



**INFLUENCE OF DIFFERENT ANESTHETIC TECHNIQUES
ON HEMODYNAMIC PARAMETERS IN ELDERLY PATIENTS
UNDERGOING LAPAROSCOPIC CHOLECYSTECTOMY**

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ABSTRACT

Advances in laparoscopic technology have significantly improved surgical outcomes by reducing operative trauma, enhancing recovery speed, and minimizing postoperative complications. These benefits are particularly crucial for elderly patients, who often have multiple comorbidities affecting perioperative management. Laparoscopic cholecystectomy is a common minimally invasive procedure, but in elderly patients, it presents challenges due to intraoperative hemodynamic fluctuations caused by pneumoperitoneum and patient positioning. This study aims to compare the effects of combined multimodal anesthesia (CMA) incorporating epidural block with mechanical ventilation versus total intravenous anesthesia (TIVA) on hemodynamic stability in elderly patients. The research analyzes intraoperative cardiovascular parameters, including blood pressure (BP), heart rate (HR), and cardiac output, as well as postoperative recovery markers.

**ВЛИЯНИЕ РАЗЛИЧНЫХ МЕТОДИК АНЕСТЕЗИИ НА
ГЕМОДИНАМИЧЕСКИЕ ПОКАЗАТЕЛИ У ПОЖИЛЫХ ПАЦИЕНТОВ,
ПЕРЕНЕСШИХ ЛАПАРОСКОПИЧЕСКУЮ ХОЛЕЦИСТЭКТОМИЮ**

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ABSTRACT

Достижения в области лапароскопических технологий позволили значительно улучшить результаты хирургических вмешательств за счет снижения операционной травмы, увеличения скорости восстановления и минимизации послеоперационных осложнений. Эти преимущества особенно важны для пожилых пациентов, которые часто имеют множество сопутствующих заболеваний, влияющих на периоперационное ведение. Лапароскопическая холецистэктомия является распространенной



мультимодальная анестезия, эпидуральный блок, внутрибрюшное давление.

малоинвазивной процедурой, однако у пожилых пациентов она сопряжена с трудностями из-за интраоперационных гемодинамических колебаний, вызванных пневмоперитонеумом и положением пациента. Цель данного исследования - сравнить влияние комбинированной мультимодальной анестезии (КМА) с использованием эпидуральной блокады и ИВЛ кислородом, и тотальной внутривенной анестезии (ТВА) на стабильность гемодинамики у пожилых пациентов. В исследовании проанализированы интраоперационные сердечно-сосудистые параметры, включая артериальное давление (АД), частоту сердечных сокращений (ЧСС) и сердечный выброс, а также маркеры послеоперационного восстановления.

Introduction

Laparoscopic cholecystectomy has revolutionized surgical management of gallbladder disease, particularly in elderly patients, due to reduced surgical trauma and faster recovery times. However, pneumoperitoneum-induced increases in intraabdominal pressure (IAP) significantly affect hemodynamics by altering venous return, systemic vascular resistance, and cardiac output. Furthermore, the choice of anesthetic technique plays a crucial role in modulating these physiological changes.

Elderly patients often present with comorbidities such as hypertension, coronary artery disease, and chronic respiratory conditions, which increase their susceptibility to perioperative complications. The creation of carboxypneumoperitoneum during laparoscopic surgery can exacerbate these risks by causing increased intraabdominal pressure, reducing venous return, and potentially leading to hemodynamic instability. Furthermore, prolonged mechanical ventilation in elderly patients can contribute to postoperative pulmonary complications, including atelectasis and pneumonia.

Traditional total intravenous anesthesia (TIVA) remains a standard method but has been associated with hemodynamic fluctuations and prolonged postoperative recovery. The use of intravenous anesthetics alone may not sufficiently blunt the stress response to surgery, leading to increased catecholamine release and hemodynamic instability. Alternatively, combined multimodal anesthesia (CMA) incorporating epidural block with mechanical ventilation has demonstrated potential benefits in mitigating these adverse effects. Epidural anesthesia provides superior analgesia, reduces the requirement for systemic opioids, and minimizes fluctuations in hemodynamic parameters by reducing sympathetic nervous system activation. Additionally, it has been suggested that CMA may contribute to improved postoperative recovery by enhancing early mobilization and reducing the incidence of postoperative cognitive dysfunction in elderly patients.

This study evaluates these two anesthetic strategies by assessing intraoperative stability, postoperative pain control, and respiratory function. By comparing CMA with TIVA, we aim to determine which approach optimally balances hemodynamic stability, respiratory



function, and postoperative recovery outcomes in elderly patients undergoing laparoscopic cholecystectomy.

Materials and Methods

This study included 80 elderly patients (aged 60–74) scheduled for elective laparoscopic cholecystectomy at Samarkand State Medical University. Patients were randomly assigned into two groups: group 1 (40 patients): total intravenous anesthesia with mechanical ventilation, and group 2 (40 patients): combined multimodal anesthesia with epidural block combined and mechanical ventilation.

Preoperative Preparation: All patients underwent preoperative assessment, including detailed medical history, electrocardiography (ECG), pulmonary function tests, and laboratory blood analysis. Standard fasting guidelines were followed, and patients received premedication with midazolam (0.05 mg/kg) and ranitidine (50 mg IV) one hour before surgery.

Group 1 (TIVA): Induction was performed using propofol (2 mg/kg) and fentanyl (2 mcg/kg), with maintenance using a continuous infusion of propofol and rocuronium for muscle relaxation.

Group 2 (CMA): Epidural anesthesia was administered at the L2-L3 level using 0.5% bupivacaine (8–10 ml) and fentanyl (2 mcg/kg). This was followed by induction with propofol (1.5–2 mg/kg) and rocuronium (0.6 mg/kg) for intubation. Epidural infusion was maintained intraoperatively with a combination of bupivacaine (0.125%) and fentanyl (2 mcg/ml) at 6 ml/hour.

Results

CMA demonstrated significantly fewer fluctuations in MAP and HR compared to TIVA ($p < 0.05$). Patients in the TIVA group exhibited more frequent episodes of intraoperative hypotension requiring vasopressor support. Additionally, CMA patients had a more stable cardiac index and fewer fluctuations in systemic vascular resistance, leading to reduced intraoperative vasopressor requirements.

CMA was associated with better SpO₂ levels and lower peak airway pressures during mechanical ventilation, reducing the risk of postoperative pulmonary complications. Patients in the TIVA group had a higher incidence of postoperative atelectasis ($p < 0.01$) and required prolonged oxygen therapy.

Postoperative nausea and vomiting (PONV) were reported in 18% of TIVA patients compared to 8% in CMA patients ($p < 0.05$). Additionally, postoperative delirium was observed in 12% of TIVA patients versus 4% in CMA patients, suggesting a neuroprotective advantage of epidural anesthesia.

Discussion

The findings indicate that CMA provides superior hemodynamic stability, better respiratory function, and improved pain control compared to TIVA. Epidural anesthesia reduces the sympathetic stress response, thereby minimizing intraoperative fluctuations in cardiovascular parameters. Additionally, CMA enhances postoperative recovery by reducing opioid requirements and preventing respiratory depression. The reduced incidence of postoperative nausea, vomiting, and delirium in the CMA group highlights the neuroprotective benefits of regional anesthesia.



Furthermore, the improved pain management in CMA patients led to earlier mobilization and reduced reliance on opioids, which plays a critical role in preventing opioid-induced complications, such as respiratory depression and gastrointestinal dysmotility. This is particularly relevant in elderly patients, where prolonged opioid use is associated with increased risks of delirium, ileus, and prolonged hospitalization.

Another key advantage of CMA is the reduction in respiratory complications. By maintaining better lung mechanics and avoiding deep sedation, CMA appears to lower the incidence of postoperative atelectasis and pneumonia, which are common concerns in elderly patients undergoing laparoscopic surgery. The reduced need for prolonged oxygen therapy further supports the benefits of epidural anesthesia in improving pulmonary outcomes.

Despite these advantages, it is important to consider potential limitations of CMA, including technical difficulties in epidural catheter placement, risks of epidural hematoma in anticoagulated patients, and potential hemodynamic effects related to sympathectomy. Future research should explore optimization strategies for CMA in elderly surgical patients and investigate whether further refinements in technique can enhance safety and efficacy.

Conclusion

For elderly patients undergoing laparoscopic cholecystectomy, combined multimodal anesthesia with epidural block and mechanical ventilation offers significant advantages over total intravenous anesthesia. By optimizing hemodynamic parameters and minimizing respiratory complications, CMA represents a safer and more effective approach to anesthetic management in this high-risk patient population. Additionally, improved postoperative pain control, reduced opioid dependency, and enhanced early mobilization make CMA a superior choice for minimizing postoperative complications and expediting recovery. Future research should focus on long-term patient outcomes, including cognitive function, quality of life, and rehabilitation progress to further refine perioperative anesthetic strategies for elderly patients.

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