

## **Problems with Traditional Laparoscopy in Gynecology and the Rationale for the Development of a Gasless Laparoscopy Technique under Spinal Anesthesia Only without a Laparolift**

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**Abstract:** Laparoscopy under general anesthesia with CO<sub>2</sub> pneumoperitoneum has become a recognized standard for the surgical treatment of various gynecological conditions. However, increased intra-abdominal pressure, the Trendelenburg position, carbon dioxide insufflation, and the need for tracheal intubation are accompanied by significant cardiorespiratory changes and a high drug load. This limits the safety and accessibility of laparoscopy in patients with comorbidities, pregnant women, elderly women, and in regional hospitals with insufficient anesthesia and intensive care facilities. Objective. To conduct a comprehensive analysis of the clinical, physiological, anesthesiological, and organizational-economic challenges of traditional laparoscopy in gynecology and, based on this, to justify the need to develop and implement a new method of gasless laparoscopy under spinal anesthesia without the use of a laparolift. Material and Methods. The study was conducted as a problem-based analytical review. Data from domestic and international publications on the effects of CO<sub>2</sub> pneumoperitoneum and general anesthesia on hemodynamics, respiration, postoperative pain, nausea, and vomiting during laparoscopic interventions in gynecology were used, as well as reports on gasless technologies and laparoscopy under regional anesthesia. Clinical observations of the use of laparoscopic interventions under spinal anesthesia in gynecological practice were also analyzed. Results Traditional laparoscopy under general anesthesia with CO<sub>2</sub> pneumoperitoneum has been shown to be associated with the risk of hypercapnia, increased airway pressure, systemic hemodynamic instability, a high incidence of postoperative pain, nausea, and vomiting, as well as significant demands on operating room equipment and personnel qualifications. The use of low-pressure CO<sub>2</sub>, gas-free technologies with a laparolift, and laparoscopy under intubation anesthesia only partially reduces the severity of adverse effects. Analysis of available data and clinical observations highlights the need for a method that eliminates CO<sub>2</sub> pneumoperitoneum and laparolift while using intubation anesthesia and maintaining adequate pelvic visibility at zero intra-abdominal pressure. Conclusion. The combination of cardiorespiratory, anesthesiological, and organizational/economic limitations of traditional laparoscopy in gynecology justifies the need to develop a new method of gasless laparoscopy under spinal anesthesia without a laparolift.

**Keywords:** Laparoscopy, Gynecology, CO<sub>2</sub> Pneumoperitoneum, General Anesthesia, Spinal Anesthesia, Gasless Laparoscopy, Laparolift, Cardiorespiratory Complications, Postoperative Pain, Nausea and Vomiting, Regional Hospitals

### **Introduction**

Over the past decades, laparoscopic interventions have become the leading surgical treatment for various gynecological pathologies, displacing laparotomy in most efficacy and safety indicators. Results of meta-analyses and randomized clinical trials have shown that laparoscopy is associated with less intraoperative blood loss, a lower rate of postoperative complications, less severe pain, and a shorter hospital stay compared to open surgery [1], [2], [3], [4]. These advantages have also been confirmed in special patient groups—in particular, in pregnant women with adnexal pathologies, where laparoscopy, if the selection criteria are met, does not worsen obstetric outcomes and reduces the length of hospital stay [5], [6], [7], [8].

The standard laparoscopic technique involves the use of general anesthesia with tracheal intubation and CO<sub>2</sub> pneumoperitoneum. This combination ensures stable respiratory control and sufficient operative space, but is accompanied by specific physiological effects. Standard (more than 12 mmHg) pneumoperitoneum and the Trendelenburg position lead to an increase in central venous pressure, pulmonary artery pressure and pulmonary artery wedge, a decrease in cardiac output, and changes in myocardial pre- and afterload [9], [10], [11], [12], [13].

At the same time, the impact on the respiratory system increases: pulmonary compliance decreases, airway pressure increases, and intracranial pressure may rise due to venous congestion [11], [12], [13], [14].

Even in relatively young patients, these changes require careful monitoring and competent anesthetic management. In patients with concomitant cardiorespiratory pathology (arterial hypertension, coronary artery disease, COPD, obesity), the effects of pneumoperitoneum and Trendelenburg can increase the risk of intra- and early postoperative complications. Modern systematic reviews show that in large surgical cohorts, general anesthesia is associated with a higher incidence of respiratory failure and sepsis compared with regional anesthesia [15], [16], [17], [18], making the choice of anesthetic method crucial, especially in high-risk patients.

To reduce the negative impact of CO<sub>2</sub> pneumoperitoneum, a number of technical modifications have been proposed: reduction of intra-abdominal pressure ("low-pressure pneumoperitoneum" laparoscopy) and gasless technologies with mechanical lifting of the anterior abdominal wall. Randomized clinical trials and meta-analyses have shown that gasless laparoscopy can reduce the severity of hemodynamic shifts and respiratory load compared to classical laparoscopy, while maintaining its minimal invasiveness [19], [20], [21], [22]. However, these technologies require the use of additional devices (laparolifts), complicate the organization of the operation, and do not always provide an optimal view of the pelvis, especially in obese patients with severe adhesions. As a result, gasless laparoscopy remains a niche technique and does not comprehensively address the problem of combining safety, simplicity, and resource conservation.

The COVID-19 pandemic has dramatically intensified the debate about the safety of laparoscopy and the choice of anesthesia. Initial concerns centered on the potential for virus aerosolization through surgical smoke and insufflated gas, as well as the risk of staff infection during intubation and extubation [23], [24], [25], [26], [27]. Subsequent recommendations from international professional societies (SAGES, EAES, ELSA, and others) confirmed that, with the use of smoke filtration systems and strict adherence to protective measures, laparoscopy remains the preferred approach even during a pandemic, and the choice between laparoscopy and laparotomy should take into account the proven advantages of minimally invasive surgery.

Concurrently, interest in regional anesthesia has increased as a way to reduce the number of aerosol-generating procedures and the drug load. A number of reviews and consensus documents (ASRA/ESRA, national and regional guidelines) emphasize that, in the absence of contraindications, regional anesthesia can reduce the incidence of postoperative pulmonary complications, the need for opioid analgesia, and the burden on intensive care units [28], [29], [30], [31]. Against this background, a combination of laparoscopy and neuraxial anesthesia has been proposed as a "compromise" option that preserves the advantages of a minimally invasive approach while reducing the risks associated with general anesthesia.

Clinical series and review papers devoted to laparoscopy under spinal or epidural anesthesia demonstrate its feasibility for interventions on abdominal and pelvic organs, including gynecological surgeries [32], [33], [34]. Less severe postoperative pain, a low incidence of nausea and vomiting, and more rapid patient mobilization compared with general anesthesia are noted. However, the vast majority of published observations continue to utilize CO<sub>2</sub> pneumoperitoneum, leaving unresolved issues related to the effects of increased intra-abdominal pressure and the need for gas equipment.

Thus, the current model of laparoscopy in gynecology faces several limitations:

- a. The physiological effects of CO<sub>2</sub> pneumoperitoneum and the Trendelenburg position;
- b. The anesthetic risks of general anesthesia, especially in patients with comorbidities;
- c. Technological and economic dependence on gas, equipment, and consumables;
- d. Limited availability of high-tech care in regional hospitals.

Against this backdrop, there is an objective need to develop a simpler and more resource-saving technique: gasless laparoscopy under spinal anesthesia without the use of a laparolift, capable of providing adequate surgical

access, reducing cardiorespiratory stress, and reducing equipment requirements. This review article is devoted to the analysis of existing data on the advantages and limitations of traditional laparoscopy and the substantiation of the concept of this method as a promising direction in the development of gynecological surgery.

The aim of this study is to conduct a comprehensive analysis of the clinical, physiological, anesthesiological, and organizational-economic problems of traditional laparoscopy in gynecology and, based on this analysis, to justify the need to develop a new method of gasless laparoscopy under spinal anesthesia without a laparolift.

### Study Objectives:

- a. To characterize the effect of CO<sub>2</sub> pneumoperitoneum and general anesthesia on hemodynamics and respiration during gynecological laparoscopic surgeries.
- b. To evaluate the anesthetic and drug burden of traditional laparoscopy and their significance for the postoperative period.
- c. To analyze organizational and resource constraints for performing laparoscopic surgeries in regional hospitals.
- d. To examine existing alternative approaches (laparoscopy under low CO<sub>2</sub> pressure, gasless technologies with a laparolift, laparoscopy under spinal anesthesia) and identify their limitations.
- e. Based on an analysis of literature and clinical observations, identify the main unresolved issues with the traditional laparoscopy model.
- f. Formulate a set of requirements for a new laparoscopy method capable of ensuring clinical safety and resource conservation in a regional healthcare setting.

### Materials and Methods

The study is problem-analytical in nature and is based on a combination of a literature review and a qualitative analysis of clinical observations.

The information base included:

- a. Data from domestic and international publications devoted to the effects of CO<sub>2</sub> pneumoperitoneum and general anesthesia on the cardiorespiratory system, the severity of postoperative pain, the incidence of nausea and vomiting, and the structure of complications in gynecological laparoscopic interventions;
- b. Studies describing the experience of using laparoscopy with low CO<sub>2</sub> pressure, gasless technologies using laparolifts, and laparoscopic surgeries under regional (primarily spinal) anesthesia;
- c. Clinical observations of laparoscopic gynecological surgeries performed under spinal anesthesia in a multidisciplinary hospital setting, with assessment of surgical tolerance, hemodynamic and respiratory characteristics, and the early postoperative period.

The data obtained were not used for quantitative statistical analysis of outcomes, but rather for a qualitative assessment of recurring problems and limitations arising from the use of various laparoscopic techniques and anesthetic management options. Based on this, requirements for the preferred laparoscopy method were developed, aimed at improving the safety and accessibility of the method in the real-life practice of regional hospitals.

Ethical aspects comply with the principles of the Declaration of Helsinki; the analysis of clinical observations was conducted within the framework of standard practice, maintaining the confidentiality of medical information.

### Results and Discussion

**Modern Standard of Laparoscopy in Gynecology.** In modern gynecological surgery, the standard for surgical treatment of most benign pelvic diseases is laparoscopy under general anesthesia with CO<sub>2</sub> pneumoperitoneum. Intra-abdominal pressure is typically maintained at 10–14 mmHg, which, combined with the Trendelenburg position (tilting the operating table head down by 15–30°), ensures cranial displacement of the intestine and greater omentum, creating a stable surgical space and adequate visualization of the pelvic organs.

General anesthesia with tracheal intubation and controlled ventilation helps compensate for the effects of increased intra-abdominal pressure and the Trendelenburg position on the respiratory and cardiovascular systems. The anesthesiologist controls the depth of anesthesia, muscle relaxation, and ventilation parameters, selecting a regimen that ensures comfort for the surgeon and relative safety for the patient.

This approach has a number of clear advantages over laparotomy: less surgical trauma, reduced postoperative

pain, early mobilization, shorter hospital stay, and a more favorable cosmetic outcome. It is for these advantages that laparoscopy is widely recognized as the "gold standard" in gynecological surgery.

However, the willingness to consider this standard universal and optimal for all patient categories and all levels of medical care raises increasing questions. Upon closer analysis, it becomes clear that the "CO<sub>2</sub> pneumoperitoneum + general anesthesia" model places high demands on both the woman's functional reserves and the technical and staffing requirements of the operating room, which is not always achievable in regional hospitals.

### **Cardiorespiratory and anesthesiological issues in CO<sub>2</sub> laparoscopy**

The effect of pneumoperitoneum and the Trendelenburg position on hemodynamics. The formation of CO<sub>2</sub> pneumoperitoneum is accompanied by an increase in intra-abdominal pressure, leading to compression of the venous vessels of the abdominal cavity and pelvis, reduced venous return through the inferior vena cava, and changes in myocardial preload. In response, compensatory responses develop in the cardiovascular system aimed at maintaining adequate cardiac output and systemic arterial pressure.

In patients without significant cardiac pathology, these changes generally remain within physiologically acceptable limits. However, in the presence of arterial hypertension, coronary heart disease, arrhythmias, previous atherosclerosis, or reduced myocardial contractility, even a moderate increase in intra-abdominal pressure can lead to episodes of arterial hypertension, tachycardia, myocardial ischemia, or, conversely, hypotension due to exhaustion of compensatory mechanisms.

The Trendelenburg position enhances the effects of pneumoperitoneum on the cardiovascular system. The displacement of abdominal organs toward the diaphragm increases venous return to the heart, increasing preload and stress on the myocardium. Given initially limited functional reserves, this can lead to significant variability in blood pressure and heart rate, requiring constant pharmacological correction and increasing the risk of intraoperative complications. Effects on respiration and gas exchange

Increased intra-abdominal pressure and cranial displacement of the diaphragm during pneumoperitoneum and the Trendelenburg position reduce the functional residual capacity of the lungs, impair lung compliance, and increase airway pressure during mechanical ventilation. This is especially significant in patients with obesity, chronic obstructive pulmonary diseases, and bronchial asthma, when the reserve capacity of the respiratory system is initially reduced.

The use of carbon dioxide to create pneumoperitoneum is accompanied by its active resorption into the systemic circulation and the development of a tendency toward hypercapnia. To maintain normal PaCO<sub>2</sub> levels, the anesthesiologist must increase the minute ventilation volume, tidal volume, and respiratory rate, which further increases airway pressure and intrathoracic pressure. In some cases, despite the correction, signs of respiratory acidosis persist, negatively affecting hemodynamics and tissue metabolism.

### **Medications for General Anesthesia**

General anesthesia for laparoscopic procedures involves the use of a combination of induction anesthetics, opioids, muscle relaxants, and, typically, inhalational anesthetics for maintenance. These drugs contribute to central nervous system and respiratory depression, alter vascular tone, and can have potentially adverse effects on the liver and kidneys.

In the early postoperative period, this manifests as nausea, vomiting, dizziness, severe weakness, and sometimes respiratory arrest, necessitating prolonged monitoring. A high incidence of postoperative nausea and vomiting impairs the patient's quality of life, increases the need for antiemetic therapy and fluid support, indirectly prolonging the hospital stay and increasing the cost of treatment.

### **Special Risk Groups**

A special risk group includes patients with obesity and metabolic syndrome, chronic lung diseases, bronchial asthma, severe cardiovascular disease, as well as pregnant women and older women. They have reduced functional reserves of the cardiovascular and respiratory systems, and impaired regulation of vascular tone and gas exchange. In this category of patients, the effects of pneumoperitoneum and general anesthesia can lead to decompensation and the development of severe complications, which often forces surgeons and anesthesiologists to refuse laparoscopy or perform it in high-risk settings.

Thus, even strict adherence to modern standards does not eliminate the fundamental cardiorespiratory and

anesthesiological problems of traditional CO<sub>2</sub> laparoscopy under general anesthesia. These problems are most acute in areas where access to minimally invasive care is especially critical—in patients with comorbidities and in regional hospitals with limited resources.

### **Organizational and resource constraints of regional hospitals**

Surgical unit equipment. Performing laparoscopic procedures under general anesthesia with CO<sub>2</sub> pneumoperitoneum requires a certain level of technical equipment. The following is required:

- a. An inhalation anesthesia and artificial ventilation apparatus;
- b. A reliable source of medical CO<sub>2</sub> (cylinders, pressure regulators, delivery system);
- c. A fully equipped laparoscopic stand;
- d. Monitors for continuous hemodynamic and respiratory monitoring.

In large centers, this is perceived as the norm. However, in the real-world practice of many regional hospitals, some of this equipment is either unavailable or available in limited quantities, which prevents laparoscopic procedures from being performed in the required volume and at any time, especially when combining elective and emergency surgery.

### **Dependence on CO<sub>2</sub> and consumables**

A separate issue is dependence on supplies of medical CO<sub>2</sub> and consumables. Logistics disruptions, delivery delays, or technical malfunctions of gas supply equipment effectively block laparoscopic procedures, forcing a return to laparotomy.

Furthermore, the consumption of CO<sub>2</sub>, disposable trocars, insufflation lines, and other components represents a significant cost. For hospitals with limited funding, this is a factor hindering the widespread use of laparoscopy, especially for routine and socially significant procedures.

### **Staffing Shortages and Uneven Training**

Safe laparoscopy under general anesthesia requires a qualified anesthesiologist-resuscitator skilled in managing patients under pneumoperitoneum and the Trendelenburg position, as well as a trained surgical team. In large centers, staffing issues are more easily resolved, while in district and inter-district hospitals, the shortage of anesthesiologists and nursing staff remains a pressing issue.

In such situations, hospital management is often forced to limit the scope of laparoscopic procedures, prioritizing the most critically ill patients and high-tech surgeries. Elective minor gynecological procedures are often performed laparotomically, despite the obvious advantages of laparoscopy for the patient.

### **Economic Aspects and Duration of Hospitalization**

The cost-effectiveness of laparoscopy is largely due to the reduced length of hospitalization and lower incidence of postoperative complications. However, with severe postoperative pain, frequent nausea and vomiting, and the need for intensive fluid and drug therapy, the actual length of hospital stay increases, offsetting the expected economic benefit.

Additional costs are associated with the need for antiemetics, pain medications, and the possibility of transfer to the intensive care unit if complications develop. For regional hospitals operating under severe budget constraints, the combination of these factors makes the classical laparoscopy model not as clearly "cheap" and cost-effective as it appears when compared solely to laparotomy under idealized conditions.

### **Alternative Approaches and Their Limitations**

In response to the identified clinical, physiological, and organizational challenges, various modifications of laparoscopic technique and anesthetic management have been proposed. However, analysis shows that each alternative addresses only a portion of the problem, without addressing it comprehensively.

### **Laparoscopy with Low CO<sub>2</sub> Pressure**

Reducing intra-abdominal pressure to 6–8 mmHg is considered one way to reduce the impact of pneumoperitoneum on hemodynamics and respiration, as well as the severity of postoperative pain. Low pressure reduces the degree of diaphragmatic elevation, reducing the load on the heart and lungs, which is especially important for patients with comorbidities. However, even at low pressure, dependence on CO<sub>2</sub> and associated equipment remains, necessitating general anesthesia with intubation and mechanical ventilation. To obtain an adequate view of the pelvic organs, it is often necessary to increase the Trendelenburg angle, which again increases the load on the cardiovascular

and respiratory systems. Thus, low CO<sub>2</sub> pressure alleviates the problem but does not fundamentally eliminate it.

### **Gasless laparoscopy using a laparolift**

Gasless technologies involve creating an operating space by mechanically lifting the anterior abdominal wall using special devices called laparolifts. This eliminates the need for CO<sub>2</sub> pneumoperitoneum, eliminating the risk of hypercapnia and reducing the impact on breathing.

However, the use of laparolifts has several disadvantages:

- a. Requires specialized, often expensive equipment;
- b. Complicates the preparatory phase of the surgery, increasing its duration;
- c. May be associated with additional trauma to the anterior abdominal wall and discomfort for the patient;
- d. Does not always provide sufficient surgical space in the pelvis, especially in obese patients with severe adhesions.

As a result, gasless laparoscopy with laparolift has not gained widespread acceptance in gynecological practice, remaining a niche technology.

### **Laparoscopy under spinal anesthesia with CO<sub>2</sub> pneumoperitoneum**

The use of spinal anesthesia in laparoscopic surgeries eliminates the need for general anesthesia, tracheal intubation, and inhalational anesthetics, reduces medication load, and reduces the risk of postoperative nausea and vomiting. Maintaining spontaneous breathing and conscious contact with the patient provides additional advantages for monitoring her condition. However, the combination of spinal anesthesia with CO<sub>2</sub> pneumoperitoneum retains the effects of increased intra-abdominal pressure and the Trendelenburg position on hemodynamics and respiration. Subjective sensations of discomfort, chest tightness, and shortness of breath are possible, requiring sedation and partial transition to general anesthesia. Furthermore, dependence on gas equipment and CO<sub>2</sub> remains, limiting the resource-saving effect of the technique.

### **Brief comparative analysis of approaches**

The overall analysis shows:

- a. Standard CO<sub>2</sub> laparoscopy under general anesthesia provides good visibility and a proven technique, but is associated with significant cardiorespiratory and anesthetic stress and high resource requirements;
- b. Laparoscopy with low CO<sub>2</sub> pressure reduces the severity of adverse effects, but does not eliminate dependence on gas and general anesthesia;
- c. Gasless technologies with a laparolift eliminate CO<sub>2</sub>, but require specialized equipment and increase the complexity and cost of the procedure;
- d. Laparoscopy under spinal anesthesia with CO<sub>2</sub> pneumoperitoneum reduces the drug load, but maintains the effects of increased intra-abdominal pressure and dependence on gas equipment.

None of these options fully meets the needs of regional healthcare, where clinical safety, minimal resource consumption, and technological simplicity are particularly important.

### **Clinical Observations and Evolving Views**

As various laparoscopy options are used in gynecological practice, it becomes clear that even with adjustments to CO<sub>2</sub> pressure, optimization of general anesthesia parameters, or the use of spinal anesthesia, a number of unresolved issues remain.

These include:

- a. Episodes of blood pressure and heart rate instability during the pneumoperitoneum and maximum Trendelenburg stages;
- b. Severe postoperative pain and the need for combined analgesia, especially when using standard CO<sub>2</sub> pressure;
- c. High frequency of complaints of nausea and vomiting in the early postoperative period with general anesthesia and opioids;
- d. Technical difficulties and limited visibility when using laparoscopic lifts, especially in obese patients;
- e. Organizational challenges associated with the need for an anesthesiologist-resuscitator and the availability of a ventilator for performing even relatively minor gynecological procedures. Observations show that patients with concomitant cardiorespiratory pathology and the most socially active women (working women, young patients, women of reproductive age) are most interested in gentle, minimally invasive interventions, but it is precisely in these patients that the limitations of the standard approach become most acute.

Taken together, this creates a demand for a technique that:

- a. Reduces or eliminates the effects of increased intra-abdominal pressure and CO<sub>2</sub> on the body;
- b. Eliminates the need for general anesthesia and intubation;
- c. Maintains all the advantages of the laparoscopic approach.

### **Requirements for a New Laparoscopy Method**

Based on an analysis of literature, clinical observations, and organizational and resource realities, a set of requirements for a promising laparoscopy method in gynecology can be formulated.

#### **Clinical and Physiological Requirements**

The new method should:

- a. Ensure stable systemic hemodynamics without significant fluctuations in blood pressure and heart rate;
- b. Minimize the impact on the respiratory system, without requiring aggressive artificial ventilation and without creating conditions for the development of hypercapnia;
- c. Reduce the severity of postoperative pain, shoulder pain syndrome, nausea, and vomiting;
- d. Facilitate early mobilization and reduce the patient's hospital stay.

#### **Anesthetic Requirements**

From an anesthetic standpoint, it is preferable that the method:

- a. Be performed under spinal anesthesia with a clearly controlled level of block sufficient for interventions on the pelvic organs;
- b. Maintains spontaneous breathing without the need for tracheal intubation and prolonged mechanical ventilation;
- c. Requires minimal sedation and additional medications;
- d. Reduces the risk of postoperative nausea and vomiting associated with the use of inhalational anesthetics and opioids.

#### **Technical, Organizational, and Economic Requirements**

From an organizational perspective, a method is desirable that:

- a. Does not depend on the availability of a CO<sub>2</sub> pneumoperitoneum or specialized gas equipment;
- b. Does not require the use of laparoscopic lifts or other expensive additional devices;
- c. Can be implemented on a standard laparoscopic stand with minimal modifications to the trocar placement technique and patient positioning;
- d. Does not place excessive demands on the level of equipment in the operating room or the number of personnel;
- e. Reduces overall costs by reducing the length of hospital stay and the need for drug therapy and intensive monitoring.

#### **Target Patient Groups**

The potential of this new method to be used in patients for whom traditional laparoscopy poses the greatest challenge is particularly significant:

- a. Women with concomitant cardiovascular and respiratory diseases;
- b. Obese patients with metabolic disorders;
- c. Pregnant women in early gestation who require surgical intervention for vital or relative indications;
- d. Women of reproductive age seeking the fastest possible return to activity;
- e. Patients living in regions with limited access to high-tech medical care.

### **Conclusion**

1. The analysis showed that traditional gynecological laparoscopy under general anesthesia with CO<sub>2</sub> pneumoperitoneum, despite its obvious advantages over laparotomy, has a number of fundamental limitations. These include cardiorespiratory stress, the drug profile of general anesthesia, the incidence of postoperative pain and nausea, and the high demands on technical and personnel resources. 2. Existing alternative approaches—low-pressure CO<sub>2</sub> laparoscopy, gasless technologies with a laparolift, and the use of spinal anesthesia with preserved pneumoperitoneum—only partially relieve the system, not eliminating its dependence on gas, specialized equipment, and complex anesthetic management.
2. Considering the specific characteristics of gynecological patients and the resource capabilities of regional hospitals, the need to develop a new laparoscopy method is justified. This method would eliminate the need for CO<sub>2</sub>

pneumoperitoneum and laparolift, utilize spinal anesthesia while maintaining spontaneous breathing, and create an adequate surgical space with zero intra-abdominal pressure.

3. The clinical, physiological, anesthesiological, and organizational-economic requirements for this method formulated in the work define the conceptual framework for the subsequent development and clinical evaluation of the original technique of gas-free laparoscopy under spinal anesthesia without a laparolift, which is considered as a promising direction for improving gynecological surgery, especially in the context of regional healthcare.

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