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Case Report

Bilateral thoracoscopic sympathectomy using EZ-Blocker for alternate lung isolation

Naba Mateen Madoo[1], Vaibhavi Baxi[1]*, Navmi Menon[1]

[1]Dept. of Anaesthesia Lilavati Hospital and Research Centre, Mumbai, Maharashtra, India.

Abstract

Bilateral thoracoscopic sympathectomy is a minimally invasive surgical procedure indicated for conditions such as primary hyperhidrosis, a condition characterized by excessive sweating, most often affecting the palms, soles, and axillae. Lung isolation is crucial to optimize surgical exposure in thoracoscopic surgeries traditionally achieved using double-lumen endotracheal tubes or bronchial blockers. EZ-Blocker is an effective tool for achieving selective or alternate lung ventilation. We present the anesthetic management of an 18-year-old female undergoing bilateral thoracoscopic sympathectomy for hyperhidrosis, with a focus on alternate lung isolation using the EZ-Blocker.

Keywords: Bilateral Thoracoscopic Sympathectomy, Lung isolation, EZ-Blocker, Bronchial blocker, Hyperhidrosis.

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1. Introduction

Primary hyperhidrosis is a condition characterized by excessive sweating in specific areas such as the palms, feet, and axillae due to over activity of the sympathetic nervous system.[1] This condition significantly impacts the quality of life, causing social embarrassment and functional impairment. Thoracoscopic sympathectomy is the definitive treatment for severe cases, providing long-term relief by disrupting sympathetic nerve pathways.[2]

Lung isolation is essential in thoracic surgeries to facilitate surgical visualization and prevent contamination between lungs. Traditional techniques include the use of double-lumen tubes (DLTs) and bronchial blockers. DLTs provide effective lung isolation but require expertise in placement and can cause airway trauma.[3] Conventional bronchial blockers offer a less invasive alternative but may be difficult to position precisely.[4] The EZ-Blocker, a Y-shaped bronchial blocker (**Figure 1**), presents a promising alternative due to its ease of positioning, reduced risk of airway trauma, and the ability to provide sequential lung isolation without tube exchange.[5]. This case highlights the anesthetic considerations and intraoperative management strategies employed.

2. Case Presentation

An 18-year-old female, weighing 40 kg and measuring 153 cm in height (BMI: 17.1 kg/m²), was scheduled for bilateral thoracoscopic sympathectomy for severe primary hyperhidrosis affecting the palms, feet, and underarms. Her Hyperhidrosis Disease Severity Scale (HDSS) score was 4, indicating severe disease impacting daily activities. She had undergone multiple failed conservative treatments, including prescription-strength antiperspirants, oral glycopyrrolate, and botulinum toxin injections, leading to the decision for definitive surgical management.

She had no significant medical history, normal preoperative investigations, which included hemoglobin of 11.6 g/dL, hematocrit of 35.5%, white blood cell count of 5520/µL, platelet count of 291 x 10^9/L, serum creatinine of 0.62 mg/dL, normal electrolytes, and a normal chest X-ray, and no known allergies. A preoperative optimization of respiratory system was done which included incentive

*Corresponding author: Vaibhavi Baxi
Email: nabamnm@gmail.com

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spirometry and breathing exercises. She was also started on propranolol 20 mg daily for 15 days to manage autonomic symptoms and anxiety.

3. Anesthetic Management

Preoperative assessment included detailed airway evaluation, which revealed a mouth opening of more than 5 cm, thyromental distance of more than three finger breadths, full neck movement, and Mallampati classification II. Standard ASA monitors, including electrocardiography (ECG), non-invasive blood pressure (NIBP), pulse oximetry (SpO_2), capnography ($EtCO_2$), and temperature monitoring, were applied. In addition, bispectral index (BIS) monitoring was used to assess the depth of anesthesia, a 20G IV cannula was secured in the right upper limb, and Preoxygenation was performed using 100% oxygen via a tight-fitting face mask for at least 3 minutes, ensuring an end-tidal oxygen concentration (EtO_2) above 90%. The patient was premedicated with glycopyrrolate 0.2 mg and midazolam 1 mg before induction. General anesthesia was then induced with intravenous fentanyl 70 mcg, propofol 100 mg, with neuromuscular blockade achieved using inj. Cisatracurium 10 mg.

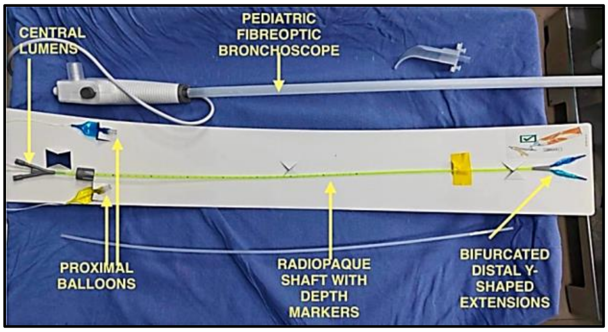

Figure 1: EZ blocker

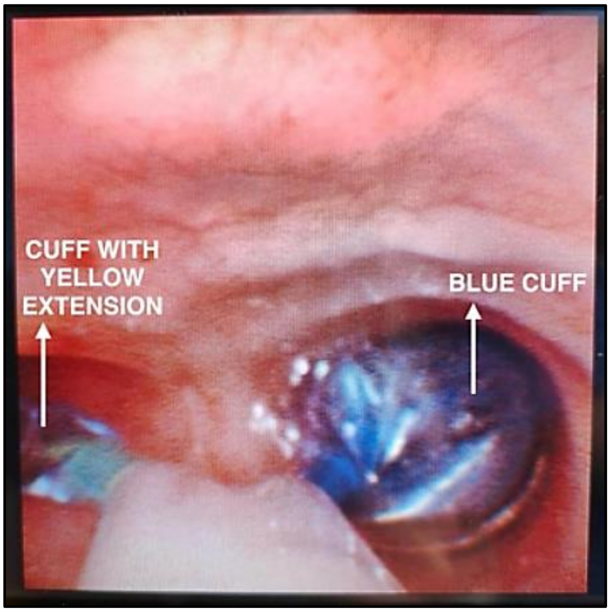

Figure 2: Fibreoptic image of proximal cuffs

Figure 3: Intra operative positioning

A video laryngoscope-guided endotracheal intubation was performed with an 8.0 mm cuffed endotracheal tube specifically chosen to accommodate both the fiberoptic bronchoscope and the EZ-Blocker, allowing smooth passage without compromising airway integrity. Lung isolation was achieved using the EZ-Blocker, positioned under fiberoptic bronchoscopy guidance to ensure correct placement in both mainstem bronchi. To avoid damage to the EZ-Blocker cuffs, the device was inserted first, followed by fiberoptic bronchoscopy to guide and confirm its accurate placement. To avoid damage to the EZ-Blocker cuffs, the device was inserted first, followed by fiberoptic bronchoscopy to guide and confirm its accurate placement within both mainstem bronchi. The tip of the endotracheal tube was placed 3–4 cm above the carina to permit the bifurcated arms of the EZ-Blocker to separate naturally and align with both mainstem bronchi. Approximately 1 mL of air was injected into the EZ-Blocker's balloon cuff to facilitate expansion and anchoring of the device in the bronchi. Surgery was performed in supine position. Initially the right lung was collapsed by inflating the right side blocker cuff (balloon) (seen as blue on FOB). (**Figure 2**) .Suction was applied to the patent central lumen of the tube within the right side cuff to deflate the right lung. Thoracoscopy on the right side confirmed absence of ventilation and deflated right lung. However, selective blocking of the right upper lobe bronchus posed a challenge. Additionally, the surgical site involved the lung apex, and in the supine position, access for the surgeon was difficult. To overcome inadequate collapse of the apical lobe, the patient was placed in a head-up position, which facilitated better surgical exposure. Intermittent suctioning was also performed to enhance lung collapse and optimize the surgical field. Sympathectomy was done at T3 and T4 levels on the right upper thoracic cavity.

This was followed by deflation of the right EZ blocker cuff and gradual ventilation of the right lung to full capacity. Following this the left EZ blocker cuff (seen yellow on FOB) was inflated to stop ventilation of left lung.(**Figure 2**). Left lung was also deflated by doing suction of the central lumen of the patent tube within the left side cuff. We confirmed the left lung deflation on left thoracoscopy. Sympathectomy was done on left side as well at T3 and T4 levels on left upper thoracic cavity. At the end the left cuff of EZ blocker was also deflated with gradual ventilation of left lung to full capacity.

The EZ-Blocker cuffs were inflated while patient was apneic and both inflation and deflation was done under continuous fiberoptic guidance throughout the procedure to ensure optimal lung collapse and ventilation management. Since the procedure was bilateral, the EZ-Blocker provided an advantage by allowing sequential lung isolation.

Oxygenation and ventilation were continuously monitored using end-tidal CO_2 measurements. Recruitment maneuvers were performed as needed to optimize gas exchange. These included sustained manual inflations with a peak inspiratory pressure of 30–35 cmH_2O for 10–15 seconds, followed by incremental increases in positive end-expiratory pressure (PEEP) to reopen collapsed alveoli. Additionally, intermittent deep breaths were provided to enhance lung expansion, and fiberoptic bronchoscopy was used to confirm re-expansion of the lung after one-lung ventilation. Recruitment maneuvers were carefully titrated to prevent hemodynamic compromise and barotrauma. Analgesia was maintained with remifentanil at 0.15 mcg/kg/min using infusion pumps.

Mechanical ventilation was set to a lung-protective strategy with low tidal volumes (3-4 mL/kg of predicted body weight), peak inspiratory pressure limited to <30 cmH_2O, and a respiratory rate adjusted to maintain normocapnia or mild permissive hypercapnia. Positive end-expiratory pressure (PEEP) of 4-5 cmH_2O was applied to prevent atelectasis, and fraction of inspired oxygen (FiO_2) was titrated to maintain $SpO_2 > 90\%$. BIS values were maintained between 40-50. Hemodynamic stability was ensured with continuous monitoring of blood pressure (SBP 110-130 mmHg, DBP 65-80 mmHg) and heart rate (70-85 bpm). Intraoperative hemodynamic stability was maintained with careful titration of anesthetic agents and fluid management to prevent hypotension or excessive sympathetic stimulation.

4. Postoperative Management

The patient was successfully extubated in the operating room and transferred to the post-anesthesia care unit (PACU). Pain was managed using multimodal analgesia, including IV paracetamol 1 g every 6 hours and diclofenac 75mg every 12 hours. Her postoperative pain scores were recorded as VAS 2/10 at rest and 3/10 on movement. She remained hemodynamically stable, with no immediate postoperative complications such as hypoxia or hyperhidrosis. She was discharged on postoperative day 1.

5. Discussion

This case highlights the advantages of the EZ-Blocker in sequential lung isolation, particularly in bilateral thoracoscopic procedures.

DLTs are the traditional standard for lung isolation, offering excellent lung separation and ventilation control. However, DLT placement requires experience, and improper positioning can lead to hypoxia or lung contamination[6] Additionally, DLTs have a larger outer diameter, increasing the risk of airway trauma, particularly in smaller patients. The smallest available DLT is 26 Fr, typically used only in children under 8 years old which may still be too large for patients with a small tracheal diameter.[7] In contrast, the EZ-Blocker provides lung isolation with a standard single-lumen endotracheal tube (ETT), reducing airway trauma. It is also easier to position using fiberoptic bronchoscopy, making it a viable alternative in cases where airway management is challenging.[8]

The Univent bronchial blocker, integrated into a modified single-lumen tube, provides lung isolation but requires frequent repositioning, leading to longer setup times and potential dislodgment during surgery.[9] The EZ-Blocker's symmetrical Y-shaped design allows for more stable placement in both mainstem bronchi, ease of placement and reducing the need for intraoperative adjustments. Additionally, sequential lung isolation is more straightforward with the EZ-Blocker, making it advantageous in bilateral procedures like this case.[10]

Sympathectomy is a well-established treatment for hyperhidrosis, targeting the T3–T4 sympathetic ganglia to disrupt excessive sympathetic activity. This procedure provides long-term relief, significantly improving the patient's quality of life.[11] While compensatory hyperhidrosis remains a potential complication, careful patient selection and counseling help mitigate postoperative concerns.[12]

Specific challenges in this case included ensuring alternate lung collapse and adequate collapse in the apical lobe and maintaining oxygenation during one-lung ventilation. Ensuring complete lung collapse is crucial for adequate surgical exposure. In this case, multiple strategies were employed to improve lung deflation with minimal trauma:

1. **Cuff Inflation During Apnea and Under Vision:** The EZ-Blocker cuffs were inflated while the patient was apneic, ensuring that the lung was not in an inflated state during placement.
2. **Use of an Optimal-Sized Endotracheal Tube (ETT):** Selecting an appropriately sized ETT facilitated smooth passage of the EZ-Blocker and fibreoptic bronchoscope without causing damage to cuff. In this case, an 8.0 mm ETT was used for a young female patient weighing 40kg, ensuring adequate

internal diameter for the blocker and fibreoptic bronchoscope while maintaining airway stability.

3. **Head-Up Positioning** (**Figure 3**) Elevating the patient's head helped optimize access to the upper thoracic cavity, improving lung deflation, particularly at the apical region.
4. **Intermittent Suctioning**: Application of suction through the central lumen of the EZ-Blocker aided in achieving complete lung collapse while preventing excessive trauma from overinflation.
5. **Fiberoptic Confirmation** ensured proper placement and maintained optimal lung isolation throughout the procedure.
6. **Recruitment Maneuvers Post-Deflation**: Careful re-expansion using recruitment maneuvers helped restore lung function without barotrauma.

6. Conclusion

The use of the EZ-Blocker in bilateral thoracoscopic sympathectomy provided effective alternate lung isolation with reduced airway trauma and improved surgical access. Compared to DLTs and Univent blockers, the EZ-Blocker offered advantages in positioning, stability, and sequential lung isolation. Strategies such as apneic cuff inflation, head-up positioning, and intermittent suctioning played a crucial role in optimizing lung deflation without excessive airway manipulation. This case underscores the importance of individualized anesthetic strategies, meticulous intraoperative management, and the potential benefits of bronchial blockers over traditional methods for selective lung ventilation in thoracic surgeries.

7. Source of Funding

None.

8. Conflict of Interest

None.

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