



CASE REPORT

Awake thoracic surgery for severe pulmonary hypertension: A case report

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Keywords: *awake thoracic surgery, segmental thoracic spinal, anesthesia, pulmonary hypertension*

INTRODUCTION

Most chest surgeries are major operations requiring one-lung general anaesthesia.¹ Patients with significant comorbidities, such as low baseline pulmonary function, may be deemed inoperable and are at high risk for general anaesthesia.² Those with severe pulmonary hypertension face increased risks of ventilator dependence, morbidity, and mortality post-anaesthesia.^{3,4} Thoracic regional anaesthesia in high-risk patients undergoing awake thoracic surgery may prevent ventilator dependency and expedite recovery.⁵ We safely performed decortication with drainage of encysted pleural effusion on a patient with severe pulmonary hypertension using segmental spinal anaesthesia. This case report demonstrates the safety and feasibility of segmental thoracic spinal anaesthesia for patients with severe cardiorespiratory compromise.

CASE DESCRIPTION AND MANAGEMENT

This case report has been reported in line with the SCARE Criteria (include citation).

A 62-year-old female patient with a history of chronic kidney disease, diabetes mellitus, systemic hypertension, and severe pulmonary hypertension presented with symptoms of dyspnea and a productive cough. She was classified as WHO functional class III for pulmonary hypertension, and her Revised Cardiac Risk Index score was 2. She was being treated with ambrisentan, sildenafil, frusemide, and digoxin. Clinical

LEARNING POINTS

1. This case report demonstrates the safety and feasibility of one-lung ventilation in
2. spontaneously breathing patients using segmental thoracic spinal anaesthesia during thoracic surgery.
3. This case report highlights the challenge of maintaining adequate gas exchange during
4. one-lung ventilation in an awake, spontaneously breathing patient. Minor complications such as hypotension and hypoxia were managed effectively, highlighting the importance of close monitoring and active intervention.
5. We demonstrated that thoracic segmental spinal anaesthesia is a feasible and safe alternative to general anaesthesia in patients with severe pulmonary hypertension or other significant comorbidities causing cardiorespiratory compromise, offering a potential solution for high-risk candidates undergoing thoracic surgery.

examinations revealed significant pulmonary hypertension, with a systolic pressure of 53 mmHg, and grade II left ventricular diastolic dysfunction. The patient's oxygen saturation was 94% while breathing room air, and her blood pressure was controlled.

Investigations revealed an NT Pro BNP level of 3877.30 pg/ml and bilateral pleural effusion with inflammation in the lower lung lobes. The diagnosis was encysted pleural effusion with impaired cardiorespiratory status. The surgical plan included pleural effusion drainage to the right lung and decortication via right-sided thoracotomy. Consultation with the surgical team

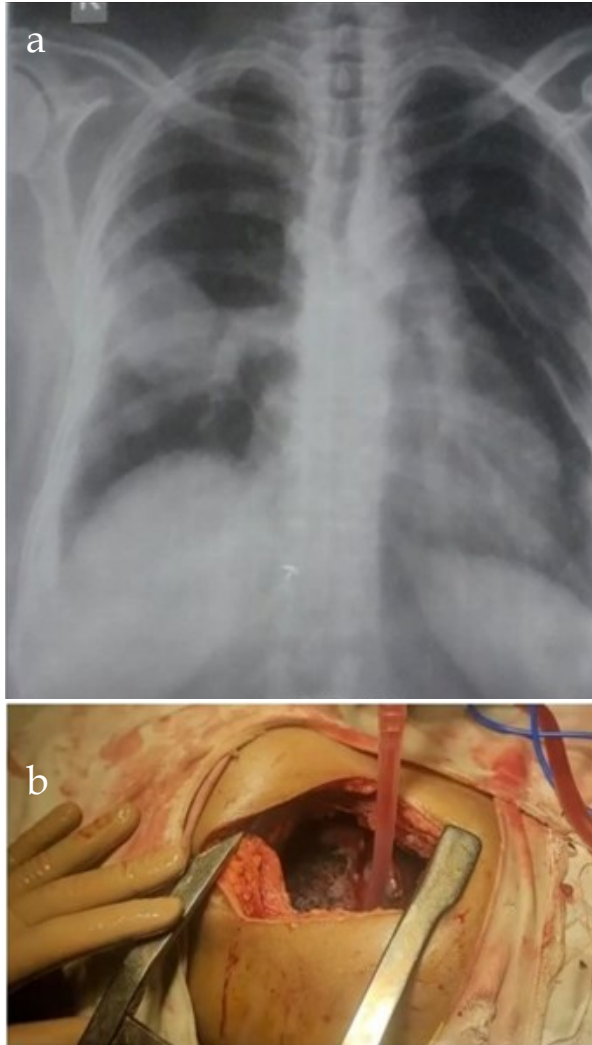


FIGURE 1 a) Preoperative X-ray chest PA view, b) operative procedure

indicated a high risk of ventilator dependence, recommending thoracic-level spinal anaesthesia over general anaesthesia. We discussed the procedures' pros and cons and obtained informed written consent from the patient and relatives.

Standard monitoring equipment was used in the operating room, with catheters inserted in the right internal jugular vein and left radial artery for blood pressure monitoring. Carefully, a 25-gauge Quincke spinal needle was inserted through the T6-T7 intervertebral space while the patient was sitting until the cerebrospinal fluid was visible. The patient did not experience paresthesia. Bupivacaine (0.5%; 10 mg) was administered into the subarachnoid space over a minute, and the patient was then positioned supine. The

pin-prick test confirmed a sensory block at the T1-T12 level. However, the patient's blood pressure subsequently dropped. Given that vasodilation from the sympathetic block was the cause, 5 mg of ephedrine and 200 ml of IV fluid bolus were administered, restoring the systolic pressure to 100 mmHg.

The patient was placed laterally for surgery, and the chest opened through the 6th intercostal space. This led to a surgical pneumothorax and lung collapse in the non-dependent lung, facilitating the procedure but causing a decrease in oxygen saturation. The patient was instructed to take deep breaths, and ventilation was assisted with a face mask. The systolic blood pressure was maintained at 90-110 mm Hg, and oxygen saturation was kept above 88% with supplemental oxygen. Fentanyl (two 25 µg boluses) was administered to alleviate occasional pain and discomfort. The surgery lasted 1.5 hours, and the patient was closely observed in the postoperative care unit before being transferred to the surgical ward.

This procedure was performed on 16 November 2023 at Al Helal Specialised Hospital, a private hospital in Dhaka City; four days later, the patient was discharged with a stable condition.

DISCUSSION

Patients with pulmonary hypertension who undergo general anaesthesia for surgery are at increased risk of severe complications, including hemodynamic effects, the need for muscle paralysis, delayed recovery, increased risk of pneumonia, acute lung injury, and prolonged mechanical ventilation. Given these risks, regional anaesthesia is an alternative that has been extensively studied.^{6,7} Non-intubation procedures, such as thoracic paravertebral block, intercostal nerve block, and thoracic epidural anaesthesia, are commonly used in thoracic surgeries.⁸ However, there are concerns with thoracic epidural and paravertebral blocks in non-intubated thoracic surgery, including patchy sensory block, delayed block onset, and the risk of local anaesthetic toxicity due to large volumes of anaesthetic.⁵ Inspired by Cardiac Surgeon Professor Adhikary's introduction of thoracic epidural anaesthesia for awake CABG in our country,⁹ we opted for awake thoracotomy using segmental spinal anaesthesia. It is worth noting that there have been no reported cases of

awake, non-intubated thoracic surgery in our country.

Thoracic segmental spinal anaesthesia using minimal local anaesthetic can effectively block the dermatomes necessary for the planned procedure. Patients who retain motor control over their legs generally experience less anxiety and higher satisfaction, which we observed in our case. However, two primary concerns are associated with the mid-thoracic spine: the risk of neuronal injury and the potential for cephalad distribution of local anaesthetic.¹⁰ In this case, no such incidents were observed.

When a surgeon penetrates the thorax, optimal lung isolation can be achieved without positive pressure ventilation in the opposite lung.⁷ Opening the non-dependent hemithorax in an awake, laterally positioned patient redirects airflow to the dependent lung. However, the loss of negative intrapleural pressure causes contralateral mediastinal displacement and compression, leading to spontaneous ventilation in open pneumothorax, resulting in pendular ventilation and potentially causing hypoxia and hypercapnia. In contrast, preserved diaphragmatic contraction in the dependent lung can maintain adequate ventilation.² We encountered two episodes of hypoxia, which were resolved by asking the patient to take deep breaths.

In summary, segmental thoracic spinal anaesthesia with a low concentration of local anaesthetic can serve as an alternative to general anaesthesia for thoracic surgery. This technique can result in faster recovery, higher levels of patient satisfaction, and a reduction in cardiorespiratory incidents, ultimately allowing for earlier discharge. This method provides a reliable and efficient anaesthetic option for patients with significant comorbidities when general anaesthesia is inappropriate.

Acknowledgments

Special thanks and acknowledgements to the authority, operation theatre and post surgery care unit staff of Al Helal specialized hospital for their support in performing this case uneventfully. Additionally, we extend our gratitude to the patient for her cooperation.

Author contributions

Manuscript drafting and revising it critically: SKS, ABA. *Approval of the final version of the manuscript:* SKS, ABA, HS, RR, MAU. *Guarantor accuracy and integrity of the work:* SKS, ABA, HS, RR, MAU.

Funding

We did not receive any funding for this work.

Conflict of interest

We do not have any conflict of interest.

Ethical approval

Ethical approval was not needed for the case report, but informed written consent was obtained from the patient.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author.

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