



Case Report

Awake Thoracic Surgery with Thoracic Epidural Anesthesia in High-Risk Patients: Three Case Reports and Clinical Insights

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Abstract

Awake thoracic surgery utilizing thoracic epidural anesthesia has shown significant advantages over general anesthesia, especially in patients with comorbidities. This case report presents three cases of critically ill patients who successfully underwent awake thoracic surgery using thoracic epidural anesthesia. The first case involved an 81-year-old male with advanced chronic obstructive pulmonary disease who underwent thoracotomy with decortication for mesothelioma. The second case involved a 73-year-old male with a history of hypertension, coronary artery bypass graft surgery, laryngeal cancer, and permanent tracheostomy who underwent video-assisted thoracic surgery for alung tumor. Finally, the third case involved a 41-year-old female with a history of hypertension, tuberous sclerosis, epilepsy, and interstitial lung disease. All patients were managed with epidural anesthesia and conscious sedation, resulting in perioperative hemodynamic stability and effective pain control without the need for additional opioids. These cases highlight the efficacy and safety of thoracic epidural anesthesia for facilitating pain-free, uneventful thoracic surgeries in high-risk patients, suggesting that thoracic epidural anesthesia is a viable alternative to general anesthesia in selected cases.

Keywords: Thoracic epidural anesthesia, thoracic surgery, pain management, perioperative medicine

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Thoracic epidural anesthesia (TEA), initially described by Crawford et al.^[1] in 1952, has been a well-established adjunct to general anesthesia in thoracic surgery. Despite its long history, the use of TEA as the sole anesthetic technique for major thoracic procedures has been limited, es-

pecially after the advent of the double-lumen tube and one-lung ventilation (OLV) technique. This conservative approach is largely due to the traditional reliance on general anesthesia to facilitate lung deflation and double-lumen tube insertion, which are believed to be essential for

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optimal surgical conditions and to prevent intraoperative complications, such as coughing and contamination of the healthy lung. Additionally, the technical difficulty of thoracic epidural placement due to the risks of dural puncture and potential spinal cord injury has further restricted its use.^[1,2]

However, thoracic surgery under awake anesthesia offers several advantages, particularly the avoidance of complications associated with general anesthesia, mechanical ventilation and one lung ventilation.^[3] Epidural anesthesia can provide effective bilateral dermatomal sensory and motor blockade and superior postoperative pain control by combining local anesthetics and opioids. This method minimizes side effects while maintaining efficacy.^[3,4] For these reasons, awake surgery with TEA has become increasingly popular in recent years, specifically in patients who are unable to tolerate general anesthesia. This report presents three cases of critically ill patients who successfully underwent awake thoracic surgery using TEA.

Case Report

Case 1 — An 81-year-old, 82 kg, 174 cm, ASA IV male patient with advanced chronic obstructive pulmonary disease was scheduled for surgery due to mesothelioma. Auscultation revealed coarse rales and rhonchi in the left lung. The patient had room air SpO₂ of 92%. Spirometry was performed, and the respiratory diseases department determined the patient as high risk. The patient underwent thoracotomy with decortication using TEA. Perioperative arterial blood gas values were pH=7.33, PO₂=150 mmHg, and PCO₂=50 mmHg. A preoperative titrated bolus dose of anesthetics containing 75 mg of bupivacaine 0.5%, 40 mg of lidocaine 2% and 50 mcg fentanyl was administered through the epidural catheter. During the 3-hour operation, an infusion of 6 mL/hour with 8 mL boluses (containing 2 mcg/mL fentanyl and 1 mg/mL bupivacaine, with a 30-minute lockout) was administered.

Case 2 — A 73-year-old, 76 kg, 171 cm, ASA IV, male patient with a history of hypertension, three-vessel coronary artery bypass graft surgery, and permanent tracheostomy from total neck dissection due to laryngeal cancer was scheduled for lung tumor surgery. Preoperative evaluation by the respiratory diseases department determined the patient to be at high risk, whereas the cardiology team assessed him as moderate risk. Awake video-assisted thoracic surgery (left lingula resection) was performed using TEA. The patient was monitored perioperatively with 2-6 L/min of oxygen through the tracheostomy cannula. The perioperative arterial blood gas values were pH=7.3, PO₂=73 mmHg, and PCO₂=51 mmHg. A preoperative titrated bolus dose of

anesthetics containing 60 mg of bupivacaine 0.5%, 40 mg of lidocaine 2%, and 50 mcg of fentanyl was administered through the epidural catheter. During the 4-hour operation, an infusion of 5 mL/hour with 7 mL boluses (containing 2 mcg/mL fentanyl and 1 mg/mL bupivacaine, with a 30-minute lockout) was administered.

Case 3 — A 41-year-old, 64 kg, 161 cm, ASA IV, woman was scheduled for surgery for left pneumothorax. The patient was tachypneic under mask oxygen and respiratory sounds were diffusely decreased. There was diffuse subcutaneous emphysema on the chest, neck and both upper extremities. She underwent left lung excision and bullectomy using TEA. Perioperative SpO₂ was 93%, peak heart rate was 86 and blood pressure was 120/80 mmHg under 3 L/min oxygen. The perioperative arterial blood gas values were (under 3 L/min oxygen) pH=7.39, PO₂=140 mmHg, and PCO₂=44.3 mmHg. A preoperative titrated bolus dose of anesthetics containing 50 mg of bupivacaine 0.5%, 40 mg of lidocaine 2% and 50 mcg fentanyl was administered through the epidural catheter. During the operation, an infusion of 4 mL/hour with 6 mL boluses (containing 2 mcg/mL fentanyl and 1 mg/mL bupivacaine, with a 30-minute lockout) was administered.

Common Details

All patients received 2 mg of intravenous midazolam 30 min before surgery, followed by the placement of an epidural catheter in the T4-T5 interspace. The level of the block was assessed using pain and temperature sensitivity. The lower and upper level of epidural analgesia was T2-T12. Conscious sedation was provided with monitoring of heart rate, invasive arterial pressure, temperature, respiratory rate, ET-CO₂, and BIS, and patients were positioned in the lateral decubitus. Intraoperative oxygenation was maintained to maintain SpO₂>92%, and no additional opioids were administered. All patients maintained stable perioperative hemodynamic parameters, and the surgeries were successfully completed with TEA while the patients remained awake. Additionally, the perioperative visual analog scale scores for all patients were less than 3 and they were discharged shortly after surgery without any complications.

Discussion

The increasing use of awake TEA is likely attributable to increased awareness of the risks associated with general anesthesia and OLV.

General anesthesia, while traditionally used in thoracic surgery, carries several potential disadvantages, particularly in high-risk patients, including prolonged intubation and mechanical ventilation, which can lead to postopera-

tive pulmonary complications, such as pneumonia and atelectasis.^[5] Additionally, the use of muscle relaxants and anesthetic agents can contribute to hemodynamic instability, increasing the risk of perioperative morbidity in patients with significant comorbidities.^[5,6] The need for extended recovery times and the potential for postoperative cognitive dysfunction further complicate the use of general anesthesia in elderly or debilitated patients.^[7] These disadvantages underscore the evolving trend toward less invasive anesthetic techniques, such as TEA and awake thoracic surgery.

On the other hand, OLV which is usually performed during general anesthesia contributes to lung injury in both ventilated and collapsed lungs. These include the development of atelectasis, alveolar overdistension, and inflammatory responses due to mismatches in ventilation-perfusion ratios. The ventilated lung faces risks of volutrauma and barotrauma, whereas the collapsed lung is susceptible to hypoxic vasoconstriction, leading to increased pulmonary vascular resistance and potential ischemia-reperfusion injury. Moreover, the transition from two-lung to OLV can trigger systemic inflammatory responses and contribute to oxidative stress.^[8] These insights underscore the complexity of managing patients undergoing OLV and advocate for strategies that minimize lung injury and optimize perioperative outcomes.

Given the low preoperative functional capacity of patients, we determined that the pathophysiological changes associated with OLV could lead to challenging postoperative recovery. The second patient posed another challenge for OLV because of having a tracheostomy. To avoid potential complications, we proposed awake anesthesia as a safer alternative. We discussed the risks, benefits, and potential need for conversion to general anesthesia with all patients and obtained their informed consent. TEA provided complete pain relief, eliminated the need for intravenous opioids or other analgesics, and thereby reduced the risk of adverse effects in our patients. This approach allowed us to complete the procedures with full patient cooperation and satisfaction.

By avoiding the need for intubation and mechanical ventilation, awake TEA reduces the risk of airway trauma and complications, such as ventilator-associated lung injury, hypoxia, and re-expansion pulmonary edema. Additionally, awake TEA minimizes the hemodynamic fluctuations and immune suppression often observed in general anesthesia, leading to a more stable perioperative course. Patients benefit from superior pain control, quicker recovery times, shorter hospital stays, and potentially lower overall healthcare costs.^[5,6,8]

Kiss et al.^[9] compared the perioperative management and outcomes of thoracic TEA in awake thoracic surgery among a group of 9 severely dyspneic patients who were unable to undergo general anesthesia. Their study demonstrated that thoracic epidural anesthesia, with or without sedation, is a viable alternative to general anesthesia for thoracic surgery in this high-risk population.

In a more recent review published by Zheng et al.,^[10] non-intubated video-assisted thoracic surgery was evaluated in terms of advantages, disadvantages, indications, anesthesia and crisis management. They suggested that it can potentially be an attractive alternative to intubated OLV in thoracoscopic surgery, especially for patients at high risk of intubation, although the long-term benefits remain uncertain.

A study by Pompeo et al.^[11] investigating the current trends, adoption rates, and future expansion potential of non-intubated thoracic surgery among members of the European Society of Thoracic Surgeons showed that members of the European Society of Thoracic Surgeons have already adopted non-intubated thoracic surgery quite widely and it is mostly used to perform simple video assisted thoracic surgery procedures. They also concluded that about 70% of the respondents believe that the number of non-intubated thoracic surgery procedures will increase in the near future.

These cases illustrate the potential of TEA not only as a viable alternative to general anesthesia and as a technique that can enhance patient safety and surgical outcomes in high-risk individuals.

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