Case report

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THORACIC EPIDURAL AS THE SOLE ANESTHETIC TECHNIQUE FOR COLORECTAL SURGERY IN AWAKE PATIENTS WITH SEVERE RESPIRATORY DYSFUNCTION

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The report presents a case of major abdominal surgery performed in an awake patient with a high surgical risk due to severe chronic obstructive pulmonary disease. Elective sigmoid colon resection was successfully performed under thoracic epidural anesthesia as the sole anesthetic technique. The patient remained awake and moderately sedated throughout the procedure, which was well tolerated. The applied anesthetic approach itself, which has been proven to reduce the intraoperative and postoperative risks of cardiac, respiratory, and gastrointestinal complications, significantly contributed to a faster postoperative recovery with minimal complications. In a situation where the risk of general endotracheal anesthesia outweighs its benefits, thoracic epidural anesthesia was opted for as the sole anesthetic technique. This approach avoided potentially severe complications, while the additional advantages of epidural anesthesia and analgesia accelerated recovery, especially in a high-risk patient.

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Key words: *thoracic epidural anesthesia, chronic obstructive pulmonary disease, colorectal surgery*

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Introduction

This paper presents a case of elective sigmoid colon resection in a patient with severely compromised pulmonary function, placing the patient in a high-risk group for the development of postoperative complications and raising concerns regarding the feasibility of surgery. Current literature indicates that thoracic epidural anesthesia may be considered a viable alternative to general endotracheal anesthesia in such high-risk patients. Accordingly, high thoracic epidural anesthesia was used as the sole anesthetic technique.

Case Presentation

Several days before the surgery, a 63-year-old male patient scheduled for elective sigmoid colon resection was evaluated at the Clinic for Anesthesia, Rheumatology and Intensive Care of the University Clinical Center Niš. The patient was a long-term smoker with a history of chronic obstructive pulmonary disease (COPD). Spirometry indicated severe obstructive ventilatory disorder, with FEV of 820 ml (23% of predicted value) and an FEV1/FVC ratio of 34.43% (Table 1). Preoperative arterial blood gas analysis indicated mild partial respiratory insufficiency: pH 7.39, pCO2—41.9 mmHg, pO2—69 mmHg, HCO3—25 mmol/L, SpO2—93% (Table 2). Auscultation revealed bilateral diffuse wheezing, both low- and high-pitched. Pulmonary therapy included dual inhaled therapy with fluticasone/salmeterol and tiotropium bromide, and oral prednisone and aminophylline. Among other comorbidities, the patient's surgical history included essential hypertension, angina pectoris, a previous myocardial infarction (one year before surgery), and hyperlipoproteinemia, as well as the implantation of a knee endoprosthesis. The patient used nebivolol, ramipril, acetylsalicylic acid, molsidomine, trimetazidine, with nitroglycerin used as needed. Preoperative chest radiography and laboratory results were within normal limits. Both surgical and anesthetic techniques were considered preoperatively, and it was decided to proceed with open surgery, using thoracic epidural anesthesia as the sole anesthetic option to minimize possible respiratory complications in this high-risk patient. Immediately before surgery, an epidural catheter was inserted using an 18-gauge Tuohy needle, with the patient in a sitting position.

The procedure was performed under strict aseptic conditions at the Th8–Th9 level. The patient was given 2 ml of 2% lidocaine for local infiltration of the puncture site and 2 ml as a test dose. After that, a mixture of 15 ml of 0.5% bupivacaine with 100 mcg of fentanyl was administered to the patient as a bolus dose for the epidural block. Ten minutes after the application, a sensory block up to the Th4 level was achieved and confirmed by pinprick testing. Analgesic and surgical conditions, including adequate muscle relaxation, were satisfactory. Due to increased cardiovascular risk, in addition to the standard monitoring (including five-lead ECG and SpO2), a radial arterial cannula was placed in the right arm for continuous arterial pressure monitoring and advanced hemodynamic assessment, if needed. The patient was lightly sedated with 1 mg of midazolam, and a continuous infusion of remifentanil in target-controlled infusion (TCI) mode at 1ng/ml. Standard respiratory function monitoring was performed during procedural sedation, including capnography (Capnostream) and bispectral index monitoring to assess sedation depth. The patient maintained spontaneous ventilation throughout the procedure, with oxygen saturation values of 98–100% under oxygen supplementation via a nasal cannula at 4–6 l/min. The patient was hemodynamically stable during the entire procedure. Capnography values (EtCO2) and SpO2 were satisfactory, with a respiratory rate of 14 breaths per minute. The patient remained responsive to verbal stimuli and interacted with the surgical and anesthesiology team, corresponding to Ramsay Sedation Scale level 3 (1). BIS values ranged between 70 and 80, consistent with moderate sedation. The operation lasted 2 hours and 15 minutes, after which the patient was transferred to the intensive care unit for postoperative monitoring. Total intraoperative blood loss was 100 ml. Continuous epidural analgesia was maintained using 0.1% bupivacaine with fentanyl (2 mcg/ml) at an infusion rate of 4–8 ml/h. Supplemental analgesic therapy was not required during the epidural analgesia, which was discontinued 48 hours after admission to the intensive care unit and subsequently replaced with intravenous non-opioid analgesic therapy. During the entire stay in the intensive care unit, the patient maintained spontaneous ventilation. However, despite avoiding general anesthesia, the optimization of pulmonary function was required, including oxygen therapy, bronchodilators, antibiotics, and respiratory physiotherapy. On the first postoperative day, arterial blood gas analysis showed a more severe degree of respiratory insufficiency compared to preoperative values (pH 7.48, pCO2 35 mmHg, pO2 53 mmHg, HCO3 26.1 mmol/L, SpO2 90%) (Table 2). By the fourth postoperative day, pulmonary function was optimized to the level before surgery, so the patient was transferred to the Department of Digestive Surgery. Seven days after surgery, the patient was discharged from the hospital seven days after surgery in good general condition.

Table 1. Interpretation of spirometry values

Spirometry test	Normal	Abnormal	Patient
FEV 1	Equal to or greater than 80%	Mild 70–79% Moderate 60–69% Severe < 60%	**23%**
FEV1/FVC	Equal to or greater than 80%	Mild 60–69% Moderate 50–59% Severe < 50%	**34.43%**

Table 2. Preoperative and postoperative arterial blood gas analyses

Arterial blood gas analyses	Normal range	Preoperative	First postoperative day
SpO2	> 94%	93%	90%
pO2	80–100 mmHg	69 mmHg	53 mmHg
pCO2	35–45 mmHg	41.9 mmHg	35 mmHg
HCO3	22–26 mmol/L	25 mmol/L	26.1 mmol/L
pH	7.35–7.45	7.39	7.48

Discussion

General endotracheal anesthesia (GETA) in surgical patients with high risk of pulmonary is associated with numerous adverse effects, including ventilator-induced lung injury, ventilator-associated pneumonia, cardiac dysfunction, neuromuscular complications such as critical illnesses, polyneuropathy, and myopathy, as well as intraoperative and postoperative hypoxemia (2). Although absolute contraindications to GETA are not clearly defined in the literature, it is often considered a last-resort option in cases when regional anesthesia techniques are unsuccessful. Thoracic epidural anesthesia has been reported to be a safe and effective technique in patients with COPD. Given the presence of advanced COPD and significant comorbidities in this patient, the benefits of thoracic epidural anesthesia (TEA) likely made a vital contribution to a satisfactory outcome and recovery. Thoracic epidural anesthesia provides superior analgesia and has been associated with a reduced risk of venous thromboembolism, myocardial infarction, intraoperative blood loss, and renal failure (3, 4). For these reasons, TEA is considered the gold standard for open colorectal surgery and is recommended within Enhanced Recovery After Surgery (ERAS) protocols. Reviews of the available literature on the use of TEA in major emergency abdominal surgeries have consistently shown a clinically significant reduction in postoperative mortality reported to be as high as 35% (4). Two review articles indicate that epidural anesthesia, with or without postoperative epidural analgesia, reduces postoperative pulmonary infections compared to general anesthesia, regardless of the type of postoperative systemic analgesia (5, 6). Ballantine et al. confirmed that postoperative epidural analgesia significantly reduces the incidence of pulmonary morbidity (7). On the other hand, there are concerns regarding the use of TEA in patients with severe COPD due to its potential effects on auxiliary respiratory muscles, including respiratory muscle impairment and alterations in bronchial tone. In a study involving patients with severe COPD, thoracic epidural analgesia with 0.25% bupivacaine did not adversely affect ventilatory mechanics, gas exchange, or inspiratory muscle strength (8). Moreover, a study by van Lier et al. demonstrated that the theoretical effect of TEA on respiratory muscle function, particularly the reduction of intercostal nerve conduction, is not clinically relevant (9). In our patient, the epidural technique proved to be safe with stable and satisfactory SpO2 levels maintained throughout the procedure. Compared to spinal anesthesia, TEA causes significantly fewer changes in inspiratory capacity and expiratory reserve volume (10). Furthermore, TEA does not affect airway resistance and respiratory gas exchange. In addition, it has been shown to improve left ventricular function in high-risk patients by preserving ventriculo-pulmonary coupling, thereby enhancing myocardial oxygen balance (10–12). Conversely, GETA through endotracheal intubation and altered respiratory mechanics may lead to changes in right ventricular function. This may be further exacerbated by the direct cardiodepressive action of anesthetic agents on myocardial function (12). Moreover, GETA reduces functional residual capacity, worsens ventilation-perfusion mismatch, and impairs diaphragmatic function (10). Therefore, in high-risk patients, such as those with COPD, who are at increased risk of right ventricular dysfunction and adverse respiratory effects associated with GETA, locoregional anesthesia techniques should be considered. Taking into account the cardiovascular status of our patient and previous damage to the myocardium, the use of thoracic epidural anesthesia and analgesia was completely justified. Nevertheless, caution is required when applying central neuraxial techniques in patients at risk of hemodynamic instability or with significant organ dysfunction. In the present case, stable hemodynamic and metabolic parameters supported the use of TEA for this procedure.

Technical challenges associated with epidural needle insertion, as well as the risk of inaccurate or unsafe catheter placement — especially in high and mid-thoracic epidural space — may pose certain difficulties for the anesthesiologists. In addition, persistent perioperative hypotension and potential neurological complications must be taken into account. Placement of the epidural catheter at the lumbar level with cephalad spread of the block may represent a simpler alternative. Unfortunately, the expected benefit for the patient may be decreased compared to well-managed thoracic epidural anesthesia.

When the risks of general anesthesia outweigh its benefits, surgery is often deferred, leaving the patient without definitive or even palliative treatment options. However, if the overall risk–benefit ratio is in favor of surgery and in the absence of contraindications, performing thoracic epidural anesthesia for awake abdominal surgery could contribute to a reasonable quality of life even after surgery. In this context, several studies have shown the advantages of epidural anesthesia in awake patients compared to orotracheal endotracheal anesthesia (OETA)(13–16).

Conclusion

General anesthesia in patients with severe respiratory disease is associated with an increased risk of prolonged mechanical ventilation, along with higher morbidity and mortality. It also presents an ethical dilemma regarding the appropriateness of surgical intervention for patients with advanced terminal chronic respiratory disease. Improving outcomes after any type of surgery relies on reducing the stress response and preventing organ dysfunction. In this context, TEA in the high-risk patient undergoing awake abdominal surgery may represent a valuable alternative, avoiding potential severe complications and accelerating recovery.

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PRIMENA TORAKALNE EPIDURALNE ANESTEZIJE NA BUDNOM PACIJENTU SA TEŠKIM POREMEĆAJEM RESPIRATORNE FUNKCIJE U TOKU OPERATIVNOG KOLOREKTALNOG ZAHVATA

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U ovom radu se prikazuje slučaj koji je podrazumevao izvođenje velike operacije abdomena na budnom pacijentu, kod kojeg je, zbog teške forme hronične opstruktivne bolesti pluća, zahvat bio visokorizičan. Obavljena je elektivna operacija resekcije sigmoidnog kolona. Operativni zahvat je uspešno izveden u torakalnoj epiduralnoj anesteziji, koja je predstavljala jedinu anesteziološku tehniku. Pacijent je u toku cele operacije bio budan, umereno sediran, i dobro je podneo proceduru. Sama tehnika anestezije, koja dokazano smanjuje intraoperativni i postoperativni rizik od nastanka srčanih, respiratornih i gastrointestinalnih komplikacija, značajno je doprinela bržem oporavku posle operacije, i to sa minimalnim komplikacijama. Budući da je rizik za primenu opšte endotrahealne anestezije bio veći od koristi koje bi ona mogla imati, doneta je odluka da torakalna epiduralna anestezija bude jedina anesteziološka tehnika; na taj način izbegnute su potencijalne ozbiljne komplikacije. Takođe, dodatne prednosti epiduralne anestezije i analgezije uticale su na to da oporavak bude brži, naročito kod pacijenta kod kojeg je postojao ovako visok rizik od izvođenja operacije.

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***Ključne reči**: torakalna epiduralna anestezija, hronična opstruktivna bolest pluća, kolorektalna hirurgija*

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