Case report

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THORACIC EPIDURAL AS THE SOLE ANAESTHETIC TECHNIQUE FOR COLORECTAL SURGERY IN AWAKE PATIENT WITH SEVERE RESPIRATORY DYSFUNCTION

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We present a case of major abdominal surgery on an awake patient with a high operative risk due to severe form of chronic obstructive pulmonary disease (COPD). The surgery was an elective resection of the sigmoid colon resection, successfully performed under thoracic epidural anesthesia as the sole anesthetic technique. The patient was awake and moderately sedated during the entire operation. The procedure was well tolerated by the patient, and the anesthesia technique itself, which has been proven to reduce the intraoperative and postoperative risk 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 outweighed its benefits, we opted for thoracic epidural anesthesia as the sole anesthetic technique. This avoided potential severe complications, and the additional advantages of epidural anesthesia and analgesia accelerated recovery, especially in such a high-risk patient.

Key words: thoracic epidural anesthesia, COPD, colorectal surgery

Prikaz slučaja

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TORAKALNA EPIDURALNA ANESTEZIJA KOD BUDNOG PACIJENTA SA TEŠKIM POREMEĆAJEM RESPIRATORNE FUNKCIJE ZA OPERATIVNI ZAHVAT U KOLOREKTALNOJ HIRURGIJI

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Prikazujemo slučaj velike abdominalne operacije na budnom pacijentu sa visokim operativnim rizikom u smislu teške forme hronične obstruktivne bolesti (HOBP). Radi se o elektivnoj operaciji resekcije sigmoidnog kolona. Operativni zahvat je uspešno izveden u torakalnoj epiduralnoj anesteziji kao jedinoj anesteziološkoj tehnici. Sve vreme operacije pacijent je bio budan, umereno sediran. Proceduru je pacijent dobro podneo, a sama tehnika anestezije koja dokazano smanjuje intraoperativni i postoperativni rizik od srčanih, respiratornih i gastrointestinalnih komplikacije, značajno je doprinela bržem postoperativnom oporavku sa minimalnim komplikacijama. U situaciji kada je rizik od opšte endotrahealne anestezije prevazilazio njene koristi, odlučili smo se za torakalnu epiduralnu anesteziju kao izolovanu anesteziološku tehniku. Time su izbegnute potencijalne teške komplikacije a dodatne prednosti epiduralne anestezije i analgezije su ubrzale oporavak naročito kod ovako visoko rizičnog pacijenta.

Ključne reči

Torakalna epiduralna anestezija, HOBP, kolorektalna hirurgija

Introduction

This paper presents an elective operation for the sigmoid colon resection, where the severely compromised lung function placed the patient in a high-risk group for the development of postoperative complications and even called into question whether the operation could be performed. The literature clearly shows that thoracic epidural anesthesia can be considered an alternative to general endotracheal anesthesia in such high-risk patients. Consequently, high thoracic epidural anesthesia was used as the sole anesthetic technique.

Case study

A few days before the operation, the case of a 63-year-old male scheduled for an elective resection of the sigmoid colon, was presented at our anesthesiology clinic. The patient was a long-term smoker with chronic obstructive pulmonary disease (COPD). Spirometry indicated severe obstructive pulmonary ventilation disorder, FEV1- 820ml or 23% of predicted value and an FEV1/FVC ratio of 34.43% (Table 1). Preoperative arterial blood gas analyses showed mild partial respiratory insufficiency: pH 7.39, pCO2-41.9mmHg, pO2- 69mmHg, HCO3- 25mmol, SpO2- 93% (Table 2). Auscultatory findings revealed bilateral diffuse low-pitched and high-pitched wheezing. Pulmonary therapy included double inhaler support, Fluticasone/salmeterol and Tiotropium bromide sprays and Pronisone and Aminofilin tabletes. Among other comorbidities, the patient had essential hypertension, angina pectoris, previous myocardial infarction (one year before surgery) and hyperlipoproteinemia as well as the implantation of a knee endoprosthesis in the surgical history. The patient used Nebivolol, Ramipril, Acetylsalicylic acid, Molsidomine, Trimetazidine and Nitroglycerin as needed. The preoperative X-ray of the lungs and heart was normal, as were the laboratory results. Both surgical and anesthetic options were considered preoperatively and it was decided to proceed with open surgery, using thoracic epidural anesthesia as the sole anesthetic option with the aim of minimizing possible respiratory complications in such a high-risk patient. Immediately before the operation, a catheter was placed in the epidural space using an 18-gauge Tuohy needle. The patient was in a sitting position and the procedure was performed in completely aseptic conditions at the Th8-Th9 level. The patient was given 2ml of 2% Lidocain for local infiltration of the puncture site and 2ml as a test dose. After that, a mixture of

15ml of 0.5% Bupivacain with 100mcg of Fentanyl was administered to the patient as a bolus dose for the epidural block. Ten minutes after the application, a sensory lost was achieved up to the Th4 level, which was confirmed by a needle test. Analgesic and surgical conditions in terms of muscle relaxation were satisfactory. Due to increased cardiovascular risk , in addition to the standard monitoring (including five-channel ECG and SpO2), an arterial cannula was placed in the radial artery on the right arm for continuous monitoring of arterial pressure and extended hemodynamic monitoring if needed. The patient was lightly sedated with 1mg of Midazolam and a continuous infusion of Remifentanil in TCI mode 1ng/ml was started. Standard respiratory function monitoring was connected during procedural sedation - Capnostream, i.e. BIS monitoring for the depth of sedation. The patient breathed spontaneously, throughout the procedure, with oxygen saturation values of 98-100% with oxygen supplementation via a nasal cannula 4-6 l/min. The patient was hemodynamically stable the whole time. Capnostream etCO2 and SpO2 values were satisfactory with a respiratory rate 14/min. The patient also responded to verbal communication and interacted with the surgical and anesthesiology team, corresponding to level 3 of the Ramsy scale [1] for assessing the depth of sedation. BIS values ranged between 70-80, which corresponded to moderate sedation. The operation lasted 2 hours and 15 minutes and the patient was afterwards transferred to the intensive care unit for postoperative monitoring. Total blood loss was 100 ml. Continuous epidural analgesia with 0.1% Bupivacain and 2mcg/ml Fentanyl was maintained at the infusion rate 4-8ml/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 breathed spontaneously. However, despite avoiding general anesthesia, it was necessary to optimize lung function with oxygen therapy, bronchodilators, antibiotics and physiotherapy. On the first postoperative day, arterial gas analyses showed a more severe degree of respiratory insufficiency compared to preoperative values (pH 7.48, pCO2 35, pO2 53, HCO3 26.1, SpO2 90%) (Table 2). By the fourth postoperative day, the lung function was optimized to the level before the operation, so the patient was discharged to the Department of Digestive Surgery. Seven days after the operation, he was discharged from the hospital in good general condition.

Table 1. Interpretation of spirometry values

Spirometry test	Normal	Abnormal	Patient
FEV 1	Equal or greater than 80%	Mild 70-79% Moderate 60-69% Severe <60%	**23%**
FEV1/FVC	Equal 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	69mmHg	53 mmHg
pCO2	35-45 mmHg	41.9mmHg	35 mmHg
HCO3	22-26 mmol/L	25mmol/L	26.1 mmol/L
pH	7.35-7.45	7.39	7.48

Discussion

General endotracheal anesthesia (GETA) in surgical patients at high risk for pulmonary function can trigger many adverse effects including ventilator-induced lung damage, ventilator-associated pneumonia, cardiac dysfunction, neuromuscular issues such as neuromyopathies or polyneuropathies in the critically ill patient, as well as intraoperative and postoperative hypoxemia [2]. Generaly speaking, the literature does not list absolute contraindications for general endotracheal anesthesia (GETA) and it always remains the last resort in cases when regional anesthesia techniques are unsuccessful. Thoracic epidural anesthesia has been reported to be a safe technique in patients with COPD. Given that our patient had end-staged COPD and significant comorbidities, the benefits of thoracic epidural anesthesia (TEA) likely made a vital contribution to a satisfactory outcome and recovery. TEA provides superior analgesia and is associated with reduced risks of venous thromboembolism, myocardial infarction, blood loss, and renal failure

[3,4]. For these reasons, TEA is recognized as the gold standard for open colorectal surgery recommended in Enhanced Recovery After Surgery (ERAS protocols). Reviews of the available literature on the use of TEA for major emergency abdominal surgeries have consistently shown a clinically significant reduction in postoperative mortality of up to 35% [4]. Two review articles indicate that epidural anesthesia, with or without postoperative epidural analgesia, reduces postoperative pulmonary infections compared to general anesthesia with or without postoperative systemic analgesia [5,6]. Ballantine et al. confirmed that postoperative epidural pain control can significantly reduce 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 effects on auxiliary respiratory muscles, including respiratory muscle paralysis and changes in bronchial tone. In one study, thoracic epidurals were administered to patients with severe COPD. Thoracic epidural analgesia with 0.25% bupivacaine did not adversely affect ventilation mechanics, gas exchange and inspiratory muscle strength [8]. Moreover a study by van Lier et al. showed that the theoretical effect of TEA on respiratory muscle function in terms of reducing intercostal nerve conduction was not clinically relevant [9]. In our patient, the epidural technique proved to be safe with satisfacotory SpO2 levels 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 pressures and has been shown to improve left ventricular function in high-risk patients by preserving ventricular-pulmonary coupling leading to improved myocardial oxygen balance [10-12]. Conversely, general anesthesia with endotracheal intubation and altered respiratory mechanics can lead to changes in the dynamics of the right ventricle. This may be further exascerbated by the direct cardiodepressive effects of anesthetics on myocardial function [12]. Moreover, GETA affects functional residual capacity, worsens the ventilation-perfusion mismatch, and impairs diaphragmatic function [10]. Therefore, in high-risk patients, such as those with COPD, in whom there is an increased risk of right ventricular dysfunction and adverse respiratory effects of GETA, it is reasonable to consider locoregional techniques. Taking into account the cardiovascular status of our patient and previous damage to the myocardium, the application of thoracic epidural anesthesia and analgesia was completely justified. Care must certainly be taken when using central neuraxial techniques in patients at risk of hemodynamic collapse or with significant organ

dysfunction. Our patient had stable hemodynamic and metabolic profiles, which prompted the use of TEA for this particular operation.

Challenges associated with needle placement, unsafe and imprecise catheter placement (especially in high and med thoracic epidural space), persistent perioperative hypotension and possible neurological problems can be present difficulties for the anesthesiologist. Placing the epidural catheter at the lumbar level and extending the block upwards can be seen as an easy compromise. Unfortunately, the expected benefit for the patient may be decreased compared to well-managed thoracic epidural anesthesia.

When the risk of general anesthesia outweighs its benefits, we are left with little choice but to forgo surgery, leaving the patient with no palliative option or definitive treatment. However, if the overall risk-benefit ratio is in favor of surgery and in the absence of any contraindications, performing thoracic epidural anesthesia for awake abdominal surgery could contribute to a reasonable quality of life even after surgery. In this regard, several studies have shown the advantages of epidural anesthesia in awake patients compared to OETA [13-16].

Conclusion

General anesthesia carries a high risk of prolonged mechanical ventilation, along with increased morbidity and mortality in patients with severe respiratory disease. It also presents an ethical dilemma as to whether surgery remains the only treatment option for patients with advanced terminal chronic respiratory disease. The basis for improving outcomes, regardless of the type of surgery is the weakening of the stress response and the prevention of subsequent organ dysfunction. The use of thoracic epidural anesthesia in the high-risk patient undergoing awake abdominal surgery could avoid potential severe complications and accelerate recovery.

Literature

1) Ramsay A, Savege T,Simpson B, Goodwin R. Controlled sedation with alphaxalone-alphadolone. Br Med J. 1974 Jun 22;2(5920):656-9.
2) Jin F, Chung F: Minimising perioperative adverse events in the elderly. British Journal Anaesthesia; 2001, 87:608-624.
3) Romanzi A, Boleso N, Di Palma G, et al. Pain Res Manag. Awake major abdominal surgeries in the COVID-19 era. 2021;2021:8763429.
4) Vester-Andersen M, Lundstrøm LH, Møller MH. The association between epidural analgesia and mortality in emergency abdominal surgery: a population-based cohort study. Acta Anaesthesiol Scand. 2020;64:104–111.

5) Jayr C, Thomas H, Rey A, Farhat F, lasser P, Bourgain Jl: Postoperative pulmonary complication: epidural analgesia using bupivacaine and opioids versus parentral opioids. Anaesthesiology; 1993,78:666-676.
6) Rodgers A, Walker N, Schug S, et al: Reduction of postoperative mortality and morbidity with epidural or spinal anaesthesia: results from overview of randomized trials. British Medical Journal; 2000,321:1493-1497
7) Ballantyne JC, Csrr DB, Deferranti A, et al: The comparative effects of postoperative analgesic therapies on pulmonary outcome: cumulative meta-analysis of randomized controlled trials. Anesthesia and Analgesia; 1998, 86:598-612
8) Gruber EM, Tschernko EM, Kritzinger M, Deviatko E, Wisser W, Zurakowski D, et al. The effects of thoracic epidural analgesia with bupivacaine 0.25% on ventilatory mechanics in patients with severe chronic obstructive pulmonary disease, Anesth Analg, 2001, vol. 92 (pg. 1015-9).
9) Van Lier F, van der Geest PJ, Hoeks SE, et al. Epidural analgesia is associated with improved health outcomes of surgical patients with chronic obstructive pulmonary disease. Anesthesiology. 2011;115:315–321.
10) Corcione N, Karim H, Mina B, et al. Non-invasive ventilation during surgery under neuraxial anaesthesia: a pathophysiological perspective on application and benefits and a systematic literature review. Anaesthesiol Intensive Ther. 2019;51:289–298.
11) Rigg JR, Jamrozik K, Myles PS, et al. Epidural anaesthesia and analgesia and outcome of major surgery: a randomised trial. Lancet. 2002;359:1276–1282.
12) Wink J, Veering BT, Aarts LPHJ, Wouters PF. Effects of thoracic epidural anesthesia on neuronal cardiac regulation and cardiac function. Anesthesiology. 2019;130:472–491.
13) Yen CR, Tsou MY, Lin SM, Chan KH, Chu YC. Thoracic epidural anaesthesia for a polymyositis patient undergoing awake mini-thoracotomy and unroofing of a huge pulmonary bulla, Acta Anesthesiol Taiwan, 2008, vol. 46 (pg. 42-5)
14) Mineo TC, Pompeo E, Mineo D, Tacconi F, Marino M, Sabato AF. Awake nonresectional lung volume reduction surgery, Ann Surg, 2006, vol. 243 (pg. 131-6)
15) Pompeo E, Mineo TC. Awake operative videothoracoscopic pulmonary resections, Thorac Surg Clin, 2008, vol. 18 (pg. 311-20)

16) Noda M, Okada Y, Maeda S, Sado T, Sakurada A, Hoshikawa Y, et al. Is there a benefit of awake thoracoscopic surgery in patients with secondary spontaneous pneumothorax. J Thorac Cardiovasc Surg, 2012, vol. 143 (pg. 613-6)