AMERICAN ACADEMIC PUBLISHER

INTERNATIONAL JOURNAL OF MEDICAL SCIENCES

ISSN NUMBER: 2692 - 5206 Volume 6. No 02. February ,2026

OPTIMIZED ENDOVIDEOSURGICAL APPROACH FOR ABDOMINAL INJURIES

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Abstract.

Abdominal injuries are associated with significant morbidity and mortality, and their diagnosis and treatment remain complex and controversial. This study evaluated the effectiveness of endovideosurgery and enhanced surgical techniques for the diagnosis and treatment of hemodynamically stable and unstable patients with abdominal injuries. This study included 190 cases of abdominal injuries treated between June 2020 and June 2025. The main group underwent endovideosurgery and improved surgical techniques, while the comparison group was treated with traditional methods. The outcomes of the advanced surgical approach and endovideosurgery were assessed and compared with traditional methods to evaluate their clinical significance. The use of endovideosurgery and enhanced surgical techniques reduced the rate of exploratory surgery for abdominal injuries from 25.4% to 3.6% (a sevenfold reduction). Postoperative complications also showed a significant decrease in abdominal injuries from 30.5% to 7.1%. Dividing patients based on hemodynamic stability is crucial in the surgical management of abdominal injuries, facilitating the effective use of endovideosurgical techniques in appropriate patient categories.

Key words

laparoscopy, abdominal injuries, extended Focused Assessment with Sonography for Trauma.

Introduction. Injuries represent a significant challenge within the healthcare system, leading to high rates of disability and mortality among affected individuals. The World Health Organization reports that injuries are responsible for 5 million deaths globally, with approximately 50% of fatalities occurring in individuals aged 15 to 44. This situation notably impacts the economic and productive workforce, particularly in developing nations, underscoring its social and economic ramifications [1].

Abdominal injuries make up 20% of cases and occur concurrently with trauma to organs in abdomen serous cavity. These injuries often result in severe hemorrhaging, shock, and peritonitis, necessitating prompt surgical intervention [2–4]. However, diagnostic and tactical errors – ranging from 30% to 70% – along with postoperative complications and a mortality rate of 30%, remain prevalent in treating this patient population. Consequently, there is a pressing need to explore and enhance both new and existing methods for diagnosing and treating abdominal injuries [5–8].

The purpose. To improve surgical management for abdominal injuries by developing an optimal diagnostic and treatment algorithm based on the use of endovideosurgical techniques.

Material and methods. The study was conducted through a comparative analysis of 190 (100.0%) patients diagnosed with abdominal injuries at the clinic of Samarkand State medical university between 2020 and 2025. Patients were categorized into two primary groups based on their diagnostic and treatment methods. The comparative group included 122 patients who received standard traditional diagnosis and treatment methods between 2020 and 2023. In

AMERICAN ACADEMIC PUBLISHER
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contrast, the main group consisted of 68 patients who were treated in the period 2023 to 2025, employing enhanced surgical techniques derived from endovideosurgery practices.

The ages of the patients ranged from 18 to 88 years, with the largest cohort comprising 126 individuals (66.3%) aged between 18 and 44 years. Injury severity was assessed using the New Injury Severity Score (NISS). The average severity scores for abdominal injuries were 13.57 ±1.04 and 13.51 ±0.84 points ($p = 0.962$).

Differentiated surgical management for the diagnosis and treatment of abdominal injuries. To enhance treatment outcomes for patients with abdominal injuries, an advanced diagnostic and treatment algorithm was implemented for those in the main group. This algorithm began with an assessment of the patient's hemodynamic status. If the patient exhibited hemodynamic instability (systolic blood pressure < 90 mm Hg, heart rate > 120 beats per minute, respiratory rate > 30 breaths per minute, or signs of clinical hemorrhagic shock) and there were indications of vital organ injury (e.g., abdominal bleeding due to large vessel damage), prompt laparotomy weas performed. If hemodynamic instability was present without signs of vital organ injury, an ultrasound examination was conducted following the extended Focused Assessment with Sonography for Trauma (e-FAST) protocol for abdomen. If the abdominal e-FAST results were positive, laparotomy was performed. In the event that abdominal e-FAST results were negative, further investigation was required to identify the source of bleeding, followed by a repeat e-FAST.

For patients with stable hemodynamics (systolic blood pressure > 90 mm Hg, heart rate < 120 beats per minute, respiratory rate < 30 breaths per minute, and no overt signs of hemorrhagic shock) and abdominal injuries, an extensive ultrasound examination of the abdomen, along with computed tomography, X-ray, laboratory tests, and other instrumental assessments, was carried out. If video-assisted thoracoscopy revealed diaphragmatic injury, video-assisted laparoscopy was performed in the subsequent stage to address this damage. During abdominal cavity examinations, if damage was noted (e.g., free gas or fluid), video laparoscopy was conducted to address the injury. Additionally, positive results from rapid analyses for abdominal cavity fluid, such as elevated alkaline phosphatase and amylase levels, indicated potential hollow organ injury that required intervention. If video laparoscopic approaches were unsuccessful, conversion to laparotomy was performed.

Results. Surgical tactics and procedures performed on the comparison group of patients.

Traditionally and generally accepted diagnostic and treatment methods were applied to all 122 patients in the comparison group.

In this group, all patients with abdominal trauma in the comparison group underwent laparotomy. Diagnostic laparotomy carried out in 15 (25.4%) patients.

Surgical management for main group patients.

In all 68 patients of the main group, a surgical tactic developed based on endovideosurgical methods was used in diagnosis and treatment.

In all patients with abdominal injuries in the main group, traditional surgical methods were used in some cases, while minimally invasive surgical methods were used in others. In this cohort, video laparoscopy was performed in 40 (58.8%) patients, video laparoscopy followed by laparotomy in 7 (7.3%) patients, and laparotomy was carried out in 16 (23.5%) patients directly. Diagnostic laparotomy was conducted on 5 (7.3%) patient in this group.

An analysis of the outcomes associated with the proposed surgical tactics and techniques for managing abdominal injuries was conducted, focusing on operational characteristics, postoperative complications, and mortality rates.

AMERICAN ACADEMIC PUBLISHER
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In patients with abdominal trauma, the implementation of endovideosurgery and enhanced surgical tactics led to a significant reduction in the need for diagnostic laparotomies, decreasing from 25.4% to 3.6% (a sevenfold reduction) (χ^2 = 6.042; Df = 1; p = 0.014). Specifically, in the comparative group, diagnostic laparotomy was performed on 42 (34.4%) patients. In contrast, within the main group, only 3 (2.4%) patient underwent diagnostic laparotomy, while 26 (21.3%) patients had diagnostic laparoscopy performed.

Following the surgical procedures with abdominal injuries in the main group, complications were noted in 7 (10.2%) patients: 3 (4.6%) patient experienced suppuration of the postoperative wound.

Postoperative complications were addressed using both conservative and surgical interventions. Specifically, in the comparison group, 2 (1.6%) patients died on the first day after surgery due to hemorrhagic shock and multiple organ failure.

The implementation of endovideosurgical techniques and enhanced surgical strategies in the main group led to a notable reduction in the occurrence of postoperative complications. In this cohort, complications were recorded in only 2 (2,9%) patients: suppuration of the postoperative wound. In contrast, the comparison group exhibited a higher complication rate, with 17 (13.9%) patients affected. Among these, 12 (9.8%) patients had wound suppuration, 3 (2.4%) patient presented with a subdiaphragmatic abscess, 2 (1.6%) patient developed peritonitis, all of which are typically associated with open surgical procedures. Additionally, in the main group, 1 (1.4%) patient succumbed to septic shock and multiple organ failure. In the comparison group, despite receiving medical intervention, 2 (1.6%) patients died due to multiple organ failure, while (3.1%) from acute blood loss and hemorrhagic shock.

Discussion. The analysis of diagnostic and treatment outcomes has shown that using the surgical tactics developed based on endovideosurgical methods in abdominal injuries offers significant advantages compared to standard surgical approaches. The primary reasons for this include the higher complication rates following open procedures, prolonged post-operative recovery time before patient mobilization, and an increase in hospital stays, leading to a more challenging recovery process after surgery.

Thorough analysis of the diagnostic and treatment outcomes reveals that the use of endovideosurgery techniques and enhanced surgical approaches has led to a significant reduction in postoperative complications for all characterized injured group patients.

For patients with abdominal injuries, postoperative complications fell from 30.5% to 7.1% (χ^2 = 5.856; Df = 1; p = 0.016), with a mortality rate of 3.39% in the comparison group and no deaths in the main group (χ^2 = 0.971; Df = 1; p = 0.325).

The study demonstrated that implementing the proposed surgical tactics allows for rapid diagnosis of patients and facilitates the selection of optimal treatment methods by incorporating both traditional and modern minimally invasive techniques. As a result, the number of unnecessary open diagnostic operations decreases, disability rates are reduced, and patients are able to return to active lifestyles earlier.

It should be particularly noted that despite numerous studies and analyses, the use of endoscopic surgical methods in diagnosing and treating this category of injuries – especially the indications, contraindications, capabilities, and limitations of endovideosurgical techniques – remains insufficiently explored. The choice of an optimal surgical strategy for patients continues to be a topic of debate. Research indicates the need to further explore measures that allow the selection of appropriate surgical tactics for abdominal injury patients at all stages of diagnosis and treatment while ensuring that postoperative complications are not increased when using minimally invasive technology.

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Conclusions. Endovideosurgical technique proves to be a safe and effective method for managing abdominal injuries. The adoption of minimally invasive and improved surgical strategies has resulted in shorter hospital stays, fewer exploratory operations, a decrease in postoperative complications, and thorough evaluations with no missed injuries.

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