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Abdominal emergency laparoscopy: Addressing anesthetic concerns for abdominal emergency surgery

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Abstract

Introduction: CO2 insufflation during laparoscopic procedures leads to respiratory changes, making general anesthesia during laparoscopy considered high-risk anesthesia. In an emergency context, this risk is likely heightened.

The objective of our study is to evaluate the role of anesthesia during laparoscopy in non-traumatic emergency abdominal surgery.

Materials and Methods: Descriptive and prospective study conducted between February 2018 and October 2021, involving 337 patients undergoing laparoscopic surgery for non-traumatic acute abdominal emergencies.

Results: Of the 337 patients operated on, 190 were female (56.4%) and 147 were male (43.6%), with a mean age of 38 years ± 15 years (range 15-82 years). Comorbidities were noted in 109 patients (32.3%), with 39 patients (11.6%) having multiple concomitant comorbidities. Our patients were classified as ASA I in 74.8% (252 patients), ASA II in 22% (74 patients), and ASA III in 3.3% (11 patients). Perioperative morbidity and mortality related to anesthesia were nil. During the analytical study, we found no correlation between anesthesia duration and perioperative and postoperative morbidity and mortality (p value: 0.082) and no relationship between ASA stage and postoperative morbidity (p value = 0.392, chi-square test).

Conclusion: Emergency abdominal surgery via laparoscopy is feasible and safe from an anesthetic standpoint.

Keywords: Acute abdomen; Anesthesia; Emergency laparoscopy

1. Introduction

The minimally invasive nature and simpler postoperative course of laparoscopy make it increasingly proposed for older patients with cardiovascular and respiratory pathologies. However, pneumoperitoneum and the surgical exposure position induce unique physiopathological repercussions that condition anesthetic management. A wide range of digestive surgery interventions can now be performed laparoscopically. The advantages of laparoscopy over conventional techniques are not always evident and remain subject to debate for certain indications. General anesthesia remains the gold standard anesthetic technique for abdominal surgical interventions via laparoscopy [1,2]. With the advancement of equipment, laparoscopy is used in increasingly longer-duration surgeries and in patients with more comorbidities [3].

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The insufflation of CO2 during laparoscopy leads to hemodynamic and respiratory modifications [1, 4-8], resulting in a decrease in cardiac output and hypercapnia. Therefore, anesthesia for laparoscopy in general, and for emergency laparoscopy in particular, is considered a high-risk anesthesia.

However, in an emergency context, several questions remain unanswered regarding anesthesia used in laparoscopic surgery: Does the use of laparoscopy in emergencies pose a risk for patients from an anesthetic standpoint? Does anesthesia delay the implementation of emergency laparoscopy? What are the specificities of anesthesia in emergency laparoscopic surgery? What are the anesthetic contraindications for emergency laparoscopy?

In the course of a prospective study on the role and feasibility of laparoscopy in non-traumatic emergency abdominal surgery, we focused on the anesthetic aspect to evaluate the place of anesthesia during laparoscopy in emergency abdominal surgery and to attempt to answer the aforementioned questions.

2. Materials and Methods

A descriptive and prospective study was conducted between February 2018 and October 2021, focusing on 337 patients who underwent laparoscopic surgery for non-traumatic acute abdominal emergencies.

This study included all adult patients aged 15 years and older presenting solely with non-traumatic acute abdominal surgical emergencies.

Exclusion criteria consisted of traumatic emergencies, patients classified as ASA IV, and patients in hypovolemic or septic shock.

The anesthesia protocol typically employed in our practice is as follows:

- Anesthesia induction with Thiopental 2.5% at a dose of 5mg/kg, or propofol 1.5 to 2.5 mg/kg, followed by upkeep at 5 to 12mg/kg/h.
- Neuromuscular blockade with Rocuronium 0.6mg/kg or vecuronium 0.1mg/kg, then half of this dose administered 30 minutes later for upkeep, followed by a quarter of the dose every 20 minutes.
- Analgesia is provided either by fentanyl 1 to 7 µg at induction, followed by 1 to 3 µg/kg 20 to 30 minutes later for upkeep, or sufentanyl 0.2 to 0.5 µg at induction, then the same dose 20 to 30 minutes later for upkeep.

3. Results

Among the 337 operated patients, 190 were female (56.4%) and 147 were male (43.6%). The mean age was 38 years ± 15 years, ranging from 15 to 82 years. The body mass index (BMI) was greater than 25 in 179 patients (53.11%). A history of surgery was found in 90 patients (26.7%), and comorbidities were noted in 109 patients (32.3%) (See Table 01), with 39 patients (11.6%) having multiple concurrent comorbiditie:

- Two concomitant comorbidities : 28 patients (8.3%)
- Three concomitant comorbidities : 8 patients (2.4%)
- Four concomitant comorbidities. 3 patients (0.9%)

Patients were classified as ASA I in 74.8% (252 patients), ASA II in 22% (74 patients), and ASA III in 3.3% (11 patients). Pregnant women accounted for 4.2% (8 patients) of our sample, with a mean gestational age of 15 weeks ± 7.29 weeks, ranging from 7 to 29 weeks. The various operated pathologies are reported in Table 02.

Table 1 Different types of comorbidities

Types de comorbidities	**Nomber**	**Pourcentage**
Diabetes	36	10.8 %
Hypertension	31	09.3 %
Atopic Terrain (Medication allergy (penicillin and NSAIDs), pollens)	17	05.1 %
Thyroid disorders	16	04.8 %
Asthma	11	03.3 %

Psychiatric history	07	02.1 %
Anemia	05	01.5 %
Gastritis	04	01.2 %
Heart disease	03	0.9 %
Epilepsy	03	0.9 %
Inflammatory bowel disease (UC or Crohn's)	02	0.6 %
Psoriasis	02	0.6 %
Hodgkinien Lymphoma	02	0.6 %
Systemic disease (vasculitis, SLE, Behcet's)	03	0.9 %
Leukemia	01	0.3 %
Hepatic cirrhosis	01	0.3 %
Acute rheumatic fever (ARF)	01	0.3 %
Ophthalmic migraines	01	0.3 %
Renal lithiasis	01	0.3 %

Table 2 Operated Pathologies

Pathologies		**N**	**%**
Acutes appendicitis	Acute uncomplicated appendicitis	141	41.9%
	Appendiceal phlegmon	06	1.8%
	Appendiceal abscess	25	7.5 %
	Generalized appendiceal peritonitis	06	1.8 %
Acute lithiasic cholecystitis		88	25.9 %
Ovarian cyst torsions (OCT)		27	08.1 %
Ectopic pregnancies		23	6.9 %
Peritonitis due to peptic ulcer perforation		10	03 %
Acute intestinal adhesive obstructions		08	2.4 %
Non-specific acute abdominal pain		02	0.6 %
Retrocecal internal hernia		01	0.3 %
Total		337	100 %

The average operative time, common to all pathologies, was 52.09 minutes ± 24.14 minutes (Range: 14 minutes to 178 minutes).

The overall duration of anesthesia (surgical intervention time) was 75.35 minutes ± 25.17 minutes (Range: 29 minutes to 203 minutes).

The postoperative morbidity rate was 6.2% (n = 21 patients). No intraoperative incidents were observed.

Analytical study using correlation tests showed, on one hand, no correlation between anesthesia duration and perioperative and postoperative morbidity (p value: 0.082), and on the other hand, no correlation between ASA status and postoperative morbidity (p value = 0.392, Chi-square test).

The average overall length of hospital stay was 1.5 days (Range: 1 day to 8.5 days), and the average postoperative hospital stay was 1 day (Range: 1 day to 7.5 days).

4. Discussion

In our series, 109 patients (32.3%) had comorbidities, with 74 patients (22%) classified as ASA II and 11 patients (3.3%) as ASA III. This did not require any specific preparation for laparoscopic approach and did not delay the management of our patients or impede the feasibility of emergency laparoscopy.

There is no relationship between ASA status and postoperative morbidity (p value = 0.392, Chi-square test).

With the advancement of equipment, laparoscopy is being used in increasingly longer procedures and in patients with more comorbidities [3].

Changes in the positions of the operating table (Trendelenburg and reverse Trendelenburg positions), as well as CO2 insufflation during laparoscopy, lead to hemodynamic and respiratory changes [1, 4-8], resulting in decreased cardiac output and hypercapnia. Therefore, anesthesia for laparoscopy in general, and for emergency laparoscopy in particular, is considered high-risk anesthesia. However, the evolution of anesthesia protocols and the improvement of monitoring techniques provide satisfactory responses to these new requirements and ensure good safety for this type of procedure [3,9].

General anesthesia remains the preferred anesthetic technique for abdominal surgery via laparoscopy [1,2]. The role of regional anesthesia (spinal anesthesia and epidural anesthesia) during laparoscopic surgery remains controversial and warrants further prospective studies [10].

Controlled ventilation is recommended because several factors can induce hypercapnia, including depression of ventilation by anesthetic agents, absorption of CO2 from the peritoneal cavity, and mechanical impairment of ventilation by pneumoperitoneum and the Trendelenburg position [2].

If the insufflation pressure of CO2 exceeds venous pressure, less CO2 is absorbed. CO2 insufflated retroperitoneally is more absorbed than that applied intraperitoneally [11].

To avoid hypercapnia and acidosis, alveolar ventilation should be increased by 20 to 50% [11].

In patients at high cardio-pulmonary risk, intra-abdominal pressure should be kept as low as possible. The lower the intra-abdominal pressure, the weaker the pathophysiological effects of pneumoperitoneum [11].

Thus, laparoscopy is feasible in subjects with various cardiovascular or respiratory conditions. The only absolute contraindications that are still relevant are [3]:

- Bullous emphysema,
- Recurrent spontaneous pneumothorax,
- Atrial or ventricular communication,
- Ventriculoperitoneal shunt,
- Intracranial hypertension,
- Acute angle-closure glaucoma,
- Peritoneo-jugular shunts (Leveen shunt),
- Irreducible diaphragmatic or parietal hernias.

Fuks [12] retrospectively compared early laparoscopic cholecystectomy for acute cholecystitis in patients over 75 years old with early laparoscopic cholecystectomy in younger patients. In the group of patients over 75 years old, 19% of patients were classified as ASA III, and laparoscopy was feasible with outcomes similar to those of younger patients.

5. Conclusion

Our results suggest that anesthesia during emergency laparoscopic surgery does not pose a risk to patients. Despite the significant number of comorbidities among our patients, with a substantial proportion classified as ASA II or ASA III, laparoscopy was safely performed from an anesthetic perspective in an emergency context. Advancements in anesthesia protocols have led to increasingly rare contraindications, allowing for longer surgical procedures to be performed under general anesthesia. General anesthesia remains the gold standard, while the role of regional anesthesia (spinal anesthesia and epidural anesthesia) is still under evaluation. The well-known benefits of laparoscopy and the absence of major contraindications from an anesthetic standpoint provide a significant advantage in the era of enhanced patient recovery. The role of the anesthesiologist is equally important as that of the surgeon.

Compliance with ethical standards

Conflicts of Interest

The author declare that they have no conflicts of interest.

Statement of ethical approval

The data and files of patiénts presented in this manuscript are available at the Department of General Surgery of the University Hospital of Ain Taya.

Statement of informed consent

All patients consent to their inclusion in this work and the publication of the results.

Author Contributions

All authors contributed to this work.

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Availability of Data and Materials

The data (Patient records, information sheets for each patient) are available and entered in Excel and Word formats

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