing, omental patch repair, diagnostic laparoscopy, minimally invasive duodenoplasty, and conversion rates.

Effectiveness was assessed using the following indicators: degree of operative trauma, postoperative pain, need for analgesics, restoration of intestinal peristalsis, wound infection, intra-abdominal abscess, suture failure, need for reoperation, duration of hospitalization, time to return to daily activity, and overall safety. These criteria make it possible to evaluate the laparoscopic method not merely as a technical innovation, but as a comprehensive surgical strategy that affects clinical outcomes.

For the analysis, duodenal pathologies were considered in three groups. The first group included perforated duodenal ulcer, because laparoscopic suturing and omental patch repair are most frequently discussed in this setting. The second group included pyloroduodenal stenosis and chronic ulcer complications accompanied by gastrectasia; in these cases, the issue of minimally invasive or less traumatic reconstructive procedures is relevant. The third group included duodenal ulcer complicated by bleeding, in which the role of laparoscopy is evaluated together with endoscopic hemostasis, radiologic methods, and open surgery.

The article does not replace a clinical protocol; its conclusions are analytical and scientific-practical in nature. In an emergency, the final decision must be based on the patient's actual condition, laboratory and instrumental findings, anesthetic risk, the experience of the surgical team, and the technical capabilities of the institution. This limitation preserves the methodological integrity of the article: laparoscopy is not a mandatory method for every patient, but a highly effective technology in appropriately selected patients and under appropriate conditions.

RESULTS

The literature review shows that the principal advantage of laparoscopic technologies is the reduction of operative injury and earlier patient rehabilitation. In perforated duodenal ulcers, laparoscopic suturing generally consists of refreshing the perforation margins, placing simple sutures, reinforcing them with an omental patch, and performing sanitation and drainage of the abdominal cavity. Magnified visualization helps identify small perforations, assess the spread of

peritonitis, and exclude additional pathology. Compared with open laparotomy, the smaller incision reduces postoperative pain, respiratory restriction, and the risk of wound infection.

Local studies have also demonstrated the clinical advantages of the laparoscopic approach. Studies by researchers of the Samarkand surgical school analyzing the use of minimally invasive technologies in perforated gastroduodenal ulcers note that the proportion of laparoscopic suturing has increased over the years and emphasize the importance of rapid diagnosis and effective surgical intervention in saving patients' lives [1]. In a comparative analysis published by S.J. Kamolov, 50 clinical cases of perforated duodenal ulcer were divided into open and laparoscopic groups; the laparoscopic method was associated with less pain, fewer complications, and a shorter hospital stay [2].

In pyloroduodenal stenosis, the role of laparoscopy is not limited to suturing a perforated ulcer. Gastric evacuation disorders, narrowing of the pyloric canal, gastrectasia, and the patient's general condition must also be taken into account. Authors from the Tashkent Medical Academy have described a minimally invasive surgical approach aimed at reducing operative trauma in the combination of pyloroduodenal stenosis and gastrectasia [3]. The main concept in such studies is not to regard a major resectional procedure as mandatory in every case, but to select a shorter, safer, and pathophysiologically justified operative option for a high-risk patient.

Endovideosurgery in children and adolescents requires particular caution. Studies associated with the Republican Center for Pediatric Minimally Invasive and Endovisual Surgery have shown that videolaparoscopy can expand diagnostic and therapeutic possibilities in perforations of the stomach and duodenum [4]. In such patients, an important advantage of the laparoscopic approach is reduced abdominal-wall trauma, improved cosmetic outcomes, and faster rehabilitation; however, because of tissue delicacy, smaller anatomic dimensions, and anesthetic risk, the technical requirements may be even higher than in adults.

International guidelines also support laparoscopy in selected patients. The WSES guidelines recommend a laparoscopic approach in hemodynamically stable patients with perforated peptic ulcer, whereas open surgery is preferred in unstable patients [8]. This position is important in practice: laparoscopy requires strict patient-selection criteria. If the patient is in shock, the abdominal cavity is extensively contaminated, or the operation must be completed rapidly, open surgery should not be delayed.

Table 1. Comparative evaluation of laparoscopic and open surgical approaches in duodenal pathologies

Evaluation criterion	Laparoscopic approach	Open approach
Operative trauma	Small incisions, less abdominal-wall injury	Large incision, greater abdominal-wall trauma
Pain and	Less pain, earlier	More pain and a

rehabilitation	patient mobilization	longer period of bed rest may occur
Abdominal cavity exploration	Magnified image, greater diagnostic capability	Allows manual palpation
High-risk situations	Limited in unstable patients, large perforations, or when experience is insufficient	More reliable in shock, severe peritonitis, and complex anatomy
Complications	Lower wound infection rate, but careful monitoring for suture failure and abscess is essential	More wound complications, but faster control in complex cases

DISCUSSION

The effectiveness of laparoscopic technologies is measured by clinical outcomes. The mere presence of a small incision does not make an operation effective. If the laparoscopic surgeon cannot close the perforation reliably, if sanitation of the abdominal cavity is inadequate, or if the operation is prolonged and the patient's overall condition deteriorates, the method loses its value. Therefore, the principal prerequisites for laparoscopy in duodenal pathologies are strict selection, a clear tactical plan, and readiness to convert when necessary. Conversion is not a sign of failure; on the contrary, it is a professional decision that places patient safety first.

In perforated duodenal ulcer, the optimal laparoscopic technique is usually limited to simple suturing and omental patch repair. Today, because of etiologic treatment of peptic ulcer disease, proton pump inhibitors, and *Helicobacter pylori* eradication, radical acid-reducing operations are no longer used as widely as in the past in most cases. In an emergency, the main tasks are to close the perforation, clean the abdominal cavity, control sepsis, and correctly continue subsequent conservative gastroenterological treatment. This concept protects the patient from unnecessary trauma.

However, simplification of the approach must not be confused with ignoring risk. In the presence of a large perforation, a callous ulcer, friability of the duodenal wall, pyloroduodenal stenosis, active bleeding, necrotic tissue, or extensive fibrinopurulent peritonitis, simple suturing may be insufficient. In such cases, duodenoplasty, pyloroplasty, a drainage procedure, resectional intervention, or conversion to an open approach may be considered. Therefore, the term effectiveness in the context of this article does not mean that the same result is achieved in every case; it means that a high level of benefit can be obtained within appropriately selected indications.

Laparoscopy is not a first-line method in duodenal ulcers complicated by bleeding. In such cases, endoscopic hemostasis, intensive therapy, and, when necessary, angiographic embolization play important roles. Surgical indications

arise in the presence of recurrent bleeding, hemodynamic instability, failure of endoscopic hemostasis, or associated complications. Laparoscopy may be used if it allows reliable control of the bleeding source; however, when rapid and wide exposure is required, the open approach is often preferable.

Another factor influencing laparoscopic outcomes is the preparedness of the operating team. Without high-quality optics, energy devices, atraumatic needles, a reliable suction-irrigation system, a sterilization protocol, and anesthetic monitoring, the theoretical advantages of the method will not translate into practical results. Especially in district or remote hospitals, the introduction of laparoscopy should not end with the purchase of equipment alone; without training, mentorship, a standard operative algorithm, conversion criteria, and an audit system, patient safety may be compromised.

An important feature of local medical practice is that endovideosurgery in Uzbekistan is no longer limited to clinics in the capital. Scientific schools in Samarkand, Andijan, and Tashkent are presenting clinical data on duodenal ulcer complications, perforation, stenosis, and minimally invasive surgery. The practical conclusion for this article is clear: when evaluating laparoscopic technologies, merely importing external theory is insufficient; a national algorithm should be developed on the basis of the local patient profile, delayed presentation of disease, hospital resources, and surgeons' qualifications.

Three small but decisive changes are needed to improve effectiveness. First, a rapid laboratory and imaging diagnostic algorithm should be introduced in the emergency department for patients with suspected perforated ulcer. Second, a short checklist should be developed to distinguish patients who are suitable from those who are unsuitable for laparoscopy. Third, the outcome of every laparoscopic duodenal intervention should be recorded according to pain, complications, conversion, length of stay, and readmission. Without any one of these three measures, the idea presented in the article will remain merely theoretical.

PRACTICAL RECOMMENDATIONS AND LIMITATIONS

In implementing laparoscopy for duodenal pathologies, the weakest point is often not the technology itself but the decision-making algorithm. If free intraperitoneal gas, signs of peritonitis, acute epigastric pain, and intoxication are identified in the emergency department, the surgical team must rapidly determine whether the patient is suitable for laparoscopy. A suitable patient is hemodynamically stable, has a relatively short interval since perforation, has controllable intra-abdominal contamination, and has a small or medium-sized perforation. An unsuitable patient is one with shock, severe cardiopulmonary insufficiency, diffuse purulent peritonitis, a large callous ulcer, or a combination of stenosis and bleeding.

A study by Sh.I. Karimov and co-authors involving 212 patients at the clinic of the Tashkent Medical Academy shows that, when choosing between laparoscopic, video-assisted, and open approaches, the perforation diameter, the nature of peritonitis, and the condition of the intestinal loops should be assessed separately [6]. This approach reinforces the central idea of the article: the choice of method

must be based not on the surgeon's preference, but on the actual severity of the pathological process. In particular, laparoscopic suturing is reasonable when the perforation is up to 5 mm and the infiltrative rim is not pronounced, whereas an open or video-assisted option should be considered for a larger perforation or when sanitation is limited.

The postoperative stage is also part of the effectiveness of laparoscopy. If the patient is not given a clear plan for proton pump inhibitors, antibacterial therapy, *Helicobacter pylori* testing, and eradication therapy, the sutured perforation is only a temporary solution while the risk of recurrent ulcer disease remains. Therefore, continuity between the surgeon, gastroenterologist, and family physician determines the outcome. Laparoscopy can reduce operative trauma, but it does not replace etiologic treatment.

Future research on this topic should not be limited to the experience of a single center. If data from district hospitals, regional centers, and specialized clinics are combined, it will become clearer which patients benefit most from laparoscopy under the conditions of Uzbekistan and in which patients an open approach is safer. Such a registry should obligatorily include age, delay before presentation, comorbid diseases, perforation size, type of peritonitis, duration of surgery, reason for conversion, and 30-day outcomes.

CONCLUSION

Laparoscopic technologies in the treatment of duodenal pathologies are an effective but selectively applied direction of modern surgery. In hemodynamically stable patients presenting with perforated duodenal ulcer, laparoscopic suturing and omental patch repair reduce operative trauma, decrease pain, lower the risk of wound infection, and promote early mobilization. Diagnostic laparoscopy also makes it possible to assess the condition of the abdominal cavity, identify the pathological focus, and perform a therapeutic intervention at the same time.

In cases of pyloroduodenal stenosis, gastrectasia, callous ulcer, large perforation, active bleeding, or severe peritonitis, laparoscopy should be selected with caution. In these situations, open surgery, reconstructive procedures, or a combined strategy may be safer. Therefore, the true effectiveness of laparoscopy is determined not by the availability of equipment, but by appropriate patient selection, sound operative technique, team experience, and timely decision-making regarding conversion.

The principal practical recommendation is that laparoscopy may become a standard approach for duodenal pathologies, but it should not be used without a protocol, by an untrained team, or at the cost of losing time in a critically ill patient. Laparoscopic technologies provide real clinical benefit to the patient only when each institution develops an algorithm appropriate to its resources, risk criteria, and an outcome-monitoring system.

REFERENCES:

1. Mustafakulov I.B., Murtazayev Z.I., Kamolov S.J., Sherkulov K.U. Evaluation of treatment outcomes of perforated duodenal ulcer using minimally invasive technologies // Problemy biologii i meditsiny. 2017. No. 1(93). pp. 84-85.
2. Kamolov S.J. Optimization of surgical tactics in perforated duodenal ulcer: a comparative analysis of laparoscopic and conventional methods // HealthWay: Scientific and Practical Medical Journal. 2025. Vol. 1, No. 7. pp. 246-257.
3. Djamalov S.I., Aripova N.U., Israilov B.N., Pulatov M.M., Matmuradov S.K. Low-Invasive: A Way of Surgical Treatment Ulcer Pyloric-Duodenal Stenosis // The American Journal of Medical Sciences and Pharmaceutical Research. 2020. Vol. 2, Issue 11. P. 115-119.
4. Berdiev E.A., Atakov S.S., Faizullaev T.S., Kasimov U.K., Mukhidinov A.U. Possibilities of treating perforative ulcers of the stomach and duodenum by means of endovideosurgery // International Journal of Medical Sciences and Clinical Research. 2024. Vol. 4, Issue 2. P. 59-63.
5. Salomov Sh.N., Aliyev Kh.M. Methodology of implementing surgical operation in the treatment of duodenal ulcer // Doktor axborotnomasi. 2024. No. 4(116). pp. 67-69.
6. Karimov Sh.I., Khakimov M.Sh., Ashurov Sh.E. Minimally Invasive Interventions in Surgery of Perforated Duodenal Ulcers // American Journal of Medicine and Medical Sciences. 2016. Vol. 6(6). P. 171-175.
7. Rustamov M., Mustafakulov I., Makhromov U., Jurayeva Z. Endoscopic hemostasis in bleeding from duodenal ulcers // Problemy biologii i meditsiny. 2017. No. 1(93).
8. Tarasconi A., Coccolini F., Biffl W.L. et al. Perforated and bleeding peptic ulcer: WSES guidelines // World Journal of Emergency Surgery. 2020. Vol. 15. Article 3.
9. Biloslavo A., et al. Laparoscopic treatment for perforated gastroduodenal ulcer // Annals of Laparoscopic and Endoscopic Surgery. 2023.
10. Siu W.T., Leong H.T., Law B.K.B. et al. Laparoscopic repair for perforated peptic ulcer: a randomized controlled trial // Annals of Surgery. 2002. Vol. 235(3). P. 313-319.
11. Vakayil V., Bauman B., Joppru K. et al. Surgical repair of perforated peptic ulcers: laparoscopic versus open approach // Surgical Endoscopy. 2019. Vol. 33. P. 281-292.
12. Cirocchi R., et al. Laparoscopic versus open repair for perforated peptic ulcer: systematic review and meta-analysis // Surgical Endoscopy. 2018.